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CEO Turnover, Network Effects, and Firm Performance

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ABSTRACT

This article applies network and organizational theory to examine the effect of CEO turnover on firm accounting and market performance in both short-term and long-term. In addition, this research investigates the moderating role of network effects using cluster analysis. Using a system generalized method of moments (GMM) estimation of panel data obtained from Compustat and S&P's Execucomp database, this study finds that it is less likely to have superior performance in the long-term for firms with frequent CEO turnover. While it is more likely to have better accounting performance over the short-term, but less likely to have superior market performance. This study further validates the moderating role of network effects. This article contributes to the research by providing new insights of CEO turnover effects on firm performance and investigating the moderation effect of network structure. The findings also provide practical suggestions for firms that experience frequent changes of their CEOs.

KEYWORDS

CEO Turnover, Cluster Analysis, Econometrics, Firm Performance, Network Effects, Panel Data

INTRODUCTION

Organizational theory has been widely used in the literature to study employee turnover (Baron & Hannan, 2001; Boyne et al., 2011; Hannan & Freeman, 1984). The theory suggests that organizational change is disruptive. Prior literature has agreed on the relationship between top management (e.g. CEO) turnover and firm performance. Lin et al. (2008) suggested that a change of chairman implied that the organization power structure of the board of directors is unbalanced, and makes firms' personnel restless while reducing firm performance. The role of senior executives, such as the CEO, have been recognized as one of the critical assets that sustains an organization's competitive advantage (Zhang et al., 2016). Today's organizations are globally integrated enterprises with complex ties such as supply chains, share transactions, and integrated information technology systems across all internal and external business processes. This complexity requires an enhanced executive understanding of the organization and its operations. If a firm encounters more frequent changes of the CEO, it may experience the loss of knowledgeable and skilled senior management in the field who could make more efficient and effective strategic decisions in a timely manner. This, in turn, could result in the loss of their competitive advantage relative to their competitors. Many studies have examined the effect of CEO turnover on organizational performance. However, empirical research on the impact of

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the frequency of CEO turnover is still sparse among academics. To fill this research gap, we propose to empirically examine the relationship between CEO turnover frequency and firm performance in both the short-term and the long-term. A frequent change in CEO not only has an expected short-term impact on organizational performance, but also a long-term impact. CEO turnover usually causes a short-term fluctuation of its stock price, and brings about an adjustment of organizational strategy and management tactics in the future. These changes will have a considerable and persistent impact on organizational performance.

While examining the influence of the frequency of CEO turnover on firm performance, we pay special attention to a factor that has been under researched in prior literature: the network effects. Network effects play an important role in firm performance. Network theory suggests that organizations are relational effects generated in patterned networks of diverse materials (Larcker et al., 2013). As the complexity of the organizations' networks increase, the impact of a change (e.g., CEO turnover) may have collateral impacts. Different network structures indicate that organizations have different connections with other firms. It is important to understand whether CEO turnover affects firm performance differently, depending on the network structure. To answer the research questions, this study empirically validates our econometric panel data model using system generalized method of moments (GMM) estimates. In general, this study finds that firms perform poorly over the long-term if they have frequent CEO turnover. It is also found that a better accounting performance over the short-term is more likely from firms with frequent CEO turnover. However, these firms are also less likely to have superior market performance. In addition, the results reveal interesting moderation effects from different organizational network structures. For instance, in the long-term, the betweenness and degree of networks positively moderate the effect of CEO turnover on firm performance. The closeness of networks negatively moderates the relationship between CEO turnover and the firms' accounting performance, but positively moderates the impact on firms' market performance. In the short-term, the betweenness and degree of networks negatively moderate the relationship, while network closeness positively moderates the impact.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature. Section 3 develops the hypotheses. Section 4 discusses the research model and methodology. Section 5 presents the empirical results and analyses. Section 6 concludes our findings and section 7 summarizes our contributions and practical implications.

LITERATURE REVIEW

This study builds on two research streams within the CEO turnover and network analysis literature: (1) the association between CEO turnover and firm performance (Adams & Mansi, 2009; Boyne, James, John, & Petrovsky, 2011; Chen & Thompson, 2015; Davidson, Worrell, & Cheng, 1990; Denis & Denis, 1995; Eisfeldt & Kuhnen, 2013; He, Sommer, & Xie, 2011; Huson, Parrino, & Starks, 2004; Hutchison, 2014; Intintoli, Zhang, & Davidson, 2014; Lin, Wang, & Lin, 2008; Karaevli, 2007; Park & Shaw, 2013; Rhim, Peluchette, & Song, 2006; Shen & Cannella, 2002; Zhang, Wierschem, Mendez Mediavilla, & Hong, 2016). (2) The role of business network clusters on firm performance (Gulati, Nohria, & Zaheer, 2000; Peng & Luo, 2000; Zaheer & Bell, 2005). This study reviews related literature as presented below. First, we introduce the firm performance measured by both accounting performance and market performance. Second, it discusses the impact of CEO turnover on firm performance. Third, it reviews the role of business networks on CEO tenure, compensation, and firm performance.

Firm Performance

Firm performance has been measured by a variety of indicators: accounting earnings and cash flows (Dechow, 1994), Tobin's Q (Hejazi, Ghanbari, & Alipour, 2016; Tobin, 1969), stock return (Jenter &

Kanaan, 2015), return on assets (Hansen & Wernerfelt, 1989), return on sales (Chakravarthy, 1986), and many others (Al-Matari et al., 2014; Li & Chang 2018).

These measurements can reflect performance across different lengths of time, for instance, long-term and/or short-term. Long-term indicators are defined as measures of the impact of previous long-term investments and strategies represented by return on assets (ROA) and/or return on sales (ROS) (Brauer, 2013). These measures reflect decision criteria that require longer time frames for implementation and subsequent responses. For changes to be reflected in ROA, the magnitude of the investments in assets is typically larger, which requires longer time spans to design and implement. Similarly, impacts on ROS also require significant changes in sales and marketing strategies, requiring longer term decision making and implementation. Conversely, Tobin's Q, is a short-term measure of market valuation of firm performance. The market valuation of an organization is a measure of a firm's position based on available public information and anticipated performance. Therefore, the Tobin's Q value is a short-term measure reflecting the immediate time view of perceived benefits or costs associated with known changes, such as a change in CEO.

CEO Turnover and Firm Performance

Prior literature has extensively studied the effect of CEO turnover on Firm Performance (Bernard et al., 2018; Chen & Thompson, 2015; Eisfeldt & Kuhnen, 2013; Hambrick & Quigley, 2014; Huson et al., 2004; Hutchison, 2014; Intintoli et al., 2014; Lin et al., 2008; Karaevli, 2007; Park & Shaw, 2013; Rhim, Peluchette, & Song, 2006; Zhang et al., 2016). Findings from the literature have been mixed. Hambrick and Quigley (2014) indicated that CEO turnover has a significant influence on firm performance without regard to direction. Huson et al. (2004) studied the CEO turnover and firm financial performance. They found that CEO turnover announcements are positively associated with average abnormal stock returns. Bernard et al. (2018) investigated the relationship between CEO turnover and corporate sustainability performance. Their results indicated that a change of CEO has a positive impact on corporate sustainability performance five years after the change. Lin et al. (2008) suggested that a change of a high-level manager is negatively associated with organizational performance. Intintoli et al. (2014) concluded that interim successions are negatively related to operating performance, but do not affect market performance. Park and Shaw (2013) indicated that turnover rates are negatively related to organizational performance. Zhang et al. (2016) suggested that CEO turnover, both in general and in IT firms specifically, is negatively associated with firm performance. Chen and Thompson (2015) provided evidence that founder turnover was not unambiguously associated with superior performance.

As stated previously, some research pays attention to the short-term effects of CEO turnover announcements or interim successions on firm performance (Boyne et al., 2011; Chen & Thompson, 2015; Denis & Denis, 1995; Hutchison, 2014). Other research is more focused on the long-term trend effects of CEO turnover as it relates to firm performance (Eisfeldt & Kuhnen, 2013; Huson et al., 2001; Huson et al., 2004; Intintoli et al., 2014; Kim, 1996; Zhang et al., 2016). However, to the authors' knowledge, no prior literature distinguishes the impacts of CEO turnover on firm performance as discussed from a time perspective. Therefore, this study examines, both long-term and short-term, the impact of CEO turnover on firm performance.

Network Effects and Firm Performance

A few current studies have examined the impacts of network clusters on firm performance (Gulati et al., 2000; Peng & Luo, 2000; Zaheer & Bell, 2005). Gulati et al. (2000) examined the impact of network structure on firm performance from a strategic network perspective. They concluded that the embeddedness of firms with a network of external relationships with other organizations has significant implications for firm performance. Peng and Luo (2000) conducted a survey from China demonstrating that managers' interpersonal relations with top executives at other firms and with government officials help improve firm performance. Zaheer and Bell (2005) indicated that firms

with superior network structures are better able to exploit their internal capabilities and to enhance their performance. In summary, the networks to which prior literature refers involve primarily social networks and resource sharing networks. Both types of networks are composed of some relationships identified by judging rules, e.g., a judging rule for board network is based on whether the same person is a member of other boards of directors.

To the best of the authors' knowledge, there is a knowledge gap regarding the interaction of CEO turnover and organization network clusters on firm performance. To fill this research gap, this study combines these literature streams to propose that the performance of firms is impacted by CEO turnover and such impact may be different due to different network structures.

This paper uses the interplay between firm performance as a judging rule to build a network cluster subject to CEO turnover influences on firm performance. The Granger causality test is used over a sample period to determine the network, based on significant interplay between firms.

Network theory develops, multiple related but, heterogeneous notions (Larcker, So, & Wang, 2013). A network consists of a set of actors (nodes) and the relations (ties) between the actors (Katz, Lazer, Arrow, & Contractor, 2004; Wasserman & Faust, 1994). The nodes may be individuals, groups, organizations, or societies (Katz et al., 2004).

Network literature has developed several quantitative measures of the network structure. Frequently used measures are closeness, betweenness, and degree of centrality. Consistent with the literature, this research uses closeness, betweenness, and degree as centrality measures of an organization within a firm's performance network structure. According to network literature, centrality is defined as the locations of positions within networks (Freeman, 1978). Organizational centrality refers to relational characteristics illustrating the position a firm occupies within an interorganizational field (Rogers, 1974). Some organizations might be sought out because of their resources and might be directly connected to other actors through exchanges. Therefore, centrality highlights the position of one actor relative to others as defined by the number of relations and the direct or indirect nature of these relations (Rogers, 1974).

Closeness centrality refers to the extent to which nodes are directly or indirectly connected to the rest of the nodes in the network (Katz et al., 2004). It is defined as the weighted sum of the direct and indirect connections a firm has. Lighter weights are placed on the connections to more distant contacts in the calculation, because these connections are presumably weaker. It is easier for firms with a higher closeness measure to get other firms' resources or information on the network. These firms can therefore reduce their gap with other firms. Closeness is defined as the inverse of the average distance between a firm and other firm. Letting $l\left(i,j\right)$ be the number of steps in the shortest path between firm i and firm j (Larcker, et al., 2013):

$$CLOSENESS_{i} = \frac{n-1}{\sum_{j \neq i} l\left(ij\right)} \tag{1}$$

Betweenness centrality refers to the extent to which nodes have relations with others who are not directly connected (Katz, et al., 2014). It is a centrality measure of a firm within its performance network. Betweenness centrality is defined as the sum of the shortest paths between all pairs of other firms that pass through a firm, scaled by the total number of shortest paths between pairs. In other words, it is defined to be the average proportion of paths between two outside firms on which a firm lies. Letting $P_{i}\left(k,j\right)$ denote the total number of shortest paths between firm k to firm *j* through node *i*; and $P\left(k,j\right)$ denotes the total number of shortest paths between k and j (Larcker et al., 2013):

$$BETWEENNESS_i = \sum_{j \neq i : i \{kj\}} \frac{P_{i(k,j)} / P\left(k, j\right)}{\left(n-1\right)\left(n-2\right) / 2} \tag{2}$$

Degree centrality refers to the extent to which nodes send or receive direct relations (Katz et al., 2004). It is defined as the sum of the direct connections a firm has. The concept is intuitive and can be easily interpreted. Each connection is equally weighted in the summation, and indirect contacts are not counted in the calculation. Firms with a higher degree measure have access to some resources or information that is provided by alliances. Degree $\delta\left(ij\right)$ denotes an indicator that firms i and j share a director, for a given company i in a network (Larcker et al., 2013):

$$DEGREE_i = \sum_{j \neq i} \delta\left(ij\right) \tag{3}$$

HYPOTHESES DEVELOPMENT

Organizational theory indicates that the effects of change are disruptive. This theory has been applied by researchers to the study of employee turnover (Baron & Hannan, 2001; Boyne et al., 2011; Hannan & Freeman, 1984). Their findings suggested that turnover mostly impacts senior executives, such as the CEOs. They also concluded that changes in employment could increase turnover, and therefore may affect firm performance. Indeed, prior literature has found that there is a significant association between CEO turnover and firm performance (Adams & Mansi, 2009; Boyne et al., 2011; Hamori & Koyuncu, 2015; He et al., 2011; Huson et al., 2004; Lin et al., 2008; Shen & Cannella, 2002; Zhang et al., 2016). In practice, network relations might enhance benefits (Engelberg, Gao & Parsons, 2013). However, if a firm experiences frequent CEO turnover, it may create chaos because of the loss of managerial knowledge resources; for example, the organizational accepted routines may be disrupted, the business processes could be reengineered, and the organizational relationships might be destabilized. Moreover, such firm's stakeholders, including business partners and investors, may be concerned by the consequence of this change (Zhang et al., 2016). These changes could result in the loss of market opportunities and losing competitive advantages over competitors. Thus, this study proposes the following hypotheses:

H1a: CEO turnover is negatively related to firm performance (as measured by Tobin's Q, ROA, ROS in the long-term).

H1b: CEO turnover is negatively related to firm performance (as measured by Tobin's Q, ROA, ROS in the short-term).

If an organization possesses relatively closer relations to outside organizations, it is more likely to make information or resource exchange quicker and more readily available (Larcker et al., 2013). Such organization has the potential to be able to reduce the gap with other firms. In other words, a firm with a larger closeness value could easily scatter its resources to other firms through its network when CEO turnover occurs. Therefore, firms with larger closeness are more likely to lose competitive advantages as compared to their competitors, and lead to worse performance. The following hypotheses are thus proposed:

H2a: Closeness negatively moderates the impact of CEO turnover on firm performance (as measured by Tobin's Q, ROA, ROS in the long-term).
H2b: Closeness negatively moderates the impact of CEO turnover on firm performance (as measured by Tobin's Q, ROA, ROS in the short-term).

If an organization lies on relatively more paths between pairs of outside organizations, such a firm is more likely to act as a key broker of information or resource exchange (Larcker et al., 2013), and can mediate or control the relationship between other companies through the network. Firms with higher betweenness may have few controls to richer and more differentiated resources or information on the network when CEO turnover occurs. Therefore, we propose the following hypotheses:

H3a: Betweenness negatively moderates the impact of CEO turnover on firm performance (as measured by Tobin's Q, ROA, ROS in the long-term).
H3b: Betweenness negatively moderates the impact of CEO turnover on firm performance (as measured by Tobin's Q, ROA, ROS in the short-term).

In this study, degree indicates the direct effect from other companies through their network. In other words, degree indicates the extent to which a company has direct relations with its alliances. If an organization possesses many channels of communication or resource exchange, it may have more opportunities or alternatives than its competitors (Larcker et al., 2013). Therefore, firms with a higher degree of centrality could have simple and economical access to the resources or information that is supported by alliances. For that reason, when CEO turnover occurs, these firms are more likely to perform better than others with fewer alliances. Accordingly, the following hypotheses are proposed:

H4a: Degree positively moderates the impact of CEO turnover on firm performance (as measured by Tobin's Q, ROA, ROS in the long-term).
H4b: Degree positively moderates the impact of CEO turnover on firm performance (as measured by Tobin's Q, ROA, ROS in the short-term).

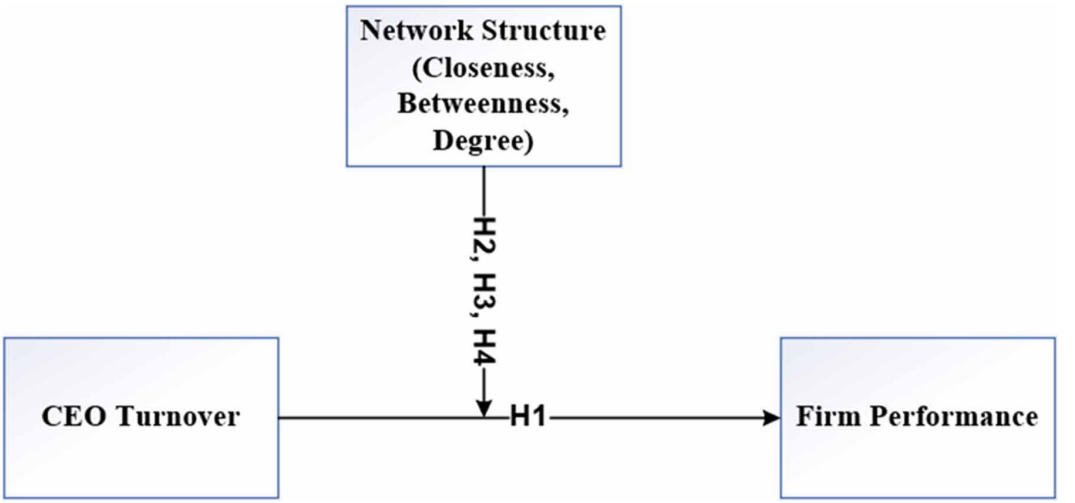
The hypothesized relationships between CEO turnover, network structure, and firm performance are summarized in the research model shown in Figure 1.

METHOD

This article uses network theory to model the relationships among firms. A network consists of a set of nodes and arcs or ties between the nodes (Katz et al., 2004; Wasserman & Faust, 1994). In the context of this study, the nodes are organizations and the ties are related to ROA, ROS, and Tobin's Q. Within this framework, a different network exists depending on the tie being used.

As previously mentioned, this study uses the Granger causality test to create a network of firms over a 10-year rolling window. The Granger causality test is a statistical test used to determine whether a time series is useful to predict another time series (predictive causality). This test can be performed on stationary time series. It is designed that the null hypothesis of no Granger causality is rejected if any of the lagged explanatory variables is found to be statistically significant (Eichler, 2012; Granger, 1969). The idea of Granger causality states that if the variance of variable *X* predicted using the universe of information is less than the variance of variable *X* predicted using all information except variable *Y*, then we can say that variable *Y* is causing variable *X*, denoted as $Y \rightarrow X$. A feedback system occurs if variable *X* Granger causes variable *Y*, and variable *Y* Granger causes variable *X*, denoted as $X \leftrightarrow Y$.

Figure 1. The research model



Further, it is unrealistic to use the universe of information. Therefore, it is better to replace it with relevant information. In this paper, for example, the Granger causality test technology is used to analyze firm performance over a ten-year period rolling window[1], covering a time span from 1992 to 2013. This results in a balanced panel dataset with 131 firms and 2197 relationships among the firms as nodes and edges that form a direct network (see Figure 2 in appendix). We then measure the centrality of the nodes (firms) in the network (i.e., betweenness, closeness, and degree) and add these to the balanced panel data of long-term and short-term effects.

Once the dataset is completed, an econometrics panel data model is used to relate firm performance to CEO turnover and the firms' measures of centrality within the network across the associated time period. Specifically, the system GMM method that is proposed by Arellano-Bond (1991) is used to estimate the model. This is a method to estimate parameters in dynamic panel data models when the maximum likelihood method cannot be applied. GMM estimates are known to be consistent, efficient and asymptotically normal. The GMM is the type of estimator designed for cases in which the number of observation objects are large and the time period is relatively short, such as the case of this study, where there are 131 firms being tracked over rolling 10 year periods from 1993 – 2013 resulting in 12 periods in our panel dataset.

It is reasonable to assume that relationships among firms, the strength of those relationships, and the leadership of those firms, change over time. It is reasonable to believe that firm performance is also affected by these changes. Therefore, this paper applies a model over two-time windows: short-term and long-term. The short-term window captures year-to-year changes and the long-term window captures ten-year trends.

RESEARCH MODEL

A system GMM is used to estimate the following panel data model to test the proposed hypotheses:

$$\begin{aligned} P_{it} &= \alpha + \rho P_{i,t-1} + \beta CEOTurnover_{it} + \gamma_1 Closeness_{it} + \gamma_2 Betweeness_{it} + \gamma_3 Degree_{it} \\ &+ \gamma_4 CEOTurnover_{it} * Closeness_{it} + \gamma_5 CEOTurnover_{it} * Betweeness_{it} \\ &+ \gamma_6 CEOTurnover_{it} * Degree_{it} + \delta_1 Size_{it} + \delta_2 Age_{it} + \mu_i + \varepsilon_{it} \end{aligned} \quad (5)$$

where i is the firm index and t is the year index. The dependent variable P_{it} is firm performance measured by ROA, ROS, and Tobin's Q. The independent variable is CEO turnover. The control variables include prior firm performance, firm size, and age. The moderating variable is the network structure, which is measured by closeness, betweenness, and degree centrality. The detailed description of all the variables appears in Table 1. A firm fixed effect that accounts for unobserved heterogeneity across firms is denoted by μ_i, and ε_{iv} is the error term.

VARIABLE DEFINITION

As stated above, firm performance has been measured by a variety of indicators and time frames. Following the literature, this study uses ROA, ROS, and Tobin's Q to measure firm performance, and applies them to both, the short-term and long-term. Table 1 provides detailed descriptions of the variables included in this study.

THE DATA COLLECTION PROCESS

The initial data set was obtained from the Compustat database. It included a total of 3726 firms. CEO turnover data was collected from S&P's Execucomp database. The financial and firm performance data was retrieved from the annual Compustat database and firm stock data from the CRSP database (Coates & Kraakman, 2010; Hamori & Koyuncu, 2011; Huson et al., 2004; Shen & Cannella, 2002). Based on the initial data set, a balanced panel data set was built, which included 131 firms with complete data for all variables, from 1992 to 2013.

To reveal the difference between the long-term and short-term effects, this study applies a rolling window process to track the long-term changing trend of CEO turnover, firm performance, and the centrality of a firms' network. This resulted in twelve 10-year period panels used to analyze the long-term effects from 2002 to 2013[2]. Meanwhile, comparing with the panel data of long-term effects, this study employed the associated individual 12-year data of CEO turnover, ROA, ROS, and Tobin's Q from 2002 to 2013 in the balanced data set to explore the short-term effect of CEO turnover on firm performance.

DATA ANALYSIS AND RESULTS

Descriptive Statistics

Table 2 displays the descriptive statistics of the variables used in this study. It provides a sense for the data by listing the mean, standard deviation, 25 percentiles, 75 percentiles, and minimum and maximum of each variable.

Table 3 displays the Pearson correlation coefficients among the variables. It shows that there are no correlations between independent variables that are greater than the critical value of 0.8. To detect any possible multicollinearity, the VIF test is also performed. The results indicate that the VIFs of all the independent variables are less than 2. Therefore, multicollinearity is not a concern.

Empirical Results

Table 4 reports the empirical results from the system GMM estimation in terms of three different measures of firm performance (i.e., ROA, ROS, and Tobin's Q). To ensure the validity of our estimation and instruments, an Arellano-Bond test for AR (2) was used. The results don't show any evidence supporting the existence of second-order serial correlation in the residuals (p-values = 0.3099, 0.3732, 0.4099, 0.1041, 0.1753, and 0.9457). Therefore, serial correlation is not a concern in the GMM estimation. A Sargan test was also performed to check the validity of the instruments.

Table 1. Variable descriptions

Dependent Variables	Definition	Measured as:
Return on Assets (roa)	A financial indicator of how profitable a company is relative to its total assets.	Earnings before extraordinary income/ assets.
Return on Sales (ros)	A financial ratio that calculates how efficiently a company is at generating profits from its revenue.	Net income/net sales.
Tobins Q (tq)	A market perspective indicator of an organization. Tobin's Q provides a measure of the market value of a company as it relates to the asset replacement value of the company.	Ratio of market value to book value of total assets: [(fiscal year-end market value of equity) + (liquidating value of the firms' outstanding preferred stock) + (current liabilities)-(current assets) + (book value of inventories) + (long-term debt)].
Independent variables		
CEO Turnover	Long-term Turnover defined as frequency of CEO turnover over 10 years.	Average CEO turnover over 10 years.
	Short-term Turnover defined as the year in which a CEO turnover event occurred.	1 if there is CEO turnover, 0 otherwise.
Moderating variables		
Closeness (C)	The extent to which nodes are directly or indirectly connected to the rest of the nodes in the network.	Weighted sum of the direct and indirect connections a firm has.
Betweenness (B)	The extent to which nodes have relations with others who are not directly connected.	Sum of the shortest paths between all pairs of other firms that pass through a firm, scaled by the total number of shortest paths between a pair.
Degree (D)	The extent to which nodes send or receive direct relations through the network.	Sum of the direct connections a firm has.
Control Variables		
Prior firm performance	The firm performance in the prior period.	The firm performance in the year t-1.
Age	The natural logarithm of the number of years the firm has CRSP data.	The natural logarithm of the number of years the firm has CRSP data.
Size	The natural logarithm of the total assets of the firm.	The natural logarithm of the total assets of the firm.

The results don't show any evidence of correlated disturbance terms. Therefore, the instruments used in the GMM estimation are valid (p-values = 0.9270, 0.9972, 0.9965, 0.9999, 0.9993, and 0.9999).

The results of this study reveal that the estimated coefficients of CEO turnover are negative and significant in the long-term (coefficients = -0.006, -0.013, and -0.139 respectively; p-values < 0.01). This suggests that firms experiencing frequent CEO turnover over the long-term are less likely to have superior firm performance, which supports hypothesis H1a. In the short-term, the coefficient of CEO turnover is negative and significant for Tobin's Q (coefficient = -0.106; p-value < 0.05). However, the coefficients of CEO turnover in the short-term are positively significant for ROA and ROS (coefficients = 0.009 and 0.023 with p-values < 0.01 and 0.1 respectively). The results indicate

Table 2. Descriptive statistics

	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
LCT	1572	0.1281	0.0872	0	0.1	0.2	0.5
SCT	1572	0.0013	0.0357	0	0	0	1
L-tq	1572	1.5868	1.0882	0.1396	0.8678	2.0031	6.4479
L-roa	1572	0.0603	0.0496	-0.3215	0.0292	0.0916	0.2074
L-ros	1572	0.0776	0.102	-1.0646	0.0496	0.1102	0.3658
S-roa	1572	0.0639	0.0686	-0.5044	0.0285	0.1005	0.2486
S-ros	1572	0.0828	0.131	-1.2289	0.0485	0.1258	0.3802
S-tq	1572	1.4221	0.9586	0.1148	0.7793	1.7845	7.556
B-tq	1572	0.0057	0.0057	0	0.0021	0.0075	0.0606
B-roa	1572	1.5742	1.0965	0.0064	0.8546	2.0013	6.4479
B-ros	1572	0.0059	0.0049	0	0.0025	0.0078	0.0359
C-tq	1572	0.0034	0.0011	0	0.0034	0.0039	0.0046
C-roa	1572	0.0037	0.0003	0.0027	0.0035	0.0039	0.0044
C-ros	1572	0.0037	0.0003	0.0027	0.0035	0.0039	0.0044
D-tq	1572	0.1478	0.0538	0.0231	0.1115	0.1769	0.3923
D-roa	1572	0.1367	0.0427	0.0308	0.1077	0.1692	0.2962
D-ros	1572	0.1398	0.0459	0.0385	0.1077	0.1692	0.2962
size	1572	9.5185	1.4227	4.9688	8.5842	10.4025	14.2658
age	1572	3.6239	0.5692	1.6276	3.3405	4.0882	4.4138

LCT: Long-term CEO Turnover; SCT: Short-term CEO Turnover; L: Long-term; S: Short-term; B: betweenness; C: Closeness; D: Degree

that CEO turnover in the short-term has a negative impact on firms' market value; but has positive influence on firms' ROA and ROS. Thus, hypothesis H1b is not supported by the data.

This study uses interaction terms to test the moderating role of network effects that are measured by closeness, betweenness, and degree. Our results indicate that the closeness network negatively moderates the impact of CEO turnover on firms' accounting performance (i.e., ROA and ROS), but such moderation effects are positive for market performance (i.e., Tobin's Q) over the long-term (coefficients = -21.730, -43.457, and 41.010, respectively; p-values < 0.05, 0.1, and 0.05, respectively). Therefore, hypothesis H2a is partially supported by the data.

The results suggest that closeness network positively moderates the impact of CEO turnover on accounting performance (coefficients = 95.679 and 247.559, respectively; p-values < 0.01); but there are no moderation effects on market performance in the short-term. Therefore, hypothesis H2b is not supported. Statistically significant moderation effects of betweenness network were found for ROS (1.471; p-value < 0.10); while the moderation effects for ROA and Tobin's Q were found to be statistically insignificant (0.001 and -1.605, respectively; p-value > 0.1). The results indicate that firms with higher betweenness have better firm performance in terms of ROS when frequent CEO turnover occurs, but not ROA and Tobin's Q over the long-term. This evidence fails to support hypothesis H3a. This study found that the moderation effect of betweenness is negatively and statistically significant, which support hypothesis H3b suggesting that the impact of CEO turnover on firm performance is affected by betweenness, over the short-term.

The results on Table 4 also show statistically significant moderation effects of degree networks were found in ROS and Tobin's Q (coefficients = 0.144 and 1.059 respectively; p-values < 0.05 and

Table 3. Correlation matrix

	LCT	L-tq	L-roa	L-ros	B-ros	C-ros	D-ros	S-roa	S-ros	S-tq	size	age	B-tq	C-tq	D-tq	D-roa	C-roa	B-roa	SCT
LCT	1.000																		
L-tq	-.060	1.000																	
L-roa	-.080	.669	1.000																
L-ros	-.040	.208	.710	1.000															
B-ros	.050	-.029	.014	-.002	1.000														
C-ros	-.070	.123	.041	-.028	.253	1.000													
D-ros	-.020	.117	.059	-.025	.345	.593	1.000												
S-roa	-.020	.409	.599	.448	-.016	-.037	-.017	1.000											
S-ros	.020	.176	.456	.671	.002	-.048	-.053	.752	1.000										
S-tq	-.100	.692	.425	-.004	-.057	.073	.091	.502	.076	1.000									
Size	.120	-.297	-.130	.262	-.016	-.146	-.120	-.089	.190	-.385	1.000								
age	.120	-.167	.048	.069	.037	-.141	-.093	.062	.077	-.166	.287	1.000							
B-tq	.050	-.033	-.028	-.055	.176	-.008	.036	-.071	-.069	-.065	.032	.044	1.000						
C-tq	.000	.061	-.023	-.023	-.035	.090	.088	-.153	-.027	-.163	-.056	-.078	.089	1.000					
D-tq	-.050	-.062	-.101	-.029	.030	.085	.058	-.111	-.051	-.063	.088	-.023	.349	.040	1.000				
D-roa	-.030	-.003	.005	-.001	.163	.350	.486	-.024	-.017	.015	-.068	-.073	.060	.013	.134	1.000			
C-roa	-.040	.029	.019	-.011	.127	.460	.232	-.038	-.032	.015	-.087	-.077	.049	.031	.113	.622	1.000		
B-roa	-.120	.260	.184	.082	-.038	.074	.161	.126	.081	.237	-.234	-.138	-.053	.076	.062	.065	-.018	1.000	
SCT	-.010	-.005	-.003	.019	.022	-.008	-.021	-.012	.013	-.021	.013	-.002	.032	.014	.017	-.007	.014	-.051	1.000

0.01 respectively), partially supporting hypothesis H4a, suggesting that firm performance is positively affected by degree, over the long-term when firms experience frequent CEO turnover. The moderation effects on ROA were found to be insignificant. The moderation effect of degree networks is found to be statistically insignificant over the short-term, which does not support hypothesis H4b (Table 4).

With respect to control variables, it was found that firm size is negatively related to firm performance with respect to ROA and Tobin' Q, but positively related to firm performance with respect to ROS in the long-term. Firm size is also positively associated with ROS and Tobin's Q in the short-term. Firm age is also negatively related to ROA and ROS and positively related to Tobin's Q in the long-term. While it is positively associated with ROA and ROS, but negatively associated with Tobin's Q over the short-term. In addition, the findings indicate that firms' prior performance has a positive impact on current performance.

DISCUSSION

Our initial hypothesis (i.e., H1b) is not supported by the data. The authors hypothesize that the reason behind this could be that CEO turnover decisions by corporate boards are more likely impacted by the exogenous industry in the short-term (Jenter & Kannan, 2015). Literature suggests that CEOs with a poor performance record are more likely to be dismissed in firms with low industry returns (Jenter & Kannan, 2015). Therefore, short-term CEO turnover may provide a positive adjustment opportunity to firms, leading to a short-term increase for accounting performance, but may convey a negative signal (poor performance) to the market, resulting in a short-term decline for market performance.

The study shows that hypothesis H2a is partially supported by the data. Over the 10-year window, if firms within the network experience more frequent CEO turnover, the firms with higher closeness are more likely to yield market opportunities to other competitors closer to them within the network. In other words, firms with higher closeness and frequent CEO turnover are associated with improved performance. Therefore, it is conjectured that long-term accounting performance is more likely to decline for the core firms, whereas long-term market performance is more likely to improve.

This study did not find evidence to support hypothesis H3a. It is speculated that the reason could be that in the firms' network, as a broker role of information resources, the higher the betweenness centrality of a firm is, the easier it is to mediate the relationship between other companies through the network. When experiencing CEO turnover, the firms with higher betweenness centrality are more likely to transfer the resulting negative impacts to other companies and reduce the long-term ROS loss. On the other hand, such firms could make optimal adjustment to the firms' operational strategies, leading to increased ROS in the long-term. However, in the Tobin's Q network, due to the public information requirements, the firms may lose the advantage of an information resource monopoly in the network. This may lead to a decreasing Tobin's Q in the long-term.

The study found support for hypothesis H3b suggesting that the impact of CEO turnover on firm performance is affected by betweenness, over the short-term. This suggests that if a firm that acts as a broker experiences CEO turnover, it could lose the mediation or control capability with other companies in the short-term, for example, other companies may discontinue current relations and discover new relations to exchange information and resources.

This study also partially supports hypothesis H4a, which suggests that firms with higher degree centrality are easier to build cluster alliances with other organizations. That is, the higher degree centrality, the larger the cluster. When firms experience CEO turnover, they may share their information and resources with their alliances in the cluster. This could reduce the negative influences from CEO turnover. Especially in the financial district and stock markets, firm clusters have higher agility to respond to market change. It is speculated that the lack of support for hypothesis H4b could be because in the short-term, the ability of a firms' cluster to enhance firm performance may not be obvious.

Table 4. Empirical results

	Long-terms relations (10 Years Rolling Windows)			Short-terms relations (Period: 2002-2013)		
	(1) ROA	(2) ROS	(3) Tobin'q	(4) ROA	(5) ROS	(6) Tobin'q
Lagged Dependent Variable (LagDV)	0.7795*** (0.0163)	0.7705*** (0.0115)	0.7459*** (0.0045)	0.3007*** (0.0047)	0.5974*** (0.0037)	0.4390*** (0.0063)
H1a: LCT	-0.0063*** (0.0021)	-0.0128*** (0.0029)	-0.1388*** (0.0187)	—	—	—
H1b: SCT	—	—	—	0.0093*** (0.0028)	0.0233* (0.0121)	-0.1063** (0.0430)
Betweeness (B)	0.0007 (0.0006)	0.0919** (0.0366)	-0.6288** (0.2580)	-0.0056*** (0.0010)	0.1851 (0.1663)	-8.5160*** (1.5299)
Closeness (C)	0.4572 (0.9069)	3.4797** (1.5640)	14.0856*** (3.7225)	-9.4592** (2.9118)	-0.5705 (6.2421)	-152.8360*** (21.0371)
Degree(D)	-0.0035 (0.0038)	-0.0137*** (0.0051)	0.1491*** (0.0279)	0.0133 (0.0146)	-0.0570*** (0.0218)	1.6298*** (0.1632)
LCT*C (H2a)	-21.7299** (10.4437)	-43.4569* (22.2494)	41.0097** (19.6803)			
LCT*B (H3a)	0.0006 (0.0014)	1.4708* (0.7580)	-1.6053 (3.8733)			
LCT*D (H4a)	0.0287 (0.0400)	0.1439** (0.0598)	1.0586*** (0.2242)			
SCT*C (H2b)				95.6786*** (30.7260)	247.5593*** (63.5710)	-67.3129 (170.1468)
SCT*B (H3b)				-0.0677*** (0.0065)	-7.6378*** (2.1672)	-37.6375** (18.4835)
SCT*D (H4b)				-0.3431* (0.1773)	-1.1923*** (0.2257)	-5.5008*** (1.2382)
Size	-0.0018*** (0.0004)	0.0036*** (0.0010)	-0.0371*** (0.0054)	0.0022 (0.0022)	0.0045*** (0.0005)	0.1775*** (0.0269)
Age	-0.0077*** (0.0024)	-0.0311*** (0.0063)	0.0590** (0.0266)	0.0266*** (0.0064)	0.0030*** (0.0010)	-0.4484*** 0.1004)
Arellano-Bond test	1.0152 (0.3099)	0.8903 (0.3732)	0.8240 (0.4099)	1.6254 (0.1041)	1.3553 (0.1753)	0.0680 (0.9457)
Sargan test	87.42594 (0.9270)	57.16981 (0.9972)	103.245 (0.9965)	115.9497 (0.9999)	111.1662 (0.9993)	118.7237 (0.9999)

Notes: (1) * p < 0.1, ** p < 0.05, *** p < 0.01 (2) Standard errors in parentheses, p-value in parentheses of Arellano-Bond test and Sargan test. (3) The null of Arellano-Bond test is that the residuals from the first differenced equation exhibit no second order serial correlation. (4) The null of Sargan test is that all the instruments used are valid.

CONCLUSION

The impact of CEO turnover on firm performance has attracted interests from scholars, resulting in a body of literature. With the complexity of organizations' networks in today's business environment, it is critical for organizations to gain a better understanding of CEO turnover effects. This study builds on prior literature and extends the model to include a cluster network structure of the organizations. Specifically, it explores how a frequent change in CEO influences firms' accounting and market performance in both the long-term and the short-term. Furthermore, it explores how such influence

differs depending on the characteristics of the network structure; which is measured in terms of closeness, betweenness, and degree centrality networks.

Our main findings indicate that CEO turnover has a negative influence on firm performance in the long-term. This is in agreement with findings in the literature suggesting that a new CEO can be disruptive to firm performance and may take significant time for it to successfully stabilize and improve (Adams & Mansi, 2009; Boyne et al., 2011; Hamori & Koyuncu, 2015; He et al., 2011; Huson et al., 2004; Lin et al., 2008; Shen & Cannella, 2002; Zhang et al., 2016). This study also finds that frequent turnover in the CEO position is associated with worse market performance, but interestingly, better accounting performance in the short-term. This may indicate that, to change the previous poor accounting performance is an important first step for successors; but the marketplace often interprets CEO turnovers as bad news for investors in the short-term. This could be also explained by the number and quality of ties between a firm, its corporate partners and customers.

As organizations have reduced the number of partners, increased the technological integration of their systems, and streamlined the flow through of their supply chains, the number of their collaborations and associated reliance on partners and collaborators has been reduced. With the introduction of a new CEO, new quality prospective collaborators, partners, and/or customers are identified thus increasing the betweenness value. However, the Tobin's Q measure indicates a negative relation with performance. This could indicate a market reaction to the uncertainty associated with the disruption of existing supply chains and the creation of new ones. The closeness network is found to weaken the influence of CEO turnover on accounting performance in the long-term but enhances the influence in the short-term. The situation espoused by the data may reflect an increase in long-term investment into new asset partners by the organization as it restructures and/or repositions itself with a corresponding decrease in interactions with existing asset partners under the direction of a new CEO. New relationships would not start as "close" and existing "close" relations would be weakened. Over the long-term (i.e., 10-year time window), the impact of CEO turnover on ROA and ROS is attenuated over the long run. In terms of market performance, the moderation effects are found to be positively significant in the long-term, but insignificant over the short-term. One of the possible explanations is that it may take a longer time period to reflect the market performance change.

Furthermore, the results in this study provide evidence that the betweenness network only moderates the relationship between CEO turnover and ROA over the long-term, but there are negative moderation effects in terms of both, accounting performance and market performance, in the short-term. The degree network is found to positively moderate the effects of CEO turnover on ROS and Tobin's Q in the long-term. This reflects the marketplace positive response to the increased number of firm connections associated with a new CEO's direction. However, it does not take into consideration the quality of those relations. Therefore, the increased number of connections does not directly influence ROA. In the short-term, degree networks are found to negatively moderate the association between CEO turnover and firm performance.

Based on our results, the authors conclude that frequent CEO turnover has effect on firm performance, and such effect is moderated by the cluster network structure.

Contributions and Implications

This research makes several contributions to CEO turnover and firm performance literature. To the best of the author's knowledge, this is the first instance of applying network analysis to the topic of the effect of CEO turnover on a firms' financial performance. The resource-based view of the firm (RBV) focuses its attention, almost exclusively, on resources and capabilities internal to the firm. In its stead, this paper uses an organizational network perspective that posits the embeddedness of firms in networks of external relationships. This paper takes into consideration how other organizations have significant interactions when analyzing the effects of CEO turnover on firm performance, which is an important complement to existing research. The results suggest the moderating role of organizational network effects to better understand the impact of CEO turnover. In addition, this paper reveals the

difference between the long-term and the short-term effects of CEO turnover on firm performance as measured by ROA, ROS and Tobin's Q. Understanding the combined influence of network effects and short-term vs long-term effects provides crucial insight into making effective decisions to dampen the effects caused by CEO turnover both for investors as well as firm management.

Practically, these results improve the understanding of the influence of a firm's operating environment. These results allow a firm's directors to better anticipate potential impacts of changes in top management. More proactively, it provides additional guidance when planning for succession. Succession plans should acknowledge the potential impacts of a CEO transition by taking action to control and/or mitigate any negative influences such as loss of current network partners, as represented by the closeness measure in the short-term. Closeness is associated with the firm's supply chain and in the event of a transition, plans should be made to enhance those strategic relationships. In the long-term, the betweenness measure, representing indirect relationships, indicates that firms should plan for identifying and creating enhancing influences such as the development of new network partners.

Further research applying cluster analysis to CEO turnover could take into consideration the initial cause of the turnover, the timing of the turnover within in the long-term window, as well as other variables. Continued research in this area will provide a more complete understanding of the role that firm networks play in the overall success of firm performance.

REFERENCES

Adams, J. C., & Mansi, S. A. (2009). CEO turnover and bondholder wealth. *Journal of Banking & Finance*, *33*(3), 522–533. doi:10.1016/j.jbankfin.2008.09.005

Al-Matari, E. M., Al-Swidi, A. K., & Fadzil, F. H. B. (2014). The measurements of firm performance's dimensions. *Asian Journal of Finance and Accounting*, *6*(1), 24–49. doi:10.5296/ajfa.v6i1.4761

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, *58*(2), 277–297. doi:10.2307/2297968

Baron, J. N., Hannan, M. T., & Burton, M. D. (2001). Labor Pains: Change in Organizational Models and Employee Turnover in Young, High-Tech Firms. *American Journal of Sociology*, *106*(4), 960–1012. doi:10.1086/320296

Bernard, Y., Godard, L., & Zouaoui, M. (2018). The effect of CEOs' turnover on the corporate sustainability performance of French forms. *Journal of Business Ethics*, *150*(4), 1049–1069. doi:10.1007/s10551-016-3178-7

Boyne, G. A., James, O., John, P., & Petrovsky, N. (2011). Top Management Turnover and Organizational Performance: A Test of a Contingency Model. *Public Administration Review*, *71*(4), 572–581. doi:10.1111/j.1540-6210.2011.02389.x

Brauer, M. F. (2013). The effects of short-term and long-term oriented managerial behavior on medium-term financial performance: Longitudinal evidence from Europe. *Journal of Business Economics and Management*, *14*(2), 386–402. doi:10.3846/16111699.2012.703965

Chakravarthy, B. S. (1986). Measuring Strategic Performance. *Strategic Management Journal*, *7*(5), 437–458. doi:10.1002/smj.4250070505

Chen, J., & Thompson, P. (2015). New Firm Performance and the Replacement of Founder-CEOs. *Strategic Entrepreneurship Journal*, *9*(3), 243–262. doi:10.1002/sej.1203

Coates, J. C., IV, & Kraakman, R. (2010). CEO Tenure, Performance and Turnover in S&P 500 Companies. *Harvard Law and Economics Discussion Paper*.

Davidson, W. N. III, Worrell, D. L., & Cheng, L. (1990). Key Executive Succession and Stockholder Wealth: The Influence of Successor's Origin, Position, and Age. *Journal of Management*, *16*(3), 647–664. doi:10.1177/014920639001600309

Dechow, P. M. (1994). Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. *Journal of Accounting and Economics*, *18*(1), 3–42. doi:10.1016/0165-4101(94)90016-7

Denis, D., & Denis, D. (1995). Performance Changes Following Top Management Dismissals. *The Journal of Finance*, *50*(4), 1029–1057. doi:10.1111/j.1540-6261.1995.tb04049.x

Eichler, M. (2012). Graphical modelling of multivariate time series. *Probability Theory and Related Fields*, *153*(1-2), 233–268. doi:10.1007/s00440-011-0345-8

Eisfeldt, A. L., & Kuhnen, C. M. (2013). CEO Turnover in a Competitive Assignment Framework. *Journal of Financial Economics*, *109*(2), 351–372. doi:10.1016/j.jfineco.2013.02.020

Engelberg, J., Gao, P., & Parsons, C. (2013). The price of a CEO's rolodex. *Review of Financial Studies*, *26*(1), 79–114. doi:10.1093/rfs/hhs114

Freeman, L. C. (1978). Centrality in Social Networks Conceptual Clarification. *Social Networks*, *1*(79), 215–239. doi:10.1016/0378-8733(78)90021-7

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, *37*(3), 424–438. doi:10.2307/1912791

Gulati, R., Nohria, N., & Zaheer, A. (2000). Strategic networks. *Strategic Management Journal*, *21*(3), 203–215. doi:10.1002/(SICI)1097-0266(200003)21:3<203::AID-SMJ102>3.0.CO;2-K

Hambrick, D. C., & Quigley, T. J. (2014). Toward more accurate contextualization of the CEO effect on firm performance. *Strategic Management Journal*, *35*(4), 473–491. doi:10.1002/smj.2108

Hamori, M., & Koyuncu, B. (2015). Career advancement in large organizations in Europe and the United States: Do international assignments add value? *International Journal of Human Resource Management*, *22*(4), 843–862. doi:10.1080/09585192.2011.555128

Hannan, M. T., & Freeman, J. (1984). Structural Inertia and Organizational Change. *American Sociological Review*, *49*(2), 149–164. doi:10.2307/2095567

Hansen, G. S., & Wernerfelt, B. (1989). Determinants of Firm Performance: The Relative Importance of Economic and Organizational Factors. *Strategic Management Journal*, *10*(5), 399–411. doi:10.1002/smj.4250100502

He, E., Sommer, D. W., & Xie, X. (2011). The Impact of CEO Turnover on Property-Liability Insurer Performance. *The Journal of Risk and Insurance*, *78*(3), 583–608.

Hejazi, R., Ghanbari, M., & Alipour, M. (2016). Intellectual, Human and Structural Capital Effects on Firm Performance as Measured by Tobin's Q. *Knowledge and Process Management*, *23*(4), 259–273. doi:10.1002/kpm.1529

Huson, M. R., Malatesta, P. H., & Parrino, R. (2004). Managerial Succession and Firm Performance. *Journal of Financial Economics*, *74*(2), 237–275. doi:10.1016/j.jfineco.2003.08.002

Huson, M. R., Parrino, R., & Starks, L. T. (2001). Internal monitoring mechanisms and CEO turnover: A long term perspective. *The Journal of Finance*, *56*(6), 2265–2297. doi:10.1111/0022-1082.00405

Hutchinson, M. R. Is CEO Human Capital Related to Firm Performance? (2014, January 17). *Proceedings of the 2014 Financial Markets & Corporate Governance Conference*. Academic Press.

Intintoli, V. J., Zhang, A., & Davidson, W. N. (2014). The Impact of CEO Turnover on Firm Performance around Interim Successions. *The Journal of Management and Governance*, *18*(2), 541–587. doi:10.1007/s10997-012-9253-2

Jenter, D., & Kanaan, F. (2015). CEO turnover and relative performance evaluation. *The Journal of Finance*, *70*(5), 2155–2184. doi:10.1111/jofi.12282

Kaplan, S. N., & Minton, B. A. (2006). How has CEO turnover changed? Increasingly performance sensitive boards and increasingly uneasy CEOs. *National Bureau of Economic Research*. Retrieved from http://www.nber.org/papers/w12465

Karaevli, A. (2007). Performance Consequences of New CEO 'Outsiderness': Moderating Effects of Pre and Post-Succession Contexts. *Strategic Management Journal*, *28*(7), 681–706. doi:10.1002/smj.589

Katz, N., Lazer, D., Arrow, H., & Contractor, N. (2004). Network Theory and Small Groups. *Small Group Research*, *35*(3), 307–332. doi:10.1177/1046496404264941

Kim, Y. (1996). Long-term firm performance and chief executive turnover: An empirical study of the dynamics. *Journal of Law Economics and Organization*, *12*(2), 480–496. doi:10.1093/oxfordjournals.jleo.a023372

Larcker, D. F., So, E. C., & Wang, C. Y. (2013). Boardroom centrality and firm performance. *Journal of Accounting and Economics*, *55*(2-3), 225–250. doi:10.1016/j.jacceco.2013.01.006

Li, X., & Chang, V. (2018). The Influential Factors of CSR and the Future of CSR in China. *International Journal of Organizational and Collective Intelligence*, *8*(2), 12–31. doi:10.4018/IJOCI.2018040102

Lin, C., Wang, Y., & Lin, W. (2008). Empirical Analysis on CEO Turnover and Company Performance: Event Study-Related GARCH Model. *Journal of Information and Optimization Sciences*, *29*(3), 583–602. doi:10.1080/02522667.2008.10699823

Park, T. Y., & Shaw, J. D. (2013). Turnover Rates and Organizational Performance: A Meta-Analysis. *The Journal of Applied Psychology*, *98*(2), 268–309. doi:10.1037/a0030723 PMID:23244224

Peng, M. W., & Luo, Y. (2000). Managerial Ties and Firm Performance in a Transition Economy: The Nature of a Micro-Macro Link. *Academy of Management Journal*, *43*(3), 486–501.

Rhim, J. C., Peluchette, J. V., & Song, I. (2006). Stock Market Reactions and Firm Performance Surrounding CEO Succession: Antecedents of Succession and Successor Origin. *American Journal of Business*, *21*(1), 21–30. doi:10.1108/19355181200600002

Rogers, D. L. (1974). Sociometric Analysis of Interorganizational Relations: Application of Theory and Measurement. *Rural Sociology*, *39*(4), 487–503.

Shen, W., & Cannella, A. A. (2002). Revisiting the Performance Consequences of CEO Succession: The Impacts of Successor Type, Postsuccession Senior Executive Turnover, and Departing CEO Tenure. *Academy of Management Journal*, *45*(4), 717–733.

Tobin, J. (1969). A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit and Banking*, *1*(1), 15–29. doi:10.2307/1991374

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. Cambridge, UK: Cambridge University Press. doi:10.1017/CBO9780511815478

Zaheer, A., & Bell, G. G. (2005). Benefiting from network position: Firm capabilities, structural holes, and performance. *Strategic Management Journal*, *26*(9), 809–825. doi:10.1002/smj.482

Zhang, P., Wierschem, D., Mendez Mediavilla, F. A., & Hong, K. P. (2016). An Empirical Investigation on CEO Turnover in IT Firms and Firm Performance. *Journal of International Technology and Information Management*, *25*(2), 67–82.

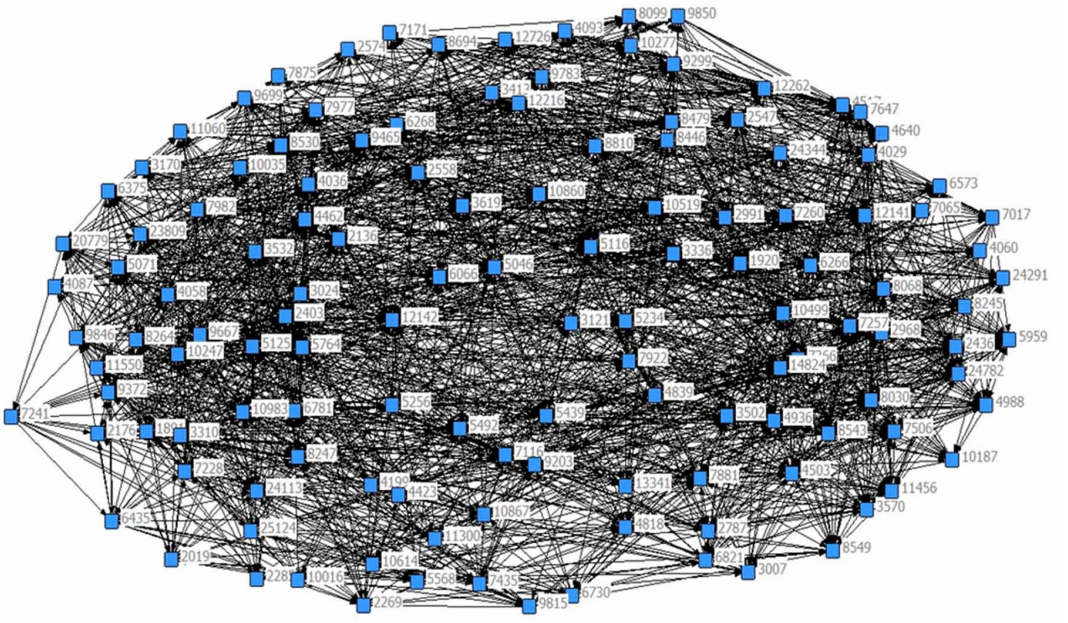
ENDNOTES

[1] Kaplan and Minton (2006) report an average CEO tenure of 5.7-6.4 years for the U.S., so this paper uses a ten-year rolling window period in order to try to ensure a CEO turnover occurred in most firms at least one time during the sample timeframe. Certainly, a longer rolling window period increases the probability a CEO turnover will occur in the firm, but that also means we have insufficient data over the sample period to examine granger causality.

[2] It is reasonable to premise the effects over the rolling window period to be aggregated to the last year of the window period.

APPENDIX

Figure 2. Firm performance network



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