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CEO Types and Firm Efficiency

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CEO TYPES AND FIRM EFFICIENCY

BY

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This thesis is approved as a creditable and independent investigation by a candidate for the master's degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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ABBREVIATIONS

GAI General Ability Index

MA Managerial Ability

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ABSTRACT

CEO TYPES AND FIRM EFFICIENCY

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This paper investigates the connection between CEO types and firm efficiency. I utilize the general ability index (GAI) as a proxy to examine and separate CEO types: generalist CEOs and specialist CEOs. Initially, I applied the pooled ordinary least square (OLS) and fixed effect regression on 26,830 firm-year observations to explore the GAI effect on firm efficiency. The finding shows that GAI has a negative impact on firm efficiency. It indicates that CEOs with lower GAI are better at improving firm efficiency; for instance, specialist CEOs are preferable to generalist CEOs. Further analysis of CEO types using the quadrant method supports this result.

INTRODUCTION

Among the core personnel in a company, the chief executive officer (hereafter referred to as CEO) remains the focal subject. For CEOs, their actions and choices are analogous to the success or failures of firms. Hence, understanding their characteristics and impact on business and society remains a broad area of research. Here, I examine these characteristics in the form of CEO types on firm efficiency. While CEOs' inherent attributes and characteristics have been the subject of much research, the literature defines them as either generalists or specialists by CEO types. Their disparate abilities create distinctive values in contributing to the outcome of firms. Chen, Huang, Meyer-Doyle, and Mindruta (2020) note that generalist CEOs have diversified backgrounds, and specialist CEOs have experience in a specific area.

Recent findings suggest that generalist CEOs contribute better to the acquisitions (Chen et al., 2020). Still, some believe those generalist CEOs negatively affect firm performance (Li & Patel, 2019). The topic of CEO types is an ongoing debate, as each kind of CEO delivers various benefits to the firm and has exclusive advantages in creating firm value. Their different level of implication and unique talents form the achievement of the companies. It is not easy to distinguish which type has a dominant advantage. Arguably, the generalist or specialist CEOs may be better in different aspects. For example, specialists stimulate better innovation (Koo, 2019), and generalists perform better in the acquisitions (Chen et al., 2020). To evaluate the success of a business, one of the features is firm efficiency. A firm's efficiency is paramount as it denotes the ability of an organization to minimize spending while extracting optimal utility. Since the CEO is

the core personnel governing the operating process, firm efficiency and CEO have a tight connection. However, this connection is still unclear in discovery in the literature.

Firm efficiency focuses on the optimality of resource allocation and utilization. However, firm performance is different as the firm's performance may depend not only on its efficiency in maximizing utility but also on the market where a such business operates. Here, I use US financial data for the years 1992 to 2016 for 26,830 observations to investigate which CEO types of matter to firm efficiency. From an economic standpoint, sources are limited, and each individual faces the scarcity problem since sources cannot satisfy people as much as they wish to produce (Mankiw, 2014). Managers face the challenge of allocating the sources and generating the maximum output for the companies. Inefficient management creates unnecessary waste in production or even leads to a failure of a business. Two types of CEOs contribute differently to firms. Therefore, the impact between CEO types and firm efficiency is an important point to know.

Data for generalist and specialist CEOs are available through Professor Miguel Ferre'ira's webpage and discussed extensively by Custódio, Ferreira, and Matos (2013) paper on "lifetime work experience and chief executive officer pay". Custódio et al. (2013) apply a principal component analysis on five factors to create the CEO types. Namely, CEO experience, number of industries that the CEO has worked in, number of firms the CEO has worked in, the number of positions the CEO has held before becoming a CEO, and if the CEO has ever worked for a conglomerate. By this account, a generalist's broader and varying experience might positively impact efficiency. I apply a series of econometric models by controlling for firm and year fixed effects. The results

show the following, on average, firms with CEOs that share many generalist traits are least best at improving firm efficiency. The evidence is affirmed by decomposing the factors used to identify a generalist against a specialist CEO.

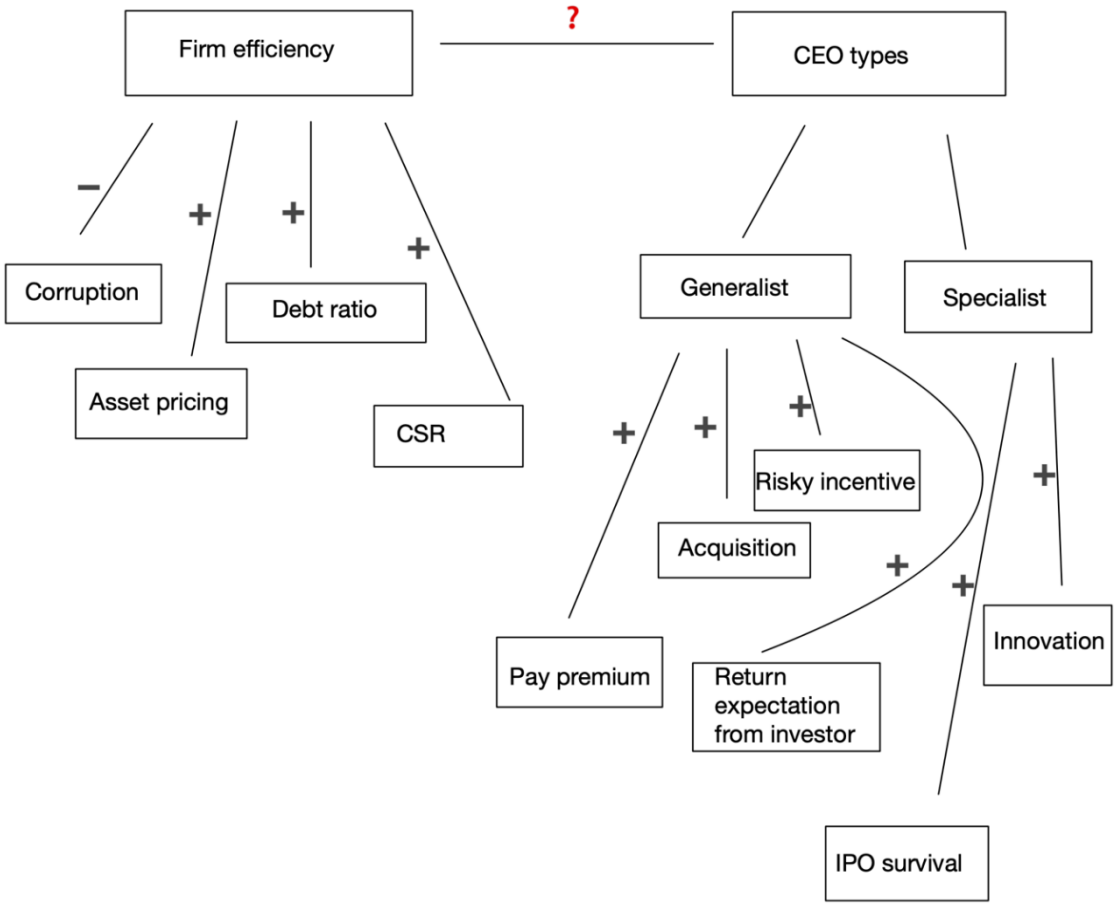
I further investigate the CEO's managerial ability. That is their talent in leading a firm. According to Demerjian, Lev, and McVay (2012), Talented managers better understand the technology and industry trends, can forecast product demand, invest in higher-value projects, and manage their people more effectively. Hence, it is possible that my results so far may be driven by spurious correlation, where generalist and specialist CEO types do not necessarily matter. Instead, their talent in managing employees. To address this question, I create quadrants by pairing generalists and specialists CEO to their ability. Demerjian, Lev, and McVay (2012) contend that managerial ability is central to many research questions.

In the literature, managerial ability proxies include firm size, past abnormal performance, compensation, tenure, media mentions, education, or manager fixed effects. Bertrand and Schoar (2003) document that managers exhibit styles reflected in the company's underlying decisions. Demerjian et al. (2012) use a novel approach by comparing managers' efficiency in converting company resources to revenue to that of their industry peers, the managerial ability (MA). The four created quadrants are a specialist with fewer MA skills, a specialist with significant MA skills, a generalist with fewer MA skills, and a generalist with significant MA skills. I find that specialists with significant MA skills improve firm efficiency. However, the rest of the CEOs do not increase firm efficiency.

The rest of the paper discusses the existing literature, outlines the methodology and data sources, enumerates the results, offers research limitations, discusses future research, and a summary conclusion.

LITERATURE REVIEW

Figure 1 An Overview of Literature



CEO types

A chief executive officer (CEO) remains an important position for any organization. Traits inherent or derived from past experiences and disciplines are crucial for the position. These traits led scholars to opine that certain exhibits are vital for the

position, performance, and firm valuation. CEOs with overconfidence and resolute characteristics tend to perform better (Kaplan, Klebanov, & Sorensen, 2012). Another study shows that the positive psychological traits of CEOs are positively associated with transformational leadership and firm performance (Peterson, Walumbwa, Byron, & Myrowitz, 2009).

Recent research categorizes these traits from education and work experience into two groups. The first category is generalist CEOs. The second category is specialist CEOs. Generalist CEO has a broader range of managerial experience and knowledge across multiple industry areas. In contrast, specialist CEOs have experience in a particular industry and a deeper level of knowledge and experience in that industry (Chen et al., 2020). Generalists and specialists are dissimilar, and their background differences provide them the distinct ways of managing, which may affect firm results.

Evidence from the existing literature shows that both types of CEOs offer unique attributes to firms' development, performance, survival, and valuation. For instance, generalist CEOs have a higher willingness to engage in risky activities (Mishra, 2014). Their diversified backgrounds allow them to perform better in acquisitions than specialist CEOs (Chen et al., 2020). For the specialist CEOs, the evidence includes: that IPO enterprises with a specialized CEO have a lower failure rate and a longer survival duration (Gounopoulos & Pham, 2018). Specialist CEOs encourage greater quantity and a higher quality of innovation (Koo, 2019).

Another recent study has a different point of view investigating between more general and less general CEOs. Li and Patel (2019) discover that the more general CEOs

negatively affect firm performance than the less general CEOs. Longer tenure could help to decrease this situation. In addition, fewer generalist CEOs benefit from the firm's performance, especially in the early stage.

Other studies state the CEOs from a cost aspect. Custódio et al. (2013) argue that generalist CEOs earn a higher pay premium than specialist CEOs, which is around a million dollars per year on average. Additionally, the salaries increase even more when switching from specialist CEOs to generalist CEOs who hire from outside. Mishra (2014) proposes that investors have higher return expectations when CEOs have the affluent general managerial ability. The study shows that shareholders need to pay the generalist CEOs for the financing cost more except for their pay packages. Generalist CEOs are more likely to influence investors to have a higher required return by discounting the company's cash flows. Combining these two studies, the findings indicate that generalist CEOs cost more to the firms, and investors have higher return expectations on generalist CEOs, especially when the CEOs have rich managerial skills.

Firm efficiency

Minimizing expense while extracting maximum usefulness is key to organizational efficiency. Firms are continually striving for this desirable goal, and this achievement is one of the CEOs' major duties.

The two common methods of firm efficiency measurement are data envelopment analysis (DEA) and stochastic frontier analysis (SFA). The main difference between the two approaches is that DEA contains missing variables while SFA drops all the missing ones. My paper adopts the DEA approach from Demerjian et al. (2012). DEA measures

the maximization between inputs and outputs from the Cobb-Douglas production function of the decision-making units; this is also called the efficiency score. In the findings, Demerjian et al. (2012) suggest that managerial ability can help moderate the passive connection between equity financing and future abnormal returns. Frijns, Margaritis, and Psillaki (2012) find that firm efficiency has a significant positive impact on asset pricing. Margaritis and Psillaki (2007) explore that more efficient firms prefer to choose higher debt ratios as higher efficiency can alleviate financial distress. Those studies provide a great overview of how firm efficiency affects the firm's financial outcome.

Firm efficiency is not only affected by the internal operating system but also influenced by the external environment, such as corporate social responsibility. Becchetti and Trovato (2011) point out that positive effects of social responsibility could lower corporate risk. Productive efficiency and performance are strongly related to the quality of corporate social responsibility. Hanousek, Shamshur, and Tresl (2019) discuss that the negative impact of corruption hurts firm efficiency. Foreign-controlled firms and female CEOs are more adverse in participle corruption. Both studies depict that the external environment and firm behavior affect firm efficiency.

Relationship between CEO types and firm efficiency

Both generalist CEOs and specialist CEOs have numerous abilities. Their differences in human capital create diversified advantages for the firms. For instance, generalist CEOs are better at engaging acquisitions (Chen et al., 2020); and specialist CEOs facilitate better innovation (Koo, 2019). In the firm structure, the managers operate

firms. Their leadership influences the whole managerial process of the companies. The various strategies from the CEOs' backgrounds bring distinct contributions to the companies, creating the firm's future development. One way to show the contributions is firm efficiency.

Firm efficiency means using the minor inputs to develop the most outputs. An efficient plan can avoid unnecessary sources in the firm's operation by receiving the highest returns. The cumulative effect of firm efficiency creates a successful business. The previous studies show that firm efficiency is tied to the asset pricing (Frijns et al., 2012) and debt ratios (Margaritis & Psillaki, 2007). In the literature, most scholars explore (e.g. Bandiera, Prat, Hansen, & Sadun, 2020; Demerjian et al., 2012) the facts of firm performance and CEOs but not firm efficiency. The affiliation between CEOs and firm efficiency is still opaque. Since an inefficient management process will harm the firm in the long run, the link between CEO types and firm efficiency is a considerable topic.

This paper is going to explore the connection between CEO types and firm efficiency and tell the different contributions of two types of CEOs to firm efficiency.

DATA DESCRIPTION AND METHODOLOGY

The general ability index (GAI) was first introduced in Custódio et al. (2013) study, and professor Miguel Ferre'ira shared an updated dataset until 2016 on his website. The firm efficiency I adopted in this study was introduced by Demerjian et al. (2012), and the data were expanded until 2018. The sample in my paper began with the GAI from 1992 to 2016 (Custódio et al., 2013) and the firm efficiency from 1980 to 2018

(Demerjian et al., 2012). Financial ratios measured the firm outcomes, and all the ratios were generated from Compustat North America using the period from 1947 to 2021. I used these three available secondary datasets to conduct my research and merged the datasets by year and gvkey. Since the datasets started with different periods, the datasets kept the mutual part after merging. The final sample included 26,830 firm-year observations from 1992 to 2016 of U.S. public trading firms. The range of firms was from 207 (in the year 1992) to 1437 (in the year 2007). This sample size was similar to Custódio et al. (2013) study. The data used Fama and French 48 industries standard and excluded the industries of utilities, insurance, real estate, and trading. All variables were analyzed by using winsorize method with 99% percentile, except for log total assets.

Dependent Variable

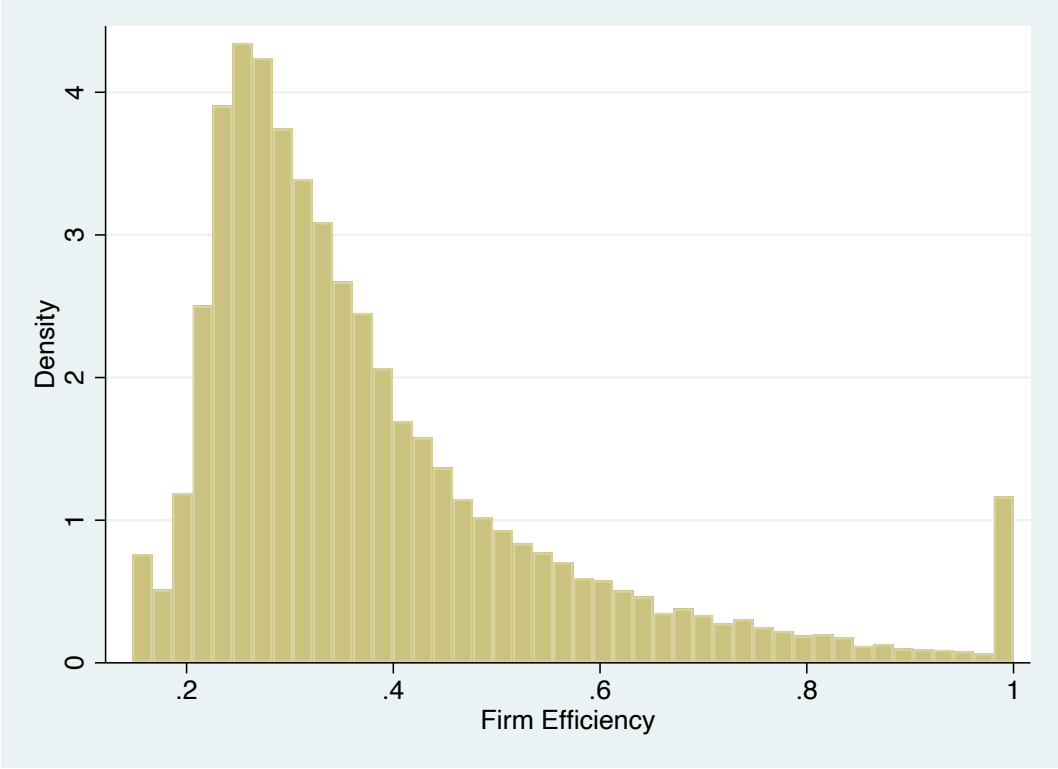
I used the firm efficiency as a dependent variable, and it was calculated by Demerjian et al. (2012). In their study, they utilized the DEA method to create the variable. DEA is one of the methods to measure efficiency. This method creates decision-making units (DMUs) and generates the efficiency scores by maximizing the output over the input(s). The inputs form a frontier; the most efficient firms locate on it, and less efficient firms depart. In Demerjian et al. (2012) study, they assigned net PP&E (property, plant, and equipment), net operating leases, net R&D (research and development), purchased goodwill, other intangible assets, cost of inventory, and SG&A (selling, general, and administrative expenses) as inputs; revenue was their output. Those variables measured the managerial decision of a manager. They separated DMUs by industry and maximized the DMUs in each group to define the weights. The sum of outputs over the sum of inputs delivered the efficiency score.

DEA model from Demerjian et al. (2012):

$$max\theta = (sales)(v_1 COGS + v_2 SG\&A + v_3 PPE + v_4 OpsLease + v_5 R\&D + v_6 Goodwill + v_7 OtherIntan)^{-1} \quad (1)$$

Figure 2 shows the distribution of firm efficiency in the data. The histogram had a right-skewed distribution. Most of the data were between 0.2 to 0.4 and it showed that there were more firms with lower firm efficiency.

Figure 2 Histogram of Firm Efficiency



Independent Variable

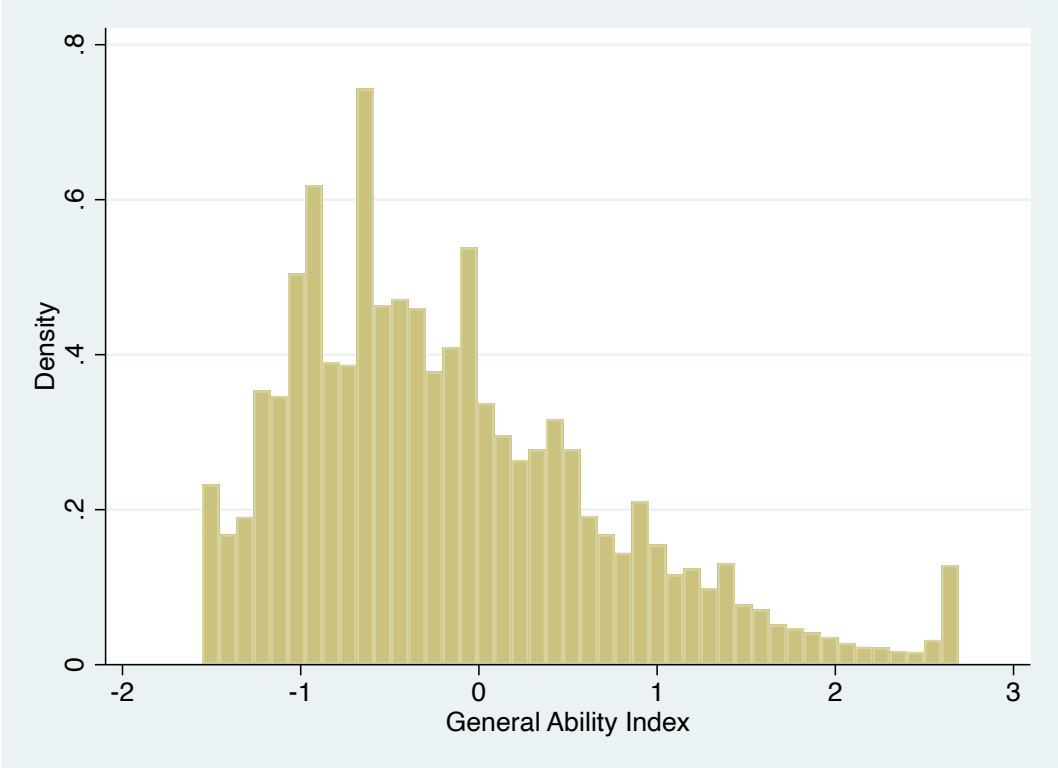
General Ability Index (GAI) captured a manager's general managerial ability, and this indicator represented the CEOs' characteristics. The method was contributed by Custódio et al. (2013), and I used the GAI that they calculated. They applied the principal component analysis to five variables, including the number of positions (X1), number of firms (X2), number of industries (X3), CEO experience dummy (X4), and conglomerate experience dummy (X5), to produce GAI. X1 depicted the different job positions of a manager. X2 depicted the number of firms that a manager performed before. X3 depicted the number of industries that a manager participated in. X4 depicted the experience of the CEO position in a different firm. X5 depicted the experience of a manager working at a diversified firm. Custódio et al. (2013) and Chen et al. (2020), they used the median of GAI to define the generalist CEOs and the specialist CEOs. In my data, the mean was -0.1543, and the median was -0.3571. Since the mean proved a more robust result, I employed the means to separate CEOs into two types. CEOs below the mean indicated that they had fewer general managerial abilities. Hence, they were classified as specialists. CEOs with the above mean were defined as generalists. There was a total of 26,830 CEO observations. 15,482 observations were classified as specialists, and 11,348 were described as generalists.

GAI from Custódio et al. (2013):

$$GAI_{i,t} = 0.268X1_{i,t} + 0.312X2_{i,t} + 0.309X3_{i,t} + 0.218X4_{i,t} + 0.153X5_{i,t} \quad (2)$$

In the sample, GAI was not distributed equally. Figure 3 summarized the distribution of GAI, and the histogram had a right-skewed distribution. It showed more specialists in the sample.

Figure 3 Histogram of General Ability Index (GAI)



Control Variables

I included financial ratios as controls in my statistical analysis to examine the link between firm efficiency and CEO types. Compustat provided raw financial data and allowed users to generate the ratios. In Chen et al. (2020) study, they had leverage, ROA, and log (total assets) as control variables. Custódio et al. (2013) contained capital expenditure, cash, ROE, and net profit margin. These seven financial controls assessed the company in a variety of ways. Capital expenditure measured a company's growth behavior. Cash measured the liquidity of a company. Leverage measured the ability to

hold debt. ROA measured the profit return related to the total assets, ROE measured the profit return associated with the total equities, and net profit margin measured the contribution from net profit to a company's revenue. These three variables showed the firm performance. The last control variable was the log (total assets) used to control the firm size.

Descriptive Statistics

Table 1 shows information about all the variables. The mean of firm efficiency is 0.3838, and the median is 0.3295. There is no big difference between the mean and the median. The lowest efficiency is 0.1477, and the maximum is 1. The standard deviation of firm efficiency is 0.1776. In the measurement of production frontier, efficiency scores are between 0 and 1. "1" presents that the manager is the most efficient while operating a firm, and "0" means the manager is inefficient. In my data, the firm efficiency scores are between 0.1477 and 1; 566 observations receive 1 in the sample. Some famous companies, including Apple, Walmart, and Costco Wholesale Corp., earned the highest efficiency score, "1" between 2015 and 2016. Denbury Resources Inc., Stone Energy Corp., and Rubicon Technology Inc. received the lowest efficiency score, "0.1477" during this period in the sample.

The range of GAI is from -1.5537 to 2.6914, with a standard deviation of 0.8832. Mean was used to classify into two groups. Above the mean represented a generalist; below the mean represented a specialist. Two types of CEOs were across industries, and there were some examples from two extremes between 2015 to 2016. Firms such as LGI Homes Inc., Alamo Group Inc., and National Instruments Corp. had specialist CEOs managing their terms; Eastman Kodak Co., MTS Systems Corp., and PayPal Holdings

Inc. have generalist CEOs for their operation. Table 2 is about the correlation between all variables.

Table 1 Summary Statistics

	N	Mean	SD	Min	p25	Median	p75	Max
Firm Efficiency	26830	.3838	0.1776	.1477	.2626	.3295	.4468	1
General Ability Index	26830	-.1543	0.8832	-1.5537	-.8416	-.3571	.3611	2.6914
Managerial Ability	26830	.012	0.1440	-.2247	-.0785	-.0236	.0615	.522
Capital Expenditure	26693	.0555	0.0517	.0029	.0215	.0395	.071	.2861
Cash	26828	.154	0.1697	.0006	.0272	.0885	.2225	.7458
Leverage	26721	.2234	0.1874	0	.0556	.2065	.3352	.8458
ROA	26824	.093	0.0961	-.2959	.0518	.0935	.1417	.3551
ROE	26822	.2155	0.3873	-1.6308	.1064	.2064	.317	2.0831
Net Profit Margin	26824	.0306	0.1759	-1.0823	.0138	.0497	.0946	.3604
Log (Total Assets)	26829	7.3615	1.6011	1.7717	6.2165	7.2457	8.3832	13.5896

Table 2 Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Firm Efficiency	1.0000									
(2) General Ability	0.112***	1.0000								
(3) Managerial Ability	0.901***	0.028***	1.0000							
(4) Capital Expenditure	-0.023***	-0.138***	-0.011***	1.0000						
(5) Cash	0.094***	-0.053***	0.230***	-0.183***	1.0000					
(6) Leverage	-0.035***	0.116***	-0.158***	0.020***	-0.377***	1.0000				
(7) ROA	0.261***	-0.0060	0.236***	0.086***	-0.096***	-0.117***	1.0000			
(8) ROE	0.149***	0.049***	0.087***	0.020***	-0.153***	0.077***	0.452***	1.0000		
(9) Net Profit Margin	0.192***	0.018***	0.168***	0.042***	-0.094***	-0.134***	0.657***	0.298***	1.0000	
(10) Log (Total Assets)	0.443***	0.324***	0.152***	-0.016***	-0.325***	0.289***	0.106***	0.174***	0.167***	1.0000

*** *p<0.01,* ** *p<0.05,* * *p<0.1*

Variations among the Two types of CEOs in strategy: Industry review

Among the 48 industries, each industry/ firm has its structure and operation type. For example, their firm strategies, target customers, and industry culture are not the same. Firms might have different demands on CEO types. Therefore, the distribution of CEO types might be unliked in the industries. Furthermore, CEO types might create different worth to companies. To investigate the details, I utilize table 3 to provide an insight into CEO types and their contributions through industries from the mean of GAI, capital expenditure, and ROA.

From table 3, based on the observations, generalists and specialists have different distributions among the industries. Some industries like tobacco products, consumer goods, and chemicals have more generalist CEOs and specialist CEOs in food products, entertainment, and pharmaceutical products. One can glean from the table other pertinent information. For instance. the agriculture industry has the lowest average GAI, and the recreation industry has the highest. This result shows that the agriculture industry owns the highest level of specialist talents, and the recreation industry has the greatest level of generalist managers on average.

From the lens of growth behavior and performance, the total capital expenditure between CEO types is $9238.22 million dollars (specialists) and $21638.47 million dollars (generalists). Generalists spend more than double (2.34 times). Only four industries with specialists spend more than generalist CEOs, such as printing & publishing, apparel, textiles, and coal. Two of these four industries deliver higher ROA (printing & publishing and textiles). However, the aggregate ROA is similar between specialists (4.10) and generalists (4.12). This result suggests that generalists use more

sources for company growth but create a similar firm performance to specialists. The table also tells other facts. Industries such as tobacco products have a big difference in capital expenditure between specialists and generalists ($353.97 vs. $1007.15 in a million dollars); generalists in the industry create 0.04 more on ROA by triple spending. The business services industry has the largest number of CEOs. There is a total of 3316 CEOs, with 2084 specialists and 1232 generalists. This table highlights some interesting information, such as the unequal distribution of CEOs and the difference in generating ROA. Scholars may consider further investigation.

Table 3 Variations among the Two Types of CEOs in Strategic: Industry review

Fama-French industry code (48 industries)	Number of firms	Frequency		Mean - GAI		Mean - CAPX (million dollars)		Mean - ROA	
		Specialist	Generalist	Specialist	Generalist	Specialist	Generalist	Specialist	Generalist
Agriculture	92	53	39	-1.01	0.90	70.96	276.01	0.14	0.08
Food Products	748	426	322	-0.75	0.70	168.99	288.18	0.13	0.12
Candy & Soda	115	55	60	-0.85	1.07	331.93	746.32	0.15	0.12
Beer & Liquor	134	66	68	-0.65	0.38	183.85	940.13	0.12	0.16
Tobacco Products	51	18	33	-0.61	1.18	353.97	1007.15	0.20	0.24
Recreation	165	96	69	-0.82	1.21	85.14	96.42	0.06	0.06
Entertainment	318	229	89	-0.92	1.08	161.75	386.69	0.08	0.06
Printing and Publishing	247	181	66	-0.73	0.51	77.09	48.74	0.12	0.11
Consumer Goods	560	266	294	-0.75	0.60	55.57	393.44	0.10	0.14
Apparel	483	367	116	-0.79	0.42	71.83	60.67	0.14	0.15
Healthcare	548	307	241	-0.81	0.53	72.09	285.52	0.10	0.10
Medical Equipment	875	484	391	-0.77	0.51	64.01	129.56	0.12	0.12
Pharmaceutical Products	1218	661	557	-0.81	0.72	170.44	329.35	0.03	0.10

Chemicals	941	425	516	-0.69	0.63	175.62	375.29	0.11	0.10
Rubber and Plastic Products	161	80	81	-0.47	0.79	59.04	83.20	0.13	0.11
Textiles	140	99	41	-0.79	0.44	95.16	33.18	0.09	0.07
Construction Materials	644	344	300	-0.72	0.71	78.33	121.83	0.09	0.10
Construction	448	277	171	-0.76	0.25	43.46	57.10	0.07	0.06
Steel Works Etc	506	262	244	-0.73	0.57	125.45	218.60	0.09	0.07
Fabricated Products	50	26	24	-0.71	0.64	49.58	51.28	0.10	0.04
Machinery	1257	595	662	-0.70	0.63	89.39	219.49	0.09	0.10
Electrical Equipment	347	204	143	-0.68	0.57	67.15	95.77	0.09	0.09
Automobiles and Trucks	630	322	308	-0.70	0.79	281.38	1814.35	0.11	0.07
Aircraft	267	108	159	-0.60	0.76	225.32	545.80	0.10	0.10
Shipbuilding, Railroad Equipment	59	31	28	-0.66	0.27	79.33	343.91	0.07	0.10
Defense	116	78	38	-0.66	0.32	72.96	287.33	0.08	0.16
Precious Metals	110	71	39	-0.69	0.52	220.91	930.35	-0.03	0.01
Non-Metallic and Industrial Metal Mining	126	64	62	-0.83	1.06	131.29	652.99	0.09	0.12
Coal	81	67	14	-0.65	0.50	240.08	211.22	0.05	-0.02
Petroleum and Natural Gas	1403	938	465	-0.82	0.67	1522.99	1966.19	0.06	0.07
Communication	824	482	342	-0.77	0.90	1123.66	2268.93	0.07	0.09
Personal Services	405	266	139	-0.79	0.66	133.68	335.67	0.12	0.13
Business Services	3316	2084	1232	-0.76	0.81	92.58	175.04	0.08	0.08
Computers	1115	601	514	-0.76	0.94	99.75	314.32	0.07	0.07
Electronic Equipment	2068	1241	827	-0.74	0.61	157.69	350.44	0.07	0.06
Measuring and Control Equipment	654	356	298	-0.72	0.75	54.49	92.43	0.08	0.10
Business Supplies	489	254	235	-0.64	0.61	157.83	424.53	0.09	0.10
Shipping Containers	171	57	114	-0.57	0.89	193.80	210.45	0.09	0.10
Transportation	989	631	358	-0.78	0.68	486.94	775.35	0.10	0.08
Wholesale	1056	617	439	-0.74	0.65	73.91	113.37	0.10	0.09
Retail	2023	1180	843	-0.84	0.62	324.31	573.08	0.12	0.11

Restaurants, Hotels, Motels	628	383	245	-0.80	0.69	98.20	407.23	0.14	0.11
Almost Nothing	252	130	122	-0.71	0.74	816.32	2601.59	0.06	0.07
Total	26830	15482	11348			9238.22	21638.47	4.10	4.12
Specialist vs. Generalist CAPX						2.34			

RESULTS

Main Regressions: Specialist CEOs are Better at Improving Efficiency

I set up two regression models to describe the link between firm efficiency and general ability index, including pooled ordinary least squares (OLS) regression and fixed-effect regression. In table 4, equation 3 is applied to columns 1 and 2; equation 4 is used for column 3. These three columns show that the results changed when adding additional controls. The purpose of including the controls is to get a better precise finding. Column 1 shows the pooled OLS model for firm efficiency and GAI without control variables. Column 2 shows the same model but with control variables. Column 3 presents the panel data for firm efficiency, GAI, and control variables by controlling year and firm fixed effect.

Table 4 presents the results of the main regressions. Column 1 summarizes that firm efficiency and GAI have a positive coefficient of 0.022 with a 0.01 significant level. After including the control variables, the coefficient changes to -0.008 with a 0.01 significant level. Colum 3 shows the coefficient of GAI is -0.006 with a 0.01 significant level.

Columns 2 and 3 have consistent findings indicating that GAI lowers the firm efficiency. It suggests that generalist CEOs do not have an advantage in achieving better firm efficiency than specialist CEOs. These findings are statistically significant with a 99 percentile, meaning they are robust and present most of the observations. In a related study, Li and Patel (2019) find that CEO generalist experience contributes negatively to the firm performance (-0.019 with a 0.01 significant level). Their result proposes that the

number of industry experience does not build an additional worth in enhancing firm performance. Furthermore, they figure out that a longer tenure can reduce this negative effect but needs more than eight years to eliminate.

Pooled OLS regression

$$y = \beta_0 + \beta_i x + u \tag{3}$$

Fixed-effect regression

$$y_{ij} = \beta_0 x_{ij} + \alpha_i + u_{ij} \tag{4}$$

Table 4 Main Regressions

	(1) Reg_1	(2) Reg_2	(3) Reg_3
General Ability Index	0.022***	-0.008***	-0.006***
	(0.001)	(0.001)	(0.001)
Capital Expenditure		0.038**	0.149***
		(0.018)	(0.023)
Cash		0.277***	-0.002
		(0.006)	(0.008)
Leverage		-0.061***	0.012*
		(0.005)	(0.006)
ROA		0.458***	0.446***
		(0.013)	(0.013)
ROE		0.002	-0.001

		(0.003)	(0.002)
Net Profit Margin		-0.047***	0.015**
		(0.007)	(0.006)
Log (Total Assets)		0.060***	0.030***
		(0.001)	(0.001)
_cons	0.387***	-0.132***	0.110***
	(0.001)	(0.005)	(0.010)
Observations	26830	26582	26582
R-squared	0.012	0.318	0.101
Year	No	No	Yes
Firm	No	No	Yes

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Quadrant Application in Regressions: Specialists with significant MA skills are Better

Demerjian et al. (2012) assert that talented managers are better at anticipating product demand, investing in higher-value projects, and managing their teams. They also have a better awareness of technological and market trends. As a result, it's likely that my findings thus far are the product of a misleading correlation in which the type of CEO matters less than it could otherwise. Rather, their ability to lead a team of workers. Demerjian et al. (2012) measure the managerial ability through CEO's contribution to a company in terms of economics and financial impacts. They measure the firm efficiency utilizing the financial inputs. In their paper, they state that firm efficiency measurement combines manager and firm effect. To eliminate the firms' impact, they developed a Tobit regression model and generated a managerial ability score that comes from the residual. This score reflects the managers' efficiency in transforming corporate resources into

revenues. I apply a quadrant method (Lang, Stulz, & Walkling, 1991) to explore GAI and managerial ability in my data, by utilizing GAI and managerial score as dummy variables to generate a quadrant analysis by separating CEOs into four groups.

Managerial score that derives from the residual (Demerjian et al., 2012):

$$\begin{aligned} firm\ efficiency \\ &= \alpha + \beta_1 \ln (Total\ Assets)_i + \beta_2 Market\ Share_i \\ &+ \beta_3 Free\ Cash\ Flow\ Indicator_3 + \beta_4 \ln (Age)_i \\ &+ \beta_5 Business\ Segment\ Concentration_i \\ &+ \beta_6 Foreign\ Currency\ Indicator_i + Year_i + \epsilon_i \end{aligned} \tag{5}$$

Lang et al. (1991) developed a quadrant method to divide observations into four quadrants by creating dummy variables. I employ this method by deriving CEOs into four groups through their GAI and managerial ability. First, I generate the GAI and managerial ability (MA) dummy variables based on their means. Then, four combinations are created including GAI = 0 & MA = 0, GAI = 1 & MA = 0, GAI = 0 & MA = 1, and GAI = 1 & MA = 1. Finally, I assigned them to four quadrants. The four quadrants contain group 1 (specialists with fewer MA skills), group 2 (generalists with fewer MA skills, group 3 (specialists with significant MA skills), and group 4 (generalists with significant MA skills). I apply equation 4 in the four quadrants and develop the regression models shown in Table 5. The analysis of four groups is shown in columns 1 to 4.

Figure 4 CEOs in Four Quadrants

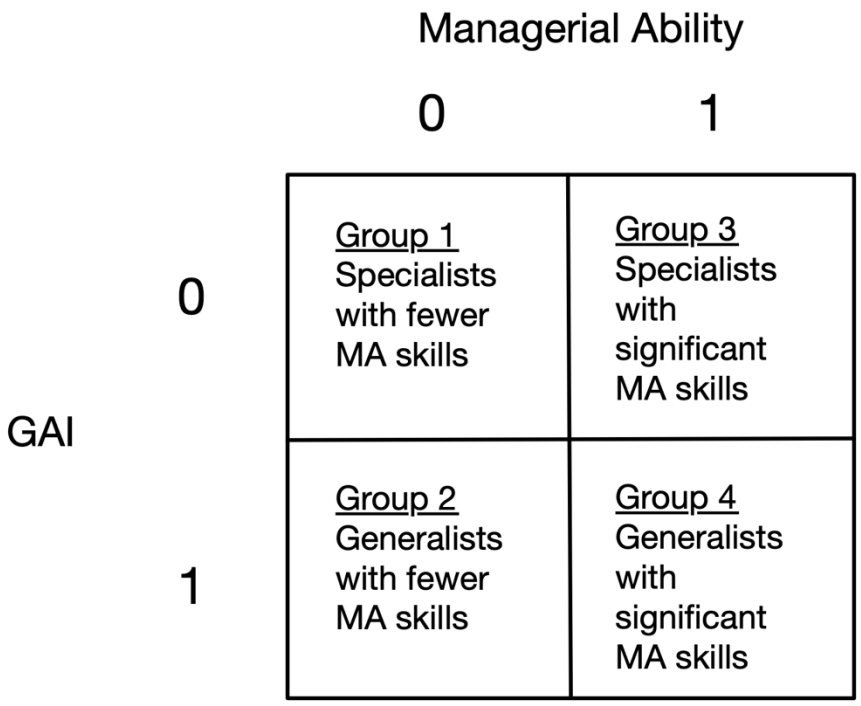


Table 5 describes the results of CEOs in the four quadrants. Column 1 shows that the coefficient of GAI is negatively related to the firm efficiency (-0.011 with the 0.01 significant level). Column 2 shows that the coefficient of GAI is -0.002, but this result is insignificant. Column 3 indicates that GAI improves firm efficiency (0.016 with 0.1 significance). Column 4 shows that the GAI coefficient is -0.009 with a 0.05 significant level.

Table 5 Regressions in Four Quadrants

	(1)	(2)	(3)	(4)
	Group 1	Group 2	Group 3	Group 4
General Ability Index	-0.011***	-0.002	0.016*	-0.009**
	(0.003)	(0.002)	(0.009)	(0.004)

Capital Expenditure	0.020	0.170***	0.116**	0.169**
	(0.017)	(0.031)	(0.054)	(0.083)
Cash	-0.008	-0.024**	0.080***	0.045**
	(0.007)	(0.012)	(0.017)	(0.022)
Leverage	0.010*	0.038***	-0.035**	-0.010
	(0.005)	(0.008)	(0.016)	(0.018)
ROA	0.182***	0.193***	0.425***	0.508***
	(0.012)	(0.018)	(0.030)	(0.038)
ROE	0.003	0.002	0.010	0.001
	(0.002)	(0.002)	(0.006)	(0.005)
Net Profit Margin	0.011**	-0.002	-0.062***	-0.117***
	(0.005)	(0.008)	(0.015)	(0.018)
Log (Total Assets)	0.011***	0.010***	0.046***	0.043***
	(0.001)	(0.002)	(0.003)	(0.004)
_cons	0.183***	0.192***	0.137***	0.164***
	(0.009)	(0.014)	(0.025)	(0.033)
Obs	9737	7033	5498	4314
R-squared	0.069	0.045	0.125	0.078
Year	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes

Standard errors are in parentheses.

**** p<.01, ** p<.05, * p<.1*

Columns 1 and 4 state that GAI decreases firm efficiency. Those columns define the specialists with fewer MA skills and the generalists with significant MA skills. The statistical analysis depicts that GAI negatively contributes to firm efficiency in these two groups. The finding of column 2 also shows that GAI reduces firm efficiency, and this

column represents the generalists with fewer MA skills. However, the result shows that GAI improves firm efficiency by 0.016 with a 0.1 significant level. It implies that specialists with significant MA skills improve firm efficiency. This discovery aligns with the conclusion in table 4.

Figure 5 Quantile Regression

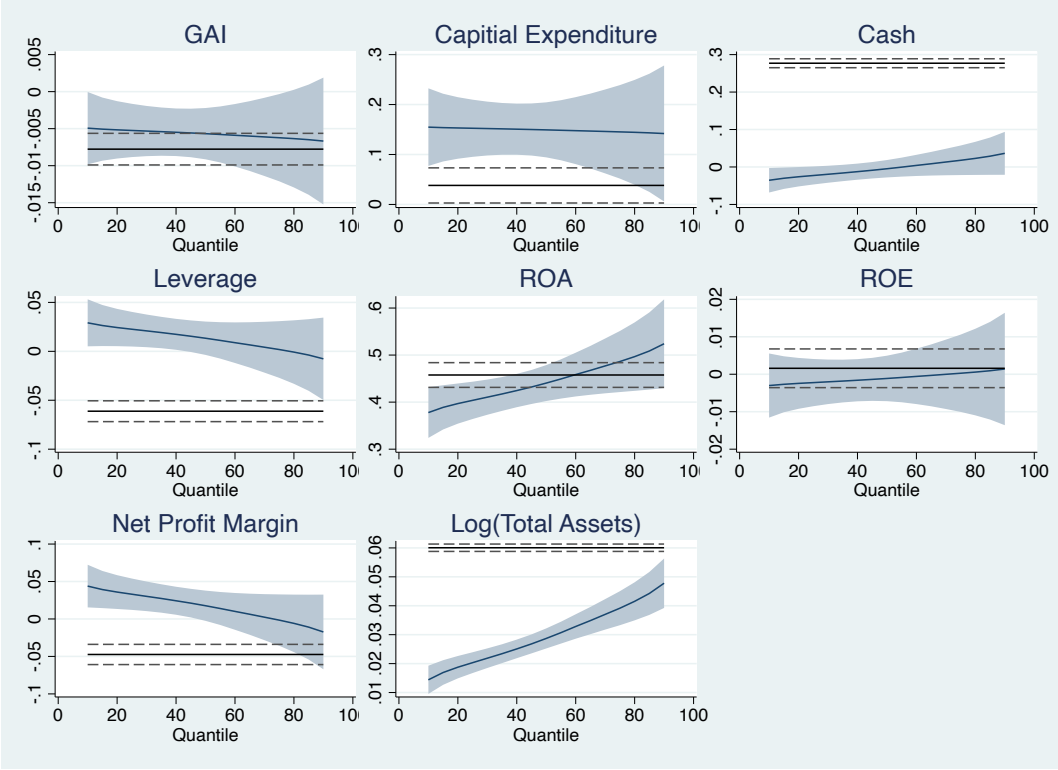


Figure 5 provides an overview of quantile regression, including the independent variable (GAI) and control variables (capital expenditure, cash, leverage, ROA, ROE, net profit margin, and log (total assets)). In the graph, the black solid lines represent the coefficient of OLS regression, and the black dish lines represent the confidence interval of OLS regression. The blue lines represent the coefficient of quantile regression, and the blue shaded areas represent the confidence interval of quantile regression.

The first graph labeled as GAI is the independent variable. It shows that there is no significant difference between the confidence interval of OLS regression and the quantile regression. However, the interval of OLS regression is lower than the interval of quantile regression in the 20 to 50 percentiles. In most of the control variables, the confidence intervals of quantile regressions are significantly different from the confidence intervals of OLS regressions. For example, capital expenditure, leverage, and net profit margin have the confidence interval of quantile regressions significantly higher than the OLS regressions. Cash and log (total assets) have the confidence interval of quantile regressions significantly lower than the OLS regressions. However, ROA and ROE perform differently. The confidence intervals of quantile and OLS regressions overlap and are not statistically significant between each other.

Regressions of GAI Components versus Firm Efficiency: General Abilities are Negatively Contribution to CEOs in Firm Efficiency

The main regressions and quadrants analysis results support that GAI negatively contributes to firm efficiency. However, because GAI is constituted of five constructs, namely: CEO experience dummy, number of industries, number of firms, number of positions, and conglomerate experience dummy; each may impact firms' efficiency differently or the GAI significance and directionality documented in the above tables might be driven by one or a few of the constructs. Here, I extend my analysis by using these five constructs and investigating their impacts on firm efficiency. In table 6, I apply equation 4. Firm efficiency is the dependent variable. CEO experience dummy, number of industries, number of firms, number of positions, and conglomerate experience dummy

are the independent variables displayed from column 1 to column 5. The model also includes control variables and year and firm fixed effects.

Table 6 delivers the discoveries on GAI components to firm efficiency. Column 1 points out that the CEO experience dummy decreases firm efficiency by -0.009. Column 2 states that the number of industry experiences reduces firm efficiency by -0.003. Column 3 shows that the number of firm experiences lowers firm efficiency by -0.003. Column 4 indicates that the number of position experiences wanes firm efficiency by -0001. Column 5 supports that conglomerate experience dummy tapers firm efficiency by -0.011. All the results are at a 0.01 significant level. Table 6 shows that all components of GAI have a negative impact on firm efficiency. It suggests that these five managers' constructs do not create benefits in boosting firm efficiency. The conglomerate experience dummy negatively affects firm efficiency within the five constructs, and the CEO experience dummy comes second. These two variables measure the managers' multiple experiences within and outside the firm. These findings suggest that the various experiences significantly decrease firm efficiency in this case.

Table 6 GAI regressions

	(1)	(2)	(3)	(4)	(5)
	CEO Experience Dummy	Number of Industry	Number of Firm	Number of Position	Conglomerate Experience Dummy
CEO Experience Dummy	-0.009***				
	(0.003)				
Capital Expenditure	0.151***	0.152***	0.151***	0.150***	0.154***

	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Cash	-0.002	-0.002	-0.003	-0.002	-0.003
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Leverage	0.012*	0.012*	0.012*	0.012*	0.011*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ROA	0.448***	0.446***	0.447***	0.448***	0.447***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
ROE	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Net Profit Margin	0.015**	0.015**	0.015**	0.015**	0.015**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Log (Total Assets)	0.029***	0.030***	0.029***	0.030***	0.029***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Number of Industry		-0.003***			
		(0.001)			
Number of Firm			-0.003***		
			(0.001)		
Number of Position				-0.001***	
				(0.000)	
Conglomerate Experience Dummy					-0.011***
					(0.004)
_cons	0.120***	0.118***	0.118***	0.117***	0.129***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Observations	26582	26582	26582	26582	26582
R-squared	0.100	0.101	0.100	0.100	0.100
Year	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

LIMITATIONS

Some limitations exist in this paper. First, this paper explores the connection between CEO types and firm efficiency using GAI, firm efficiency, and financial ratios. Besides the financial ratios, CEO traits also influence firm governance. For example, liberal-leaning CEOs and conservative-leaning CEOs share different preferences in corporate social responsibility (CSR) and downsizing (Gupta, Nadkarni, & Mariam, 2019), and transformational leadership ratings benefit from managers' positive psychological traits (Peterson et al., 2009). However, my paper does not contain CEO traits as the control variables. Scholars can consider including CEO traits as the additional control variables in a future study.

Second, besides CEO traits, CEO gender also influences the firm operation. Hanousek et al. (2019) find those female CEOs have less inclination to participle in corruption. Okafor and Ujah (2020) indicate that female managers prefer to propagandize CSR more than male managers. The influences of leadership from female managers bring different preferences in firm governance. Hence, gender may be a factor affecting the result in exploring the connection between CEO types and firm efficiency.

Third, table 3 shares insights into different industries. The table shows that CEO types are not evenly distributed across industries. The aircraft industry, for example, employs more generalists, while the petroleum and natural gas businesses employ more

experts. Furthermore, there is a significant discrepancy in total capital expenditure between them. However, the overall ROA is comparable. These findings could indicate that each industry has its own culture and traits. Two types of CEOs may be superior to one another in certain situations. Scholars may think about these areas in the future.

Finally, the sample adopted in this paper is from the Compustat North America dataset. Therefore, the variables do not encompass Asia, Europe, and Africa companies. The North American region cannot present the global as a whole. Countries from other places may have different features, and their companies may operate differently, such as South Korea has different corporate cultures. Furthermore, my data contain both specific and diversified companies. The firm strategy affects the firm's management plan and the CEO's decision. Therefore, the governance between a specific firm and a diversified firm may be suitable for applying different analyses to firm efficiency.

CONCLUSION

This paper examines the connection between CEO types and firm efficiency. CEOs are the crucial members of a firm system, and their decision shapes a firm's future. Their past experiences and backgrounds influence their actions when implementing the managerial plan. Therefore, generalists and specialists bring unique values to companies and share distinctive impacts. One of the measurements of firm success is firm efficiency. CEOs who attain optimal firm efficiency fully utilize the sources and avoid making extra waste. Thus, the interaction between two types of CEOs and firm efficiency is a substantial consideration.

The main regression results show that the general abilities negatively contribute to firm efficiency and suggest that specialists are preferable to generalists. In the quadrant analysis (table 5), the findings are consistent with the main regression analysis and support those generalists with significant MA skills do not benefit from improving firm efficiency (-0.009**). Furthermore, the analysis indicates that specialists with fewer MA skills have a more significant negative impact (-0.011***). However, the result indicates that specialists with significant MA skills increase firm efficiency (0.016*). An investigation of GAI suggests that the five constructs from CEOs' experiences decrease firm efficiency.

This paper contributes to two areas: research gap and scarcity problem. The prior studies show the lack of literature investigating from the standpoint of CEO types and firm efficiency. My study states new knowledge in this aspect. Li and Patel (2019) indicate a negative relationship between generalist CEOs and firm performance in the literature. My research finds out that general ability decreases firm efficiency. In the production process, firm efficiency is a core topic. Sources are limited, and individuals cannot exploit the sources as many as they wish (Mankiw, 2014). Therefore, individuals face the scarcity problem and always try to maximize their utility functions in the optimal case. From the firm standpoint, CEOs take the role of managing the team and leading the companies. Maximizing the firm's utility is their priority. An efficient arrangement is important to achieve this purpose because it helps produce maximum output and eliminate additional waste sources. By accomplishing maximum production, the firm generates the most considerable profit. The statistical analysis of my research shows that the general ability of the CEO contributes negatively to achieving better firm efficiency.

However, generalist CEOs create better benefits in the acquisitions (Chen et al., 2020) and are more likely in participating risky activities (Mishra, 2014). Overall, general ability provides advantages in some aspects, but it is not always the case.

APPENDIX

Variable Names	Variable Description	Data Sources
GAI	General Ability Index GAI includes five constructs: number of positions (X1), number of firms (X2), number of industries (X3), CEO experience dummy (X4), conglomerate experience dummy (X5) GAI measures the ability of CEOs' past working experience	Custódio et al. (2013)
Managerial Ability	This variable captures the managerial ability of a manager from the standpoint of generating revenues	Demerjian et al. (2012)
Capital Expenditure	Capital Expenditures / Total Assets This variable measures the growth behavior of firm	Compustat
Cash	Cash and Short-Term Investments / Total Assets This variable measures the liquidity of firm	Compustat
Leverage	(Total Debt in Current Liabilities +	Compustat

	Total Long-Term Debt) / Total Assets This variable measures the firm ability in holding debt	
ROA	Return on assets Earnings Before Interest and Taxes / Total Assets	Compustat
ROE	Return on equity Earnings Before Interest and Taxes / Total Stockholders' Equity	Compustat
Net Profit Margin	Net Income / Net Sales This variable measures the firm performance from profit aspect	Compustat
Log (Total Assets)	Log (Total Assets) This variable is for controlling the firm size	Compustat

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