The Impact on Firm Performance: CEO Selection and Product Market Competition

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I examine the relationship between the change in a firm's performance and its CEO selection sources: internal promotion versus external hire in both high and low product competition environments. My results show that firms will not be better off hiring an outside CEO (external hire) when the firms operate in a high product competition industry. However, firms will be better off hiring an outside CEO when the firms operate in a low product competition industry. Specifically, the evidence shows that hiring an outside CEO for a firm in a low product competition industry would increase the firm's ROA and risk-adjusted stock return by about 3 percent and 4 percent, respectively. This paper shows that product market competition is an important factor in CEO selection. The paper contributes to the existing literature by showing that no one group of CEOs (internal versus external) would always outperform the other. In terms of CEO selection, what matters is whether the CEO's characteristics fit with the level of product market competition the firm faces rather than the CEO's characteristics per se. My results are robust to different measures of firm performance and product market competition.

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1. Introduction

The Chief Executive Officer (CEO) is the most important economic agent in the firm. The selection of the CEO affects the firm's performance tremendously in all aspects because he/she has the ultimate responsibility to design and implement all policy decisions of the firm. Indeed, Bertrand and Schoar (2003), Bennedsen et al. (2006), and Bennedsen et al. (2007) among others show that CEOs matter for firm performance. Thus, the selection of CEO is critical. This paper contributes to the literature by showing that product market competition is an important factor in CEO selection. Specifically, the paper contributes to the existing literature by showing that no one group of CEOs (internal versus external) would always outperform the other. In terms of CEO selection, what matters is whether the CEO's characteristics fit with the level of product market competition the firm faces rather than the CEO's characteristics per se.

Choosing the right CEO is one of the most important decisions made by a firm's board of directors. When hiring a new CEO, the board has two options. The board

can promote one of the firm's current executives or board members to be the new CEO. I refer to the CEOs who are promoted from within the firm (an officer or an inside director of the firm prior to their appointment) as inside CEOs. Alternatively, the board can hire someone outside the company to be the new CEO. I call these outside CEOs since they are not an officer or an inside director of the hiring firm prior to their appointment. The decision to promote an insider or hire an outsider to be the CEO depends on the quality of internal and external candidates. When choosing a new CEO, the board considers how well suited the abilities of each candidate are for the competitive environment faced by the firm. Due to information asymmetry between CEO candidates and the board of directors, board members should be able to more accurately evaluate the abilities of inside candidates because they know better the characteristics of these candidates. Internal candidates must first survive the in-house tournaments to become an executive or a director. This internal selection process provides the board with plenty of opportunities to assess how well the internal candidates would match the firm's mode of operations and culture. Holmstrom (1982) models the mechanism by which a principal can learn about the agent's ability over time. He shows that the updating of ability estimate becomes more informative each successive period. Therefore, it is likely that the board has the opportunity to update its ability estimate of an inside CEO candidate more accurately over time. As a result, the possibility of having a mismatch between an inside candidate and the CEO position is lower than between an outside candidate and the CEO position. The greater the lack of knowledge about the ability and fit of outside candidates, the greater the dispersion in the assessment of a pool of such candidates, even if they are on average of similar quality. In this regard, inside CEOs should outperform outside CEOs as the job matching theory in labor economics has shown that the best performance is the result of the best match between a job and the worker whose skill set best fits the needs of the firm (Jovanovic, 1979; Jovanovic, 1984; Simon and Warner, 1992; McLaughlin, 1994).

Proponents of hiring external candidates to the position of CEO, however, believe that managerial skills that come from both innate abilities and experiences are transferable between firms. This means that a successful CEO at one firm will be able to replicate the success at other firms with his managerial skills. Indeed, while most of the internal candidates for a CEO position have no previous experience as a CEO, many external candidates tend to have impressive stories of being a successful CEO elsewhere. However, the literature has shown mixed results. While some studies present evidence that, on average, externally hired CEOs outperform internally promoted CEOs, others find the opposite.[1]

Outside CEOs are believed to be more willing and able to change a firm to make it more efficient than inside CEOs who are burdened by internal connections (Cao and Mauer, 2010). However, hiring outside CEOs may be costly. Agrawal et al. (2006)

[1] See literature review section for details of the literature.

shows that disincentives and discouragements created to current employees who hope to become the CEO can be damaging to the firm. Given the costs and benefits, companies whose benefits of hiring outside CEOs outweigh the costs should find it valuable to do so. In contrast, companies whose costs of hiring outside CEOs outweigh the benefits will find it more attractive to promote new CEOs internally.

The benefits for firms to hire outside CEOs are not always the same according to two competing hypotheses: increasing incentive hypothesis and Schumpeterian hypothesis. According to increasing incentive hypothesis, product market competition motivates managers to improve efficiency by increasing their supply of effort (Hart, 1983; Hermalin, 1992; Schmidt, 1997; Karuna, 2007). With a higher level of competition, CEOs have greater incentives to work harder in order to retain their jobs because an increase in competition increases the likelihood of bankruptcy. Unlike inside CEOs who are burdened with internal connections, outside CEOs are more able and willing to improve firm efficiency with necessary restructuring. When an outside CEO is motivated to work hard, the value he creates for the firm may be higher than the cost of discouragements to current employees. As a result, it may increase shareholder wealth for companies in the more competitive environment to hire outside CEOs because the benefits of hiring outside CEOs may outweigh the costs.

However, Schumpeterian hypothesis suggests that competition implies that there is very little room for improvement because firms that survive in more competitive industries should have already operated in a very efficient mode (Scharfstein, 1988; Raith, 2003). As a result, when an outside CEO cannot improve firm's efficiency significantly, the value he creates for the firm may not be high enough to cover the costs of discouragements to current employees. However, it may be easier for CEOs of firms in a less competitive environment to increase efficiency. Consequently, Schumpeterian hypothesis implies that it may increase shareholder wealth for companies in the less competitive environment to hire outside CEOs because the benefits may outweigh the costs.

I test the two competing hypotheses using a sample of 2,461 CEO turnovers from 1998 to 2013. My results support the Schumpeterian hypothesis, which suggests that firms will be better off hiring an outside CEO if they operate in a low product competition environment. Specifically, the evidence shows that hiring an outside CEO for a firm in a low product competition environment will increase the firm's performance by about 3% for the entire tenure of the CEO.

The remainder of this paper is organized as follows. In section 2, I summarize the relevant literature and develop the hypotheses. In section 3, I describe the data sources and variables used in the analyses. The empirical findings are presented in section 4. Section 5 concludes.

2. Relevant Literature and Hypothesis Development

2.1. Literature on CEO selection and firm performance

The literature has shown mixed results for post-succession performance comparison between outside and inside CEOs. Some studies, present evidence that, on average, outside CEOs outperform inside CEOs. Huson et al. (2004) use a sample of all CEOs listed in the Forbes annual compensation surveys over the 1971-1995 period, and document that post-turnover changes in firm's operating rate of return on total assets (OROA) are positive and greater when the successor CEOs are hired externally.[2] They classified each succession as either forced or voluntary by using the Wall Street Journal. However, there is no evidence showing a difference between post-turnover performance changes for forced and voluntary successions. Falato et al. (2009) use a hand-collected sample of 2,195 CEO successions between 1993 and 2005, and document that appointments of talented CEOs are associated with significantly higher stock market returns and operating performance, and the positive relationship between firm performance and CEO talent is significantly stronger for outside successions. Liang (2007) uses a survey dataset covering 800 Chinese enterprises from 1994 to 1999, and finds that productivity of a firm increases by two to three percentage points when an outside CEO is appointed.

However, there are also studies that show CEOs who are promoted from within the firm outperform outside CEOs. Zajac (1990) uses a sample of Forbes 500 listing companies combined with some very large firms that are not listed in the Forbes 500 index but designated by Forbes as having annual sales of at least $1 billion. He finds that firms with inside CEOs tend to be significantly more profitable than firms with outside CEOs. The post-succession average return on assets (ROA) associated with inside CEOs is significantly higher than the average ROA associated with outside CEOs. He argues that because of information asymmetry, board of directors is more likely to know better the characteristics of a CEO candidate who is from within the firm. Therefore, boards have advantage in observing the characteristics of an inside CEO, but may face a relative informational disadvantage in considering outside CEOs. Ang and Nagel (2010) use a sample of CEO appointments for non-financial firms over the period from 1970 to 2005. They find that inside CEOs deliver superior performance that persists for more years than outside CEOs. Moreover, even in some cases in which inside CEOs are perceived to be inferior, there is still no evidence that shows inside CEOs would underperform.

2.2. Costs of hiring outside CEOs

Besides the benefits that outside CEOs could bring to the hiring firm such as new innovative ideas in production, management, etc., there may also be costs such as the disincentives and discouragements to current employees who are in the process to survive the in-house tournaments to become an internal candidate for the CEO position. Agrawal et al. (2006) document that when firms are choosing new CEOs, external candidates are handicapped. They argue that in order to win the prize of being named CEO, employees of the firm will compete with each other. Such

[2] OROA is the ratio of operating income to book value of assets.

aspirations provide employees with an incentive to work hard. The more responsive is an employee's chance of winning, the greater is the incentive effect that CEO aspirations have on employees' effort. Adding outsiders to the competition to become the CEO typically weakens the relationship between hard work of an insider and his chance of success to the CEO position. As a result, it may reduce the incentive for current employees to work hard. In many cases, incumbent executive officers may be forced to leave the firm or choose to leave voluntarily when the firm hires a new CEO externally (Fee and Hadlock, 2004). Shen and Cannella (2002) show that focusing on a CEO successor alone without considering other personnel changes within top management cannot fully and accurately capture the performance consequences of CEO succession. Post-succession senior executive turnover has been primarily studied as an outcome of CEO succession (Friedman and Saul, 1991). Results of this study suggest that post-succession senior executive turnover has important implications for firm performance and, more importantly, the direction of its impact depends on successor type. They find that senior executive turnover has a positive impact on a firm's ROA in insider succession, but a negative impact in outsider succession. Shen and Cannella (2002) find that senior executive turnover has a negative impact on firm performance when the successor is an outsider. Because there are both benefits and costs associated with hiring outside CEOs, firms whose benefits of hiring outside CEOs outweigh the costs should find it valuable in doing so. Contrarily, firms whose costs of hiring outside CEOs outweigh the benefits will find it more economically sensible to promote someone internally.

2.3. Product market competition and hypothesis development

Firms in different environments with different levels of competition may not have the same benefits with hiring outside CEOs. That is, no one type of CEOs (outside or inside) will always outperform the other. It may be advantageous for some firms to hire outside CEOs, and others to hire inside CEOs. Hart (1983), Hermalin (1992), Schmidt (1997), and Karuna (2007) study whether product market competition induces managers to improve efficiency by increasing their supply of effort. They find that increased competition in a product market increases the provision of effort by managers. Hart (1983) shows that greater competition provides stronger implicit managerial incentives, as additional market players make firms better informed and thus better able to evaluate managers' actions. Similarly, Schmidt (1997) shows that an increase in competition increases the likelihood of bankruptcy and therefore greater incentives to managers, who work harder to retain their jobs. Karuna (2007) also finds evidence that supports the conclusion that firms provide stronger managerial incentives when industry competition is greater. So what kind of firms may find it more valuable to hire CEOs externally than to promote from within the company? According to the increasing incentive hypothesis, product market competition serves as a positive incentive that makes CEOs work hard. When outside CEOs work hard, the benefits of hiring them are more likely to outweigh the costs. Therefore, the impact on firm performance of hiring outside CEOs may be

positive for firms in a more competitive industry. Contrarily, in a less competitive industry, without product market competition to motivate outside CEOs to put more effort into work, the costs of hiring them may outweigh the benefits. Therefore, the impact on firm performance of hiring outside CEOs may not be positive for firms in a less competitive industry.

Hypothesis I: For firms in more competitive product markets, the benefits of hiring outside CEOs are greater than the costs. Therefore, firm performance should be increased by hiring outside CEOs.

Hypothesis II: For firms in less competitive product markets, the benefits of hiring outside CEOs are not greater than the costs. Therefore, firm performance should not be increased by hiring outside CEOs.

In contrast to increasing incentive hypothesis, Schumpeterian hypothesis suggests that competition may not provide incentive for managers (Scharfstein, 1988; Raith, 2003). Scharfstein (1988) among others shows that competition may actually exacerbate the incentive problem. Schumpeterian hypothesis argues that firms in a less competitive environment may not be operated efficiently so there is much room to improve. On the other hand, firms that survive in a more competitive environment should have already in a highly efficient mode so there is not much space to improve. Therefore, if Schumpeterian hypothesis is supported, product market competition would serve as a disincentive for hiring outside CEOs. When there is not much room for firms to improve efficiency, the costs of hiring outside CEOs are more likely to outweigh the benefits. Therefore, the impact on firm performance of hiring external CEOs may not be positive for firms in a more competitive industry. On the other hand, because there is much room for firms to improve efficiency in a less competitive environment, the benefits of hiring outside CEOs may be greater than the costs.

Hypothesis III: For firms in more competitive product markets, the costs of hiring outside CEOs are greater than the benefits. Therefore, firm performance should not be increased by hiring outside CEOs.

Hypothesis IV: For firms in less competitive product markets, the benefits of hiring outside CEOs are greater than the costs. Therefore, firm performance should be increased by hiring outside CEOs.

3. Data and Variables

3.1. Sample

I identify the CEO turnover sample for both voluntary and forced leaves from ExecuComp database over the period from 1998 to 2013. I obtain the information on CEOs and board members from ExecuComp, RiskMetrics (IRRC), proxy statements, 10-K reports, and Edgar data retrieval system. I additionally require that each observation in the sample has sufficient data in the University of Chicago's Center for Research in Security Prices (CRSP), Security Data Corporation (SDC), Compustat database, and LexisNexis database. CEOs are categorized into two groups; inside or

outside CEOs. Inside CEOs are those who were an officer or an inside director of the hiring firm prior to their appointment whereas outside CEOs are those who were not an officer or an inside director of the hiring firm prior to their appointment. I eliminate the resignations of CEOs from the sample if they are directly related to takeovers. The final sample has 2,461 CEO turnovers across all industrial sectors in the economy.

3.2. Measures of firm performance

I use annual return on assets (ROA) and risk-adjusted stock return to measure firm performance. ROA is the net income before interests and taxes divided by total assets, whereas risk-adjusted stock return is the industry-adjusted stock return estimated as the annual stock return of a firm minus the contemporaneous industry stock return based on the Fama-French 48 portfolios. Therefore, the dependent variable used in my regression analyses is the change of firm performance of a company from the year of hire to the year of the turnover of the CEO.

3.3. Measures of competition

3.3.1. Herfindahl index

The first measure of competition I use is the Herfindahl index, a measure of the size of firms in relation to the industry, as an indicator of the amount of competition among firms. The Herfindahl index can range from 0 to 1, moving from an extremely large number of very small firms to a single monopoly. An increase in the Herfindahl index indicates less competition and more market power.

3.3.2. Product substitutability

The second measure of competition I use is product substitutability. Prior studies in the industrial organizations literature have used the price-cost margin to measure product substitutability in an industry (Demsetz, 1997; Besanko et al., 2000; Nevo, 2001). Low (high) price-cost margins imply high (low) levels of substitutability. Therefore, the greater the intensity of price competition due to higher substitutability, the smaller the price-cost margin would be. I calculate the price-cost margin as sales divided by operating costs, all at the four-digit SIC code level.

3.3.3. Market size

The third measure of competition I use is market size. Market size reflects the density of consumers in a market or industry. I measure an industry's market size by industry sales. This reflects the fact that, when market demand for a product increases at any given price, sales of that product also increase.

3.4. Methodology

Following the methodology of Huson et al. (2004) and Ang and Nagel (2010), I use the lagged values of firm characteristics to mitigate endogeneity concerns. There may be selection bias in the estimation of an ordinary least squares (OLS) regression with change of firm performance as the dependent variable, while use CEO and other firm characteristics as independent variables because there may be systematic

differences between firms that hire external and internal CEOs. As a result, I use the two-step procedure introduced by Heckman (1979) to compute the inverse Mills ratio (IML) to control for potential selection bias. A probit model, in which the dependent variable equals one if the CEO is hired externally and zero otherwise, is first used to estimate the IML, where

$$IML = \frac{\Phi(-(x_i'\frac{\beta}{\sigma}))}{1-\Phi(-(x_i'\frac{\beta}{\sigma}))} . \quad (1)$$

In equation (1), Φ and $\boldsymbol{\Phi}$ represent the density and cumulative density functions of the standard normal distribution, respectively, x_i' is a vector that contains observations for the independent variables predicting whether a firm hires an external CEO, β is the vector of coefficient estimates from the probit regression, and σ is the standard deviation for the residuals from the probit regression. The second step of the Heckman procedure is to simply estimate the OLS regression with the IML as an independent variable.

To investigate how CEO hiring sources and competitive environments affect firm performance, I use OLS regressions to estimate the relationship between the change in firm performance and the interaction between CEO hiring sources and industry competitiveness. The complete regression model is as follows:

$$\begin{aligned}\Delta\, firm\ performance_t = {} & a + \\ & +\beta_1 * D_{outside\_highH} \\ & +\beta_2 * D_{outside\_lowH} \\ & +\beta_3 * D_{inside\_highH} \\ & +\delta_1 * Ln\ (total\ assets) \\ & +\delta_2 * (\Delta\ Leverage)_{t-1} \\ & +\delta_3 * (\Delta\ R\&D)_{t-1} + \delta_4 * (CEO\_chair) \\ & +\delta_5 * (\Delta\ percentage\ of\ outside\ directors)_{t-1} \\ & +\delta_6 * (\Delta\ number\ of\ directors)_{t-1} \\ & +\delta_7 * (\Delta\ CEO\ ownership)_{t-1} \\ & +\delta_8 * (\Delta\ institution\ ownership)_{t-1} \\ & +\delta_9 * (CEO\ tenure) \\ & +\delta_{10} * (\Delta\ firm\ performance)_{t-1} \\ & +\delta_{11} * IML \\ & + industry\ and\ year\ dummies + errors. \end{aligned} \quad (2)$$

$D_{outside\_highH}$ is a dummy variable that is equal to 1 if the firm hires an outside CEO and is in a high Herfindahl industry (less competitive), and 0 otherwise. An industry's Herfindahl index is considered high (low) if it is above (below) the sample median. $D_{outside\_lowH}$ is a dummy variable that is equal to 1 if the firm has an outside CEO and is in a low Herfindahl industry (more competitive), and 0 otherwise. Similarly, D_{inside_highH} is a dummy variable that is equal to 1 if the firm has an inside CEO and is not in a competitive industry, and 0 otherwise. I measure firm size by total assets in millions of dollars, and leverage by the ratio of long term debt to total

assets. R&D is research and development expense of a firm to proxy its growth opportunities. CEO_chair is a dummy variable that is equal to 1 if a firm's CEO is also the chairman of the board and 0 otherwise. Percentage of outside directors is the percentage of outside directors on the firm's board to proxy board independence.

Table 1: Variable Definitions

Variable	Description	Definition
N	Number of Turnover	The number of CEO turnover.
Δ *ROA*	Change in ROA	Percentage change in annual return on assets of a firm from the year of hire to the year of the turnover of the CEO.
$D_{outside\_highH}$	Outside CEO in a high Herfindahl Industry	Binary variable equals to one if the firm is in a high Herfindahl industry and has an outside CEO and zero otherwise.
$D_{outside\_lowH}$	Outside CEO in a low Herfindahl Industry	Binary variable equals to one if the firm is in a low Herfindahl industry and has an outside CEO and zero otherwise.
D_{inside_highH}	Inside CEO in a high Herfindahl Industry	Binary variable equals to one if the firm is in a high Herfindahl industry and has an inside CEO and zero otherwise.
Ln (total assets)	Total Assets	Natural log of total assets of a firm.
Δ Leverage	Change in Leverage	Percentage change in leverage of a firm from the year of hire to the year of the turnover of the CEO.
Δ R&D	Change in R&D	Percentage change in R&D of a firm from the year of hire to the year of the turnover of the CEO.
CEO_chair	CEO Durality	Binary variable equals to one if the CEO is also the chairman of the board and zero otherwise.
Δ pct_outd	Change in Outside Directors	Percentage change of outside directors from the year of hire to the year of the turnover of the CEO.
Δ board size	Change in Number of Directors	Percentage change in the total number of directors from the year of hire to the year of the turnover of the CEO.
CEO tenure	CEO Tenure	The number of years the CEO had held the position as of the year of the turnover.
Δ CEO ownership	Change in CEO Ownership	Percentage change in the fraction of shares owned by the CEO from the year of hire to the year of the turnover of the CEO.
Δ institution ownership	Change in institution Ownership	Percentage change in the fraction of shares owned by institutions from the year of hire to the year of the turnover of the CEO.

Number of directors is the total number of directors on the board to proxy board size. CEO ownership is the percentage of shares held by the firm's CEO. Institution ownership is the percentage of shares held by institutions. Finally, I also control for CEO tenure, firm's performance in the past, industry fixed effect, and year fixed effect. Definitions of all variables are shown in Table 1.

If increasing incentive hypothesis is supported, I expect the coefficient of $D_{outside\_highH}$ (β_1 in equation (2)) not to be significantly positive because it implies the benefits for a firm to hire an outside CEO in a less competitive industry may not be greater than the costs. Thus, the total effect should not be positive (hypothesis II). However, the coefficient of $D_{outside\_lowH}$ (β_2 in equation (2)) is expected to be significantly positive because the benefits for a firm to hire an outside CEO in a more competitive industry may be greater than the costs (hypothesis I).

If Schumpeterian hypothesis is supported, the coefficient of $D_{outside\_highH}$ (β_1 in equation (2)) is expected to be significantly positive, which means the benefits for a firm to hire an outside CEO in a less competitive industry are greater than the costs (hypothesis IV). Also, the coefficient of $D_{outside\_lowH}$ (β_2 in equation (2)) is expected not to be significantly positive because the benefits for a firm to hire an outside CEO in a more competitive industry may not be greater than the costs (hypothesis III).

4. Empirical Results

4.1. Summary statistics

Table 2 provides the mean, median, standard deviation, 5th percentile, and 95th percentile of all the variables I use in my regression analyses. The mean of the outside CEO_high Herfindahl dummy is 0.225, while the median value of this dummy variable is 0. On the other hand, the mean of the outside CEO_low Herfindahl dummy is 0.345, and the median value of this dummy variable is also 0. Therefore, on average, 22.5 percent of firms in industries with low product market competition have an outside CEO, while 34.5 percent of firms in industries with high product market competition have an outside CEO.

Table 2: Summary Statistics

Variable	*N*	*Mean*	*Median*	*σ*	*5th*	*95th*
$D_{outside\_highH}$	2,461	0.22507	0.00000	0.24692	0.00000	1.00000
$D_{outside\_lowH}$	2,461	0.34511	0.00000	0.43062	0.00000	1.00000
D_{inside_highH}	2,461	0.17724	0.00000	0.25071	0.00000	1.00000
Ln (total assets)	2,461	7.34862	7.35188	1.62284	4.80338	10.02930
CEO_chair	2,461	0.29501	0.00000	0.45654	0.00000	1.00000
Δ Leverage	2,461	0.02025	0.01839	0.01753	0.00000	0.04980
CEO tenure	2,461	9.32104	8.00000	7.71031	1.00000	25.00000
Δ R&D	2,461	-0.16740	0.00000	0.27218	-0.34000	0.06000
Δ pct_outd	2,461	0.24259	0.26666	0.07960	0.08571	0.28888
Δ board size	2,461	0.09338	0.12457	0.02966	0.05000	0.18000
Δ CEO ownership	2,461	0.00201	0.00000	0.00104	0.00000	0.00700
Δ institution ownership	2,461	0.07018	0.00000	0.06041	0.00000	0.11800

Notes: Descriptive statistics for firms that had voluntary and forced CEO turnovers from 1998 to 2013.

Table 3 shows the distributions of inside and outside CEOs under high and low Herfindahl industries. An industry's Herfindahl index is considered high (low) if it is above (below) the sample median. The final sample has 456 inside CEOs (42.9%) and 605 outside CEOs (57.1%) in high Herfindahl industries, while it has 522 inside CEOs (37.3%) and 878 outside CEOs (62.7%) in low Herfindahl industries.

Table 3: Frequency Table

	Inside CEO	outside CEO	Total
High Herfindahl Index	456	605	1,061
%	(42.9%)	(57.1%)	
Low Herfindahl Index	522	878	1,400
%	(37.3%)	(62.7%)	
Total	978	1,483	2,461
%	(39.7%)	(60.3%)	

Notes: The frequency of inside and outside CEO representation under high Herfindahl Index and low Herfindahl Index based on 2,461 observations of both voluntary and forced CEO turnovers from 1998 to 2013. Numbers in parentheses are percentages.

Table 4 presents Pearson correlations between independent variables included in my regression tests. Except for the correlation between total assets and the change in board size, and the correlation between the change in leverage and the change in ROA, all the other correlations are small in magnitude (the absolute correlation coefficients are not greater than 0.3). This suggests that multicollinearity is not likely to pose a serious problem in the multivariate analysis.

4.2. The impact of CEO selection on firm performance

Table 5 reports the results of OLS models using ROA as the performance measure. The dependent variable is the percentage change in ROA of a firm from the year of hire to the year of the turnover of the CEO. Independent variables include outside CEO_high Herfindahl dummy (equals to 1 if the firm is in a high Herfindahl industry and has an outside CEO and zero otherwise), outside CEO_low Herfindahl dummy (equals to 1 if the firm is in a low Herfindahl industry and has an outside CEO and zero otherwise), inside CEO_high Herfindahl dummy (equals to 1 if the firm is in a high Herfindahl industry and has an inside CEO and zero otherwise), and other control variables as specified in equation (2).

The first column of Table 5 shows that the coefficient on outside CEO_high Herfindahl dummy is significantly positive (0.036). This indicates that firm performance will be increased by 3.6 percent when a firm operates in a high Herfindahl industry hires an outside CEO.

The second column of Table 5 examines the effect of CEO selection on firm performance when controlling for corporate governance variables. The coefficient on outside CEO_high Herfindahl dummy is significantly positive (0.032). This shows that firm performance will be increased by 3.2 percent when a firm operates in a high

Table 4: Pearson Correlation

	$D_{outside\_highH}$	$D_{outside\_lowH}$	D_{inside_highH}	Ln (total assets)	CEO _chair	Δ Leverage $_{t-1}$	CEO tenure	Δ R&D $_{t-1}$	Δ pct_outd $_{t-1}$	Δ board size $_{t-1}$	Δ CEO ownership $_{t-1}$	Δ Instn ownership $_{t-1}$	Δ ROA $_{t-1}$
$D_{outside\_highH}$	1	-0.15***	-0.07	-0.09**	0.06	0.05	0.00	-0.01	-0.04	-0.16**	-0.01	0.17*	-0.01
$D_{outside\_lowH}$		1.00	-0.15***	-0.20***	-0.05	-0.02	0.10**	0.03	0.01	-0.28**	0.15**	0.12*	-0.13**
D_{inside_highH}			1.00	-0.08*	0.01	-0.01	-0.04	0.01	-0.05	-0.02	0.02	-0.11	-0.01
Ln (total assets)				1.00	0.11***	0.26***	0.07	-0.10**	0.15***	0.60***	-0.10**	0.09	0.29***
CEO_chair					1.00	0.02	0.11**	-0.06	0.12***	0.06	0.07	0.12**	0.03
Δ $Leverage_{t-1}$						1.00	0.05	0.02	0.06	0.14***	-0.07	-0.08	0.42***
CEO tenure							1.00	-0.06	-0.12**	0.11**	0.3***	-0.01	0.04
Δ $R\&D_{t-1}$								1.00	-0.05	-0.10**	0.02	-0.06	0.01
Δ pct_outd $_{t-1}$									1.00	0.03	-0.24***	0.05	-0.01
Δ board size $_{t-1}$										1.00	-0.1**	0.03	0.22***
Δ CEO $ownership_{t-1}$											1.00	-0.22**	-0.10**
Δ Instn $ownership_{t-1}$												1.00	
Δ ROA $_{t-1}$													1.00

Herfindahl industry hires an outside CEO when controlling for corporate governance variables.

The third column of Table 5 examines the effect of CEO selection on firm performance when controlling for economic variables, while the fourth column controls for both governance and economic variables. The results remain consistent. The fourth column of Table 5 shows that the coefficient on outside CEO_high Herfindahl dummy is 0.034 and significant at the 5 percent level. This suggests that firm performance will be increased by 3.4 percent when a firm operates in a high Herfindahl industry hires an outside CEO when controlling for both governance and economic variables. Also note that the estimated coefficient on the outside CEO_low Herfindahl dummy is consistently insignificant for all OLS models in Table 5. Therefore, the results strongly support the Schumpeterian hypothesis. Therefore, firm performance will be increased when firms in less competitive industries hire an outside CEO.

Table 5: Estimates of Ordinary Least Square Models

	(1)	(2)	(3)	(4)
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*
constant	0.070**	0.094**	0.061**	0.081**
$D_{outside\_highH}$	0.036**	0.032**	0.039**	0.034**
$D_{outside\_lowH}$	0.016	0.012	0.018	0.013
D_{inside_highH}	0.001	-0.001	0.001	0.002
Ln (total assets)			0.001	0.005
Δ $Leverage_{t-1}$			-0.013	-0.014
Δ $R\&D_{t-1}$			-0.001	-0.001
CEO_chair		-0.016		-0.017*
Δ pct_outd_{t-1}		0.029**		0.035**
Δ $board\ size_{t-1}$		-0.001		-0.003*
Δ $CEO\ ownership_{t-1}$		-0.001		-0.001
Δ $institution\ ownership_{t-1}$		0.010		0.007
CEO tenure		0.001*		0.001*
Δ ROA_{t-1}	0.456***	0.457***	0.458***	0.455***
Inverse Mills ratio	0.005	0.012	0.012	0.378
Industry and year dummies	Yes	Yes	Yes	Yes
R^2	0.267	0.321	0.316	0.329

Notes: This table reports estimates of OLS regression analyses of change in ROA at time t regressed on outside CEO and high Herfindahl dummy variable, outside CEO and low Herfindahl dummy variable, inside CEO and high Herfindahl dummy variable, and other economic and governance control variables for a sample of 2,461 CEO turnovers from 1998 to 2013. Year and industry fixed effects are controlled by dummy variables. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5 also reports consistent coefficients on the control variables with the findings in the literature. For example, the coefficient of CEO_chair dummy is -

0.017, suggesting a decrease in firm performance of 1.7 percent when the firm's CEO is also the chairman of the board. Moreover, it also shows a positive association between the percentage change of outside directors and firm performance, a negative association between board size and firm performance, and a positive association between CEO tenure and firm performance.

4.3. Robustness checks

Table 6 presents OLS results using product substitutability to determine the level of product market competition. Low (high) levels of the price-cost margin signify high (low) levels of substitutability. Therefore, the greater the intensity of price competition due to higher substitutability, the smaller the price-cost margin would be. I calculate the price-cost margin as sales divided by operating costs, all at the four-digit SIC code level.

Table 6: Robustness Tests - alternative measure on market competition

	(1)	(2)	(3)	(4)
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*
constant	0.067***	0.092***	0.051**	0.070**
$D_{outside\_high\_PCmargin}$	0.091***	0.087***	0.094***	0.089***
$D_{outside\_low\_PCmargin}$	0.002	-0.002	0.004	-0.001
$D_{inside\_high\_PCmargin}$	-0.030	-0.028	-0.029	-0.027
Ln (total assets)			0.002	0.006*
Δ $Leverage_{t-1}$			-0.017	-0.018
Δ $R\&D_{t-1}$			-0.001	-0.001
CEO_chair		-0.016*		-0.018*
Δ pct_outd_{t-1}		0.021**		0.027**
Δ $board\ size_{t-1}$		-0.001		-0.003*
Δ $CEO\ ownership_{t-1}$		-0.0006		-0.001
Δ $institution\ ownership_{t-1}$		0.0113		0.009
CEO tenure		0.001*		0.001*
Δ ROA_{t-1}	0.368***	0.369***	0.371***	0.369***
Inverse Mills ratio	0.002	0.028	0.010	0.022
Industry and year dummies	Yes	Yes	Yes	Yes
R^2	0.248	0.349	0.347	0.350

Notes: This table reports estimates of OLS regression analyses of change in ROA at time t regressed on outside CEO and high price-cost margin dummy variable, outside CEO and low price-cost margin dummy variable, inside CEO and high price-cost margin dummy variable, and other economic and governance control variables for a sample of 2,461 CEO turnovers from 1998 to 2013. Year and industry fixed effects are controlled by dummy variables. * significant at 10%; ** significant at 5%; *** significant at 1%

The fourth column of Table 6 shows that the coefficient of outside CEO_high price-cost margin dummy is 0.089 and significant at the 1 percent level. This suggests that firm performance will be increased by 8.9 percent when a firm operates in a high price-cost margin industry hires an outside CEO when controlling for both

governance and economic variables. The results here are even stronger than the results in Table 5. Again, this suggests that Schumpeterian hypothesis is supported. In addition, the coefficient of the outside CEO_low price-cost margin dummy is consistently insignificant across all OLS models in Table 6.

Besides Herfindahl Index and price-cost margin, I also use market size as the measure of market competition and re-estimate the same OLS models. Market size reflects the density of consumers in a market or industry. I measure an industry's market size by industry sales. The results are consistent and similar to those reported in Table 6.

Table 7: Robustness Tests – alternative measure on firm performance

	(1)	(2)	(3)	(4)
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*
constant	0.083***	0.082**	0.071**	0.073**
$D_{outside\_highH}$	0.045**	0.042**	0.047**	0.044**
$D_{outside\_lowH}$	0.023	0.032	0.021	0.022
D_{inside_highH}	0.001	0.001	0.001	0.002
Ln (total assets)			0.003	0.003
Δ $Leverage_{t-1}$			-0.037	-0.045
Δ $R\&D_{t-1}$			-0.001	-0.001
CEO_chair		-0.023		-0.021*
Δ pct_outd_{t-1}		0.037**		0.025**
Δ $board\ size_{t-1}$		-0.005		-0.008*
Δ $CEO\ ownership_{t-1}$		-0.001		-0.001
Δ $institution\ ownership_{t-1}$		0.008		0.007
CEO tenure		0.004*		0.004*
Δ $Return_{t-1}$	0.287***	0.274***	0.258***	0.255***
Inverse Mills ratio	0.016	0.014	0.015	0.015
Industry and year dummies	Yes	Yes	Yes	Yes
R^2	0.356	0.367	0.358	0.372

Notes: This table reports estimates of OLS regression analyses of change in risk-adjusted return at time t regressed on outside CEO and high Herfindahl dummy variable, outside CEO and low Herfindahl dummy variable, inside CEO and high Herfindahl dummy variable, and other economic and governance control variables for a sample of 2,461 CEO turnovers from 1998 to 2013. Year and industry fixed effects are controlled by dummy variables. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7 re-estimates the OLS results using risk-adjusted stock returns as the measure of firm performance. The dependent variable is the percentage change in the Fama-French four-factor risk-adjusted return of a firm from the year of hire to the year of the turnover of the CEO. Independent variables include outside CEO_high Herfindahl dummy (equals to 1 if the firm is in a high Herfindahl industry and has an outside CEO and zero otherwise), outside CEO_low Herfindahl dummy (equals to 1 if the firm is in a low Herfindahl industry and has an outside CEO and zero

otherwise), inside CEO_high Herfindahl dummy (equals to 1 if the firm is in a high Herfindahl industry and has an inside CEO and zero otherwise), and other control variables as specified in equation (2).

The fourth column of Table 7 shows that the coefficient on outside CEO_high Herfindahl dummy is 0.044 and significant at the 5 percent level. This suggests that firm performance will be increased by 4.4 percent when a firm operates in a high Herfindahl industry hires an outside CEO when controlling for both governance and economic variables. Results of Table 7 are also consistent with the results in Table 5 which again support the Schumpeterian hypothesis.

5. Conclusions

This paper examines the relationship between the change in firm performance and CEO selection sources: internal promotion versus external hire in both high and low product competition environments. I test the implications of two competing hypotheses—the increasing incentive hypothesis and the Schumpeterian hypothesis. My results support the Schumpeterian hypothesis. Specifically, the evidence shows that hiring an outside CEO for a firm in a low product competition environment would increase firm performance by about 3% for the entire tenure of the CEO.

Existing literature in corporate governance shows the trend that more and more firms prefer to hire outside CEOs. However, this paper shows that hiring outside CEOs may not always be beneficial to firms in terms of firm performance. The optimal type of CEO for one firm depends on the match between the CEO and the level of product market competition the firm faces. According to the evidence of this paper, in order to maximize shareholder wealth, firms in industries with high product market competition will be better off hiring an inside CEO. Contrarily, firms in industries with low product market competition will be better off hiring an outside CEO.

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