

Managerial education and the wealth effect of corporate capital investment in Taiwan

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Abstract

Purpose – The purpose of this paper is to study the effect of managerial education levels on the wealth effect at the time of investment announcements, by testing two competitive hypotheses: the agency theory-based overinvestment hypothesis vs the Q-theory-based organizational legitimacy hypothesis.

Design/methodology/approach – The authors construct the sample by hand-collecting the announcement dates of capital investments from major newspapers published in Taiwan from 2006 to 2014. The authors then use the event study methodology to estimate cumulative abnormal returns at the time of investments announcements to measure the wealth effect. Finally, the authors examine the wealth effect for capital-investing firms with higher managerial education vs those with lower managerial education. The authors also conduct a cross-sectional regression to test the relation between the wealth effect of capital investment and managerial education.

Findings – The empirical results indicate that the wealth effect at the time of investment announcements is less favorable for firms with better-educated managers; this negative relation is mitigated for firms with higher institutional ownership and is aggravated for family-controlled firms; and the overall findings are supported by the agency theory-based overinvestment hypothesis, suggesting that higher managerial education lead to greater managerial optimism/overconfidence, which in turn increases the likelihood of overinvestment and implies a less favorable wealth effect associated with capital investment.

Originality/value – This study contributes to the literature by proposing a new, unexplored stock market's reaction channel through which managerial education signals adverse information about potential overinvestment behavior, even though many studies suggests that managerial education serves as an indication of knowledge/capability and improves firm performance.

Keywords Overinvestment, Agency theory, Capital investment, Managerial education

Paper type Research paper

1. Introduction

The literature has documented that corporate investment expenditures have a significant economic impact on shareholder value, namely, a positive short-term wealth effect partly due to the announcements of investment as a signal of the firm's future growth opportunities (e.g. McConnell and Muscarella, 1985; Blose and Shieh, 1997; Chen and Ho, 1997; Chung *et al.*, 1998). Further, empirical evidence suggests that an investment's favorable wealth effect varies with alternative managerial characteristics, such as the appointment of generalist vs specialist CEOs (Xuan, 2009) as well as a CEO's reputation (Jian and Lee, 2011). However, the issues of whether and how managerial educational qualifications explain the wealth effect of investment have so far not been addressed. Our study contributes to the literature by filling this gap.

Our study, which focuses on the role of managerial education, is mainly motivated by the growing literature that postulates managerial educational qualifications as an indication of knowledge and skill, highlighting its importance on corporate investment, general decision-making, and firm performance (e.g. Hambrick and Mason, 1984; Bantel and Jackson, 1989; Hitt and Barr, 1989; Wiersema and Bantel, 1992; Barker and Mueller, 2002; Graham and Harvey, 2002; Malmendier and Tate, 2005a; Gottesman and Morey, 2006;



Bhagat *et al.*, 2010; King *et al.*, 2016). For example, an influential study by Malmendier and Tate (2005a) suggests a significant effect of managerial overconfidence on corporate investment distortions and mentions that CEOs with a financial education exhibit better understanding of capital markets and, thus, usually invest more in capital expenditure. Following the literature, this study aims to examine the role of managerial educational qualifications in explaining the net wealth effect of corporate investment expenditures by testing two competitive hypotheses: the overinvestment hypothesis vs the organizational legitimacy hypothesis[1].

The overinvestment hypothesis predicts that the wealth effect associated with announcements of investment expenditures is less favorable for firms with higher managerial education levels than for firms with lower managerial education levels. Previous literature suggests that individuals' educational attainment is an important factor in driving their overconfidence (e.g. Bhandari and Deaves, 2006; Graham *et al.*, 2009; Deaves *et al.*, 2010; Ben-David *et al.*, 2013) as well as their optimistic traits (e.g. Puri and Robinson, 2007; Landier and Thesmar, 2009). For example, Ben-David *et al.* (2013) suggest that miscalibration is one form of overconfidence and that better-educated top financial executives severely miscalibrate and are overconfident regarding their own firm's prospects[2]. Landier and Thesmar (2009) document that entrepreneurs' educational level has a positive impact on optimism toward corporate financial contracting (i.e. self-selecting to make more use of short-term debt). Another strand of literature suggests that optimistic/overconfident managers typically overestimate their own managerial skills and the firm's perspective, and they are likely to undertake value-destroying investments when internal funds are abundant (e.g. Camerer and Lovallo, 1999; Heaton, 2002; Lin *et al.*, 2005; Malmendier and Tate, 2005a, b, 2008; Glaser *et al.*, 2008; Huang *et al.*, 2011; Wang *et al.*, 2016). Using CEOs' personal exposure to company-specific risk as a measure of overconfidence, Malmendier and Tate (2005a, b, 2008) empirically suggest a relation between CEOs' overconfidence and overinvestment. This relation is supported by Heaton (2002) and Glaser *et al.* (2008), who state that excessively optimistic managers systematically overvalue their firm's investment opportunities and, thus, have a tendency to overinvest, which can impair firm value. Using a sample of Chinese-listed companies, Huang *et al.* (2011) and Wang *et al.* (2016) also provide supportive evidence that managerial overconfidence leads to overinvestment. In brief, the above literature summarizes that optimism/overconfidence due to managerial educational qualifications is one explanation for observed investment distortions, *ceteris paribus*.

Traditional agency theory emphasizes the agency costs of managerial discretion overinvestment funds (e.g. Jensen and Meckling, 1976; Jensen, 1986; Stulz, 1990), which in turn implies that managerial overinvestment behavior results in lower firm value. Building upon the agency theory, the overinvestment hypothesis predicts that, compared to firms with lower managerial education levels, firms with higher managerial education levels are likely to overinvest and, thus, experience a lower, abnormal return when capital investments are announced.

In contrast, the organizational legitimacy hypothesis predicts that the wealth effect associated with the announcements of investment expenditures is more favorable for firms with higher managerial education levels than for firms with lower managerial education levels. The literature suggests that organizations can use a variety of legitimating mechanisms to enhance their reputation (e.g. Suchman, 1995; Davis and Mizruchi, 1999; Certo, 2003; Long and Driscoll, 2008). For example, Certo (2003) proposes that the appointment of highly educated and experienced directors improves a board's prestige and, thus, secures organizational legitimacy. In addition, existing literature has argued that legitimacy enhances organizational survival by allowing managers to affect the perceptions of customers, suppliers, and investors and to assist in resource acquisition (e.g. Meyer and

Rowan, 1977; DiMaggio and Powell, 1983, 1991; Baum and Oliver, 1991). Consequently, a legitimate firm is expected to be less likely to fail by default and, thus, have a lower cost of capital when accessing sources of external financing (e.g. Cornell and Shapiro, 1987; Miller and Bromiley, 1990; Mizruchi, 1996). In summary, the above literature implies that a better-educated management is associated with organizational legitimacy, which can credibly signal to potential investors and lenders a firm's quality and help reduce the cost of external funds.

A key economic implication of the Q-theory is that a lower cost of capital encourages firms to invest more. This naturally generates a higher net present value for new investments, which increases investment efficiency and, thus, a firm's value (e.g. Cochrane, 1991; Zhang, 2005; Xing, 2008; Li *et al.*, 2009; Liu *et al.*, 2009; Li and Zhang, 2010; Chen *et al.*, 2011; Cooper and Priestley, 2011; Lam and Wei, 2011). Expanding upon the Q-theory, the organizational legitimacy hypothesis predicts that, compared to firms with lower levels of managerial education, firms with higher managerial education levels have greater organizational legitimacy and, thus, experience a higher, abnormal return when capital investments are announced.

To test the overinvestment hypothesis vs the organizational legitimacy hypothesis, we examined a sample of Taiwan listed firms that announced capital investments between 2006 and 2014. Following the previous literature, we measure the shareholder wealth effect using two-day cumulative abnormal returns, ($CAR(-1, 0)$), around the investment announcement period. The level of managerial education is measured by the proportion of postgraduate degrees among all top managers in a sample firm[3]. Consistent with Chen *et al.* (2001), we first show a significantly positive $CAR(-1, 0)$ of 0.503 percent for our whole sample investing firms, suggesting announcements of capital investments by Taiwanese firms are associated with a positive shareholder wealth effect. More important, we further show that investing firms with higher (lower) managerial education levels have a lower (higher) $CAR(-1, 0)$ near the investment announcement period. On average, the difference in $CAR(-1, 0)$ between high and low levels of managerial education at investing firms is statistically and economically significant at -0.895 percent. The cross-sectional regression analyses further show a significantly negative relation between the shareholder wealth effect of capital investment announcements and the level of managerial education, even after controlling for other determinants suggested in the literature that could affect the value of corporate capital investment. These findings suggest that the overinvestment hypothesis dominates the organizational legitimacy hypothesis. Firms with a higher managerial education level are more likely to overinvest, resulting from managerial optimism/overconfidence; hence, their capital investments are less favorable than those by firms with a lower managerial education level.

With our main finding of highly educated, managerial, agency-related overinvestment behavior, one further testable implication arises from the overinvestment hypothesis. The role of corporate governance in monitoring and controlling managers is a fundamental concept in agency theory (e.g. Jensen and Meckling, 1976; Jensen, 1986; Stulz, 1990). Because good corporate governance helps prevent value-reducing investments (e.g. Richardson, 2006), an unfavorable wealth effect caused by overinvestment at investing firms with better-educated managers should be mitigated (aggravated) among well- (poorly) governed firms. To test this argument, we consider two typical characteristics of corporate governance mechanisms in Taiwan: institutional ownership and family control (e.g. Yeh *et al.*, 2001; Filatotchev *et al.*, 2005; Yeh and Woidtke, 2005; Huang and Shiu, 2009; Wong *et al.*, 2010). Previous research has documented that institutional investors have a critical function in monitoring management's actions and, thus, promoting good corporate governance, which implies that larger institutional ownership correlates with better corporate governance (e.g. Gillan and Starks, 2003; Almazan *et al.*, 2005; Huang and Shiu, 2009; Aggarwal *et al.*, 2011). Other authors

suggest that family control raises serious agency conflicts resulting from the pyramidal ownership structure, cross-holding of shares, nepotism, and expropriation of private benefit, all of which imply poor corporate governance (e.g. La Porta *et al.*, 1999; Claessens *et al.*, 2002; Lubatkin *et al.*, 2005; Wong *et al.*, 2010). In our cross-sectional regression analyses, we find that the interaction term between managerial educational level and a dummy with high institutional ownership significantly and positively explains investing firms' CAR (-1, 0). In contrast, the interaction term between managerial educational level and a family-controlled dummy significantly and negatively explains investing firms' CAR (-1, 0). Consistent with our corporate governance argument, these findings suggest that the unfavorable impact of managerial educational level on the wealth effect of investment is mitigated for well-governed firms owned by large numbers of institutional investors and is aggravated for poorly governed firms controlled by a family.

This study makes several major contributions to the literature. First, most empirical research on the determinants of wealth effects associated with capital investment announcements has focused on US firms (e.g. Chen, 2006). Our focus, on a sample of Taiwanese firms, is important because as an emerging market, Taiwan generally has poor corporate governance and weak shareholder protection (e.g. Huang and Shiu, 2009). Such a poorly governed environment allows self-interested managers to engage in opportunistic behaviors that can destroy the value of investments. This can signal overinvestment to Taiwan market investors when capital investments are announced. Our empirical evidence that Taiwan market investors respond less favorably to investment announcements made by firms with highly educated managers seems to echo this concern, highlighting a potential "dark" side of managerial education levels.

Second, our study sheds new light on the economics of managerial education. To the best of our knowledge, this is the first study that relates managerial education to the shareholder wealth effect at the time of capital investment announcements. For decades, the literature has studied how managerial education affects corporate decisions (e.g. Bantel and Jackson, 1989; Wiersema and Bantel, 1992; Barker and Mueller, 2002; Graham and Harvey, 2002; Haniffa and Cooke, 2002; Ferris *et al.*, 2003; Malmendier and Tate, 2005a) and how it affects a firm's performance (e.g. Carpenter and Westphal, 2001; Gottesman and Morey, 2006; Bhagat *et al.*, 2010). Given that managerial education may signal organizational legitimacy or managerial optimism/overconfidence, we study the reaction of the unexplored Taiwanese financial market to managerial education, which influences investor responses to investment announcements and influences shareholder value.

Three, our study contributes to the literature on corporate investment decisions. Recent influential studies have indicated that corporate capital investment is significantly affected by various managerial characteristics. For example, Malmendier and Tate (2005a) show that the level of corporate investment varies by educational background. Jian and Lee (2011) show that CEO reputation explains significantly the economic effect of capital investment announcements. Pan *et al.* (2016) note that a CEO's tenure affects the amount of investment and document the pattern of a CEO investment cycle. Our study complements this stream of literature and, thus, enhances our understanding of how the net economic impact of firms' capital investments is affected by managers' educational qualifications.

Finally, our study also contributes to the corporate governance literature. Although previous literature has investigated how corporate governance affects the valuation of capital investments (e.g. Chung *et al.*, 2003), they do not consider the potentially interactive effect between corporate governance and managerial education on the valuation of capital investments. Our study fills this gap by providing new evidence: managerial overinvestment resulting from high levels of education is mitigated (aggravated) in well-governed (poor-governed) firms.

The remainder of this study is organized as follows. Section 2 describes the sample and summarizes statistics, and Section 3 examines the effect of managerial education on the wealth effect associated with capital investment announcements. Section 4 provides a conclusion.

2. Sample and descriptive statistics

2.1 Sample design

To conduct our analysis, we hand-collected the announcement dates of corporate capital investments from major newspapers published in Taiwan (e.g. *Economic Daily News*, *Commercial Times*, and *Digitizes*) as well as from well-known global internet websites (e.g. Google, Yahoo!, cnYES, and MoneyDJ). The sample contains all Taiwan Stock Exchange listed firms that voluntarily announced plans to increase their investment expenditures in fiscal years from 2006 to 2014.

Managerial education level is our key explanatory variable. We collected data on managerial education level for all top managers in a sample firm from the *Taiwan Economic Journal (TEJ)*, where top managers are defined as the high ranking executives with titles such as chairman/chairwoman, chief executive officer, chief financial officer, general manager, vice general manager, associate general manager, senior manager, managing director, executive directors, associate director, president, and executive vice-president. Similar to Zajac and Westphal (1996), we use a proportion of postgraduate degrees among all top managers in a sample firm for the fiscal year prior to the announcement (denoted as *MGRedu*) to capture the effect of managerial education. A postgraduate degree includes a master's, graduate certificate, graduate diploma, doctor of philosophy (PhD), doctor of business administration (DBA), and their equivalents, received from either domestic or overseas institutions. After merging several sets of data on capital investment announcements, managerial education, and other important variables (e.g. stock returns and accounting-based variables), our final sample consisted of 191 announcements of capital investments made by 79 TWSE-listed firms[4].

Table I presents the sample distribution by sample year in Panel A and by industry in Panel B. Panel A shows that during the financial crisis of 2008-2009, Taiwanese firms tended to delay capital investments (21 percent of the sample). Panel B shows that corporate capital investments for Taiwanese firms are more concentrated in the semiconductor (34.6 percent) and electronics industries (24.1 percent). The proportion of managers with a postgraduate degree appears to be relatively low in the rubber industry (6.3 percent), one of the major traditional industries in Taiwan.

2.2 Descriptive statistics

Table II presents descriptive statistics on variables used in our empirical analysis in Panel A and their correlations in Panel B. All data used were collected from the *TEJ*. Panel A shows that the average of two-day CARs during the announcement date -1 to date 0 ($CAR(-1, 0)$) [5] is significantly positive at 0.503 percent. We detail the implication of this result in the following section. On average, investing firms' top management teams tend to have relatively high education qualifications (about 47 percent of top managers have a postgraduate degree) and relatively short tenures (about 7 years). Panel B further shows that $CAR(-1, 0)$ is negatively correlated with managerial education (-0.139), providing preliminary evidence to support the overinvestment hypothesis. In addition, $MGRtenure$ is positively correlated with $MGRedu$ at 0.160, suggesting that long-tenure managers are also highly educated in investing firms.

3. Empirical analysis

3.1 Univariate analysis

We first conduct a univariate analysis by examining the short-run wealth effect for capital-investing firms with higher managerial education vs those with lower managerial education.

	<i>n</i>	% of sample	<i>Avg. MGRedu</i> (%)
<i>Panel A: by sample year</i>			
2006	21	11.0	55.3
2007	19	9.9	41.6
2008	15	7.9	38.0
2009	25	13.1	54.1
2010	25	13.1	58.1
2011	22	11.5	32.8
2012	20	10.5	51.9
2013	17	8.9	45.0
2014	27	14.1	42.0
2006-2014	191	100.0	46.5
<i>Panel B: by industry</i>			
Semiconductor	66	34.6	59.2
Electronic	46	24.1	49.8
Electrical Engineering and Machinery	15	7.9	74.0
Plastic	11	5.8	14.1
Steel and Iron	10	5.2	41.2
Cement	5	2.6	14.8
Food	4	2.1	29.7
Rubber	4	2.1	6.3
Chemical, Biotechnology, and Healthcare	3	1.6	38.9
Papermaking	3	1.6	16.6
Others	24	12.6	–

Notes: This table presents a sample distribution of 191 announcements of capital investments made by 79 TWSE-listed firms between 2006 and 2014, categorized by sample year in Panel A and by industry in Panel B. Data on the announcement date of corporate capital investments are hand-collected from major newspapers published in Taiwan (e.g. *Economic Daily News*, *Commercial Times*, and *DigiTimes*) and internet websites (e.g. Google, Yahoo!, cnYES, and MoneyDJ). The sample contains all TWSE-listed firms voluntarily announcing plans to increase their investment expenditures in the forthcoming fiscal year. *MGRedu* is the proportion of postgraduate degrees among all top managers in a sample firm for the fiscal year prior to the announcement, where a postgraduate degree includes a master's, graduate certificate, graduate diploma, doctor of philosophy (PhD), doctor of business administration (DBA), and their equivalents, received from either domestic or overseas institutions. *n* represents sample size

Table I.
Sample distribution

Following previous literature, we use two-day announcement period CARs from event date -1 to date 0 ($CAR(-1, 0)$) to measure the shareholder wealth effect[6]. Table III reports the results for whole sample, as well as for two subsamples sorted by managerial educational levels (*MGRedu*). For whole sample analysis, we first demonstrate a significantly positive abnormal return due to the announcements of corporate capital investments in Taiwan. As show in Table III, the average $CAR(-1, 0)$ for whole sample firms is significantly positive at 0.503 percent with a *t*-statistic of 2.50. This result is quite similar to Chen *et al.* (2001), who show that the average $CAR(-1, 0)$ of announcements of cross-border capital investments by Taiwanese firms during 1991-1995 is 0.51 percent with significance at the 5 percent level. Accordingly, these results suggest that announcements of capital investments by Taiwanese firms are associated with a positive shareholder wealth effect.

For the subsample analysis, on average, the average $CAR(-1, 0)$ for investing firms with higher managerial education is statistically insignificant at 0.044 percent. Conversely, investing firms with lower managerial education have a significantly positive $CAR(-1, 0)$ of 0.939 percent, with a *t*-statistic of 3.32. More importantly, the average difference in $CAR(-1, 0)$ between high-*MGRedu* and low-*MGRedu* investing firms is significantly negative at -0.895 percent, with a *t*-statistic of -2.24 . The results are similar when we assess the median $CAR(-1, 0)$. The overall results in Table III support the overinvestment hypothesis.

Panel A: summary statistics

	<i>n</i>	Mean	Median	STD
<i>CAR</i> (-1, 0) (%)	191	0.503	0.170	2.786
<i>MGRedu</i>	191	0.470	0.400	0.325
<i>MGRtenure</i>	191	7.191	6.470	3.550
<i>Firm size</i>	191	18.693	18.903	1.636
<i>Tobin's Q</i>	191	2.020	1.620	1.295
<i>FCF</i> (%)	191	2.634	2.167	9.734
<i>Debt</i> (%)	191	13.387	11.272	10.997
<i>Insider ownership</i> (%)	191	40.015	39.510	14.760
<i>Board size</i>	191	8.764	9.000	2.699
<i>Board independence</i>	191	0.206	0.222	0.204
<i>IOR</i> (%)	191	41.830	41.300	23.441
<i>Family</i>	191	0.346	0.000	0.477

Panel B: correlations

	<i>CAR</i> (-1, 0)	<i>MGRedu</i>	<i>MGRtenure</i>	<i>Firm size</i>	<i>Tobin's Q</i>	<i>FCF</i>	<i>Debt</i>	<i>Insider ownership</i>	<i>Board size</i>	<i>Board independence</i>	<i>IOR</i>
<i>MGRedu</i>	-0.139										
<i>MGRtenure</i>	0.153	0.160									
<i>Firm Size</i>	-0.113	0.242	0.171								
<i>Tobin's Q</i>	-0.001	0.087	0.273	0.048							
<i>FCF</i>	-0.053	0.213	0.235	0.239	0.245						
<i>Debt</i>	0.117	-0.170	-0.205	-0.094	-0.298	-0.487					
<i>Insider Ownership</i>	0.090	-0.197	0.064	-0.312	0.208	-0.075	-0.056				
<i>Board Size</i>	0.077	-0.120	-0.091	0.293	0.048	0.091	0.043	0.130			
<i>Board Independence</i>	-0.099	0.475	0.222	0.355	0.208	0.151	-0.232	-0.087	-0.128		
<i>IOR</i>	-0.105	0.358	0.305	0.644	0.337	0.445	-0.286	-0.233	0.051	0.424	
<i>Family</i>	-0.066	-0.385	-0.060	-0.102	-0.082	0.017	0.082	0.047	0.023	-0.361	-0.068

Notes: This table presents descriptive characteristics for investment-announcing firms in Panel A and their correlation in Panel B. The sample consists of 191 capital investment announcements made by 79 TWSE-listed firms for a sample period from 2006 to 2014. *CAR* (-1, 0) is two-day cumulative abnormal returns from the announcement date -1 to date 0 using a standard market model based on the 141-day ($t = -200$ to $t = -60$) estimated period for computing expected returns. *MGRedu* is the proportion of postgraduate degrees among all top managers in a sample firm for the fiscal year prior to the announcement, where a postgraduate degree includes a master's, graduate certificate, graduate diploma, doctor of philosophy (PhD), doctor of business administration (DBA), and their equivalents, received from either domestic or overseas institutions. *MGRtenure* is the average of all top managers' tenure in a sample firm for the fiscal year prior to the announcement. *Firm Size* is the natural log of the book value of total assets for the fiscal year prior to the announcement. *Tobin's Q* is the market-to-book ratio for the fiscal year prior to the announcement. *FCF* is free cash flow scaled by total assets for the fiscal year prior to the announcement. *Debt* is long-term debt scaled by total assets for the fiscal years prior to the announcement. *Insider Ownership* is ownership held by the firm's insiders, including directors, company presidents, CEOs, and top ten shareholders for the year end prior to the announcement. *Board Size* is the number of board members for the fiscal year prior to the announcement. *Board Independence* is the proportion of independent directors for the fiscal year prior to the announcement. *IOR* is total ownership held by the three major institutional investors in the TWSE (i.e. qualified foreign institutional investors (QFIIs), mutual funds, and securities dealers) for the fiscal year prior to the announcement. *Family* is a dummy variable that equals 1 if a sample firm is family controlled and 0 otherwise

Table II.
Summary statistics

3.2 Cross-sectional regression analysis

We further conduct a cross-sectional regression of capital investment firms' *CAR* (-1, 0) on managerial education after controlling for other potential explanatory variables that may affect the wealth effect of capital investments. The regression model we estimate is in the following equation:

$$\begin{aligned}
 CAR(-1, 0)_i = & \beta_0 + \beta_1 MGRedu_i + \beta_2 Firm\ Size_i + \beta_3 Tobin's\ Q_i + \beta_4 FCF_i + \beta_5 Debt_i \\
 & + \beta_6 MGRtenure_i + \beta_7 Insider\ Ownership_i + \beta_8 Board\ Size_i \\
 & + \beta_9 Board\ Independence_i + \theta_j + \varphi_t + u_i
 \end{aligned} \tag{1}$$

Table III.
Managerial education
and abnormal returns
around the investment
announcement

	Whole Sample ($n = 191$)	High $MGRedu$ ($n = 93$)	Low $MGRedu$ ($n = 98$)	H-L
Mean $CAR(-1, 0)$ (%)	0.503	0.044	0.939	-0.895
t -statistics	[2.50]**	[0.16]	[3.32]***	[-2.24]**
Median $CAR(-1, 0)$ (%)	0.170	0.055	0.570	-0.515
p -values for Wilcoxon z -statistics	[0.02]**	[0.45]	[< 0.01]***	[0.08]*

Notes: This table presents two-day cumulative abnormal returns ($CAR(-1, 0)$) around the investment announcement period for whole sample, as well as for two subsamples sorted by managerial educational level ($MGRedu$) in the year prior to the announcement date. The sample consists of 191 capital investment announcements made by 79 TWSE-listed firms for a sample period from 2006 to 2014. The t -test and Wilcoxon signed-rank tests are used to test the hypotheses that the means and medians are equal to 0. The t -test and Wilcoxon rank-sum test are used to test the difference in the mean and median between high- $MGRedu$ and low- $MGRedu$ groups. n represents sample size. t -statistics and p -values for Wilcoxon z -statistics are presented in square brackets. *, **, ***Significant at 10, 5 and 1 percent levels, respectively

where $MGRedu_i$ is firm i 's managerial educational level, which is the variable we are most interested in. The control variables are related to investing firms' characteristics such as firm size, Tobin's Q , free cash flow (FCF), firm debt, managerial tenure, insider ownership, board size, and board independence. Firm size is used to capture information asymmetry. It is expected that small firms exhibit more severe information asymmetry and thus market investors' reaction would be negatively related to firm size, *ceteris paribus* (e.g. Hertzell and Smith, 1993; and Kang and Stulz, 1996). Tobin's Q is used to measure investment opportunities. Following Lang *et al.* (1991), Chen and Ho (1997), and Chen (2006), we hypothesize a positive relation between a firm's Tobin's Q and market investors' reaction to a capital expenditure announcement. FCF is used to proxy for the possibility of managerial wasteful investment and thus it is expected to be a negative relation between the firm's FCF and market investors' reaction to a capital expenditure announcement (see, e.g. Jensen, 1986). Debt is used to measure as a credible precommitment to pay out the excess cash and is expected to be positively associated with market investors' reaction to a capital expenditure announcement (see, e.g. Jensen, 1986). Following Jian and Lee (2011), we use managerial tenure to measure managerial reputation and hypothesize that, due to efficient contracting effect, managerial tenure is expected to be positively associated with wealth effects of corporate capital investments. Insider ownership is used to capture the alignment of interests (see, e.g. Jensen and Meckling, 1976). If insiders and managers have a greater ownership in the firm, they will be less likely to undertake a bad investment. This, in turn, implies a positive relation between insider ownership and market investors' reaction to a capital expenditure announcement. Board size and board independence are incorporated to control for organizational legitimacy. Previous literature suggests that the board structure (e.g. board size and board independence) is a common indicator of organizational legitimacy (see, e.g. Singh *et al.*, 1986). To rule out the possibility that our managerial education-based organizational legitimacy effect is driven by board structure, we thus consider board size and board independence as control variables. These variables above are defined in Table II. The industry-fixed effect (θ_j) and the time-fixed effect (φ_t) are also included into our regression models. Table IV reports the results estimated by Equation (1).

Model I of Table IV shows that the coefficient on $MGRedu$ is significantly negative at -1.971 , with a t -statistic of -2.50 . After adding other control variables in Model II, even $MGRedu$ is significantly negatively related to capital investments' $CARs$ (coefficient = -2.623

Dependent Variable: <i>CAR</i> (-1, 0)	I	II
<i>MGRedu</i>	-1.971 (-2.50)**	-2.623 (-2.78)***
<i>Firm size</i>		-0.344 (-1.45)
<i>Tobin's Q</i>		-0.141 (-0.64)
<i>FCF</i>		-0.987 (-0.35)
<i>Debt</i>		1.862 (0.74)
<i>MGRtenure</i>		0.270 (3.37)***
<i>Insider Ownership</i>		0.011 (0.62)
<i>Board size</i>		0.084 (0.80)
<i>Board independence</i>		0.329 (0.20)
<i>Industry-fixed effect</i>	Yes	Yes
<i>Year-fixed effect</i>	Yes	Yes
<i>n</i>	191	191
<i>R</i> ²	30.59%	37.92%

Notes: This table presents the results of cross-sectional regressions of abnormal returns around the investment announcement period (*CAR* (-1, 0)) on managerial educational levels (*MGRedu*) and a set of control variables. We estimate the regression model as follows:

$$\begin{aligned}
 CAR(-1, 0)_i = & \beta_0 + \beta_1 MGRedu_i + \beta_2 Firm\ Size_i + \beta_3 Tobin's\ Q_i + \beta_4 FCF_i + \beta_5 Debt_i \\
 & + \beta_6 MGRtenure_i + \beta_7 Insider\ Ownership_i + \beta_8 Board\ Size_i \\
 & + \beta_9 Board\ Independence_i + \theta_j + \varphi_i + u_i
 \end{aligned}$$

Table IV.
Cross-sectional regression of the wealth effect of capital investment

The variables in the model are defined in Table II. Regression models also incorporate industry-fixed effects and time-fixed effects, where industry category is identified by the TWSE's two-digit industry code. The sample consists of 191 capital investment announcements made by TWSE-listed firms for a sample period from 2006 to 2014. *n* represents sample size. *t*-statistics in square brackets are calculated using heteroskedasticity-consistent and industry-clustered standard errors; ***,**Significant at 5 and 1 percent levels, respectively

with a *t*-statistic of -2.78). Interestingly, consistent with Jian and Lee's (2011) efficient contracting hypothesis, we find that managerial tenure is significantly and positively associated with wealth effects of corporate capital investments. Most of our control variables are statistically insignificant possibility because of an inclusion of industry effect in our regression model[7]. Overall, these results again support the overinvestment hypothesis, suggesting that because of a concern about overconfidence, market investors respond unfavorably to capital investment announcements made by firms with higher managerial education levels.

3.3 The interaction effect with corporate governance

Given our above findings of highly educated managerial agency-related overinvestment behavior, one further testable implication arises from the overinvestment hypothesis. Since good corporate governance plays an important role in preventing managerial value-destructing investments (e.g. Richardson, 2006), the unfavorable wealth effect due to signaling information about overinvestment for investing firms with better-educated managers should be mitigated (aggravated) among well- (poorly) governed firms. To test this hypothesis, we consider two typical characteristics of corporate governance mechanisms in Taiwan: institutional ownership (e.g. Huang and Shiu, 2009) and family control (e.g. Claessens *et al.*, 2002; Huang and Shiu, 2009; Wong *et al.*, 2010),

and we introduce an additional interaction term associated with corporate governance to Equation (1):

$$\begin{aligned}
 CAR(-1, 0)_i = & \beta_0 + \beta_1 MGRedu_i + \beta_2 MGRedu_i \times IOR_i^H + \beta_3 IOR_i^H + \beta_4 Firm\ Size_i \\
 & + \beta_5 Tobin's\ Q_i + \beta_6 FCF_i + \beta_7 Debt_i + \beta_8 MGRtenure_i \\
 & + \beta_9 Insider\ Ownership_i + \beta_{10} Board\ Size_i \\
 & + \beta_{11} Board\ Independence_i + \theta_j + \varphi_t + u_i
 \end{aligned} \tag{2a}$$

where IOR_i^H is a high institutional ownership dummy that equals 1 if an investing firm i 's institutional ownership is larger than its sample median and 0 otherwise. Because previous research suggests that institutional investors have a critical function to monitor management's actions and, thus, promote good corporate governance (e.g. Aggarwal *et al.*, 2011), IOR_i^H represents good governance. Other variables are identified in Table II. A negative (positive) coefficient on the interaction term (i.e. $\hat{\beta}_2$) in Equation (2a) indicates a stronger (weaker) unfavorable wealth effect of managerial education for firms with an IOR_i^H of one relative to firms with an IOR_i^H of 0.

Similarly, we estimate the following equation:

$$\begin{aligned}
 CAR(-1, 0)_i = & \beta_0 + \beta_1 MGRedu_i + \beta_2 MGRedu_i \times Family_i + \beta_3 Family_i + \beta_4 Firm\ Size_i \\
 & + \beta_5 Tobin's\ Q_i + \beta_6 FCF_i + \beta_7 Debt_i + \beta_8 MGRtenure_i \\
 & + \beta_9 Insider\ Ownership_i + \beta_{10} Board\ Size_i \\
 & + \beta_{11} Board\ Independence_i + \theta_j + \varphi_t + u_i
 \end{aligned} \tag{2b}$$

where $Family_i$ is a family-controlled firm dummy that equals 1 if an investing firm i is family controlled and 0 otherwise. Since the literature suggests that family control involves serious agency conflicts resulting from the pyramidal ownership structure, cross-holding shares, nepotism, and expropriation of private benefits (e.g. Wong *et al.*, 2010), $Family_i$ represents bad governance. A negative (positive) coefficient on the interaction term (i.e. β_2) in Equation (2a) indicates a stronger (weaker) unfavorable wealth effect of managerial education for firms with a $Family_i$ of one relative to firms with a $Family_i$ of 0.

Model I of Table V reports the estimated results of Equation (2a) and shows that the coefficient on $MGRedu \times IOR^H$ is significantly positive at 1 percent (coefficient = 3.578 with a t -statistic of -2.05), while the coefficient on $MGRedu$ is still significantly negative. It should be noted that the coefficient on IOR^H itself is not significant. Such finding suggests that institutional investors do not have a significant impact on the valuation of capital expenditures for whole sample of investing firms in Taiwan, but plays an important monitoring role in investing firms with highly managerial education levels. This implies that managerial monitoring provided by institutional investors only works in those firms with investment distortions driven by highly managerial education[8].

Furthermore, Model II reports the estimated results of Equation (2b) and shows that the coefficient on $MGRedu \times Family$ is significantly negative at 5 percent (coefficient = -3.859 with a t -statistic of -1.92), while $MGRedu$ continues to have a significantly negative effect on the wealth effect of investment. Consistent with the corporate governance hypothesis, these results suggest that the unfavorable impact of managerial education on the wealth effect of investment is mitigated for well-governed firms owned by large numbers of institutional investors and is aggravated for poorly governed firms controlled by a family.

Dependent variable: CAR (-1, 0)	I	II
<i>MGRedu</i>	-4.544 (-3.44)***	-2.457 (-2.16)**
<i>MGRedu</i> × <i>IOR^H</i>	3.578 (2.05)**	
<i>IOR^H</i>	-1.237 (-1.17)	
<i>MGRedu</i> × <i>Family</i>		-3.859 (-1.92)*
<i>Family</i>		-0.010 (-0.01)
<i>Firm Size</i>	-0.305 (-1.20)	-0.433 (-1.84)*
<i>Tobin's Q</i>	-0.129 (-0.57)	-0.069 (-0.31)
<i>FCF</i>	-1.669 (-0.59)	-1.426 (-0.52)
<i>Debt</i>	2.121 (0.84)	3.033 (1.20)
<i>MGRtenure</i>	0.228 (2.74)***	0.273 (3.36)***
<i>Insider Ownership</i>	0.006 (0.34)	0.001 (0.04)
<i>Board Size</i>	0.034 (0.32)	0.034 (0.32)
<i>Board Independence</i>	-0.993 (-0.56)	-0.880 (-0.51)
<i>Industry-Fixed Effect</i>	Yes	Yes
<i>Year-Fixed Effect</i>	Yes	Yes
<i>n</i>	191	191
<i>R²</i>	40.09%	41.08%

Notes: This table presents the results of cross-sectional regressions of abnormal returns around the investment announcement period (CAR (-1, 0)) on managerial educational level (*MGRedu*), interacting with institutional ownership in Model I and with family-controlled effects in Model II. We estimate Model I as follows:

$$CAR(-1, 0)_i = \beta_0 + \beta_1 MGRedu_i + \beta_2 MGRedu_i \times IOR_i^H + \beta_3 IOR_i^H + \beta_4 Firm\ Size_i + \beta_5 Tobin's\ Q_i + \beta_6 FCF_i + \beta_7 Debt_i + \beta_8 MGRtenure_i + \beta_9 Insider\ Ownership_i + \beta_{10} Board\ Size_i + \beta_{11} Board\ Independence_i + \theta_j + \varphi_i + u_i$$

where IOR_i^H is a high institutional ownership dummy that equals 1 if an investing firm i 's institutional ownership is larger than its sample median and 0 otherwise. Similarly, we estimate Model II as follows:

$$CAR(-1, 0)_i = \beta_0 + \beta_1 MGRedu_i + \beta_2 MGRedu_i \times Family_i + \beta_3 Family_i + \beta_4 Firm\ Size_i + \beta_5 Tobin's\ Q_i + \beta_6 FCF_i + \beta_7 Debt_i + \beta_8 MGRtenure_i + \beta_9 Insider\ Ownership_i + \beta_{10} Board\ Size_i + \beta_{11} Board\ Independence_i + \theta_j + \varphi_i + u_i$$

Table V. Cross-sectional regression of the wealth effect of capital investment: considering institutional ownership and family-controlled effects

where *Family_i* is a family-controlled firm dummy that equals 1 if a investing firm i is family controlled and 0 otherwise. Other variables are identified as those in Table II. Regression models also incorporate the industry-fixed effects and time-fixed effects, where industry category is identified based the TWSE's two-digit industry code. The sample consists of 191 capital investment announcements made by 79 TWSE-listed firms from 2006 to 2014. n represents sample size; t -statistics in square brackets are calculated using heteroskedasticity-consistent and industry-clustered standard errors; *, **, ***Significant at 10, 5 and 1 percent levels, respectively

4. Conclusions

Building upon two competitive hypotheses, namely, the overinvestment hypothesis vs the organizational legitimacy hypothesis, this study investigates the role of managerial education to explain the net wealth effect of corporate investment. The agency theory-based overinvestment hypothesis postulates that higher managerial education is associated with a greater degree of managerial optimism/overconfidence and, thus, a higher likelihood of overinvestment, which implies a negative relation between managerial education and the wealth effect when corporate investments are announced. Conversely, the Q-theory-based organizational legitimacy hypothesis postulates that a better-educated management is associated with organizational legitimacy, thereby credibly signaling a firm's quality to potential investors and lenders and helping reduce the cost of external funds. This implies a

positive relation between managerial education and the wealth effect when corporate investments are announced.

By testing a sample of TWSE-listed firms that announced capital investment during 2006-2014, our overall findings suggest that the overinvestment hypothesis dominates the organizational legitimacy hypothesis. Firms with higher managerial education levels have a significantly less favorable wealth effect on capital investment than firms with lower managerial education levels. A cross-sectional regression analysis further confirms this negative correlation between managerial education and the wealth effect of capital investment. One further testable implication associated with corporate governance arises from the overinvestment hypothesis. Given that the role of corporate governance in monitoring and controlling managers is a fundamental concept from agency theory, the unfavorable wealth effect due to signaling information about agency-related overinvestment for investing firms with better-educated managers should be mitigated (aggravated) among well- (poorly) governed firms. Consistent with this argument, our additional results indicate that the unfavorable impact of managerial education on the wealth effect of investment is mitigated for well-governed firms owned by large numbers of institutional investors and is aggravated for poorly governed firms controlled by a family.

In sum, our study contributes to the literature by proposing a new, unexplored market's reaction channel through which managerial education unfavorably influences investors' response to information about an increase in investment announcements, which impacts shareholder value. This highlights a potential "dark" side of managerial education associated with a likelihood of overinvestment behavior. Our study also complements the literature by enhancing an understanding of how the net economic impact of firms' capital investments is affected by an important indication of managerial human capital – the educational qualifications.

Notes

1. Meyer and Scott (1983, p. 201) mention that "We take the view that organizational legitimacy refers to the degree of cultural support for an organization – the extent to which the array of established cultural accounts provide explanations for its existence, functioning, and jurisdiction, and lack or deny alternatives [...]"
2. Ben-David *et al.* (2013, pp. 1547-1548) mention that "Miscalibration is the systematic underestimation of the range of potential outcomes. Evidence from psychology lab experiments indicates that subjects are generally miscalibrated. This happens either because most overestimate their ability to predict the future or because they underestimate the volatility of random events."
3. Postgraduate degrees include a master's, graduate certificate, graduate diploma, doctor of philosophy (PhD), doctor of business administration (DBA), and their equivalents, received from either domestic or overseas institutions.
4. Our raw data show that TWSE-listed firms' capital investments announcements are most concentrated in large, well-known firms (e.g. Taiwan Semiconductor Manufacturing Company). Such pattern in information disclosure leads us to generate limited sample. Our sample size is comparable to those in Chen *et al.* (2001), who use 95 capital investment announcements by 71 Taiwanese firms to examine the importance of investment opportunities and free cash flow in assessing the stock market reaction to announcements of cross-border investments in China by Taiwanese firms.
5. As suggested by MacKinlay (1997), the day of announcement (i.e. $t=0$) is used to capture the information content of an event with daily data. And the prior to the day of announcement (i.e. $t=-1$) is used to address the issue that the market may acquire information about the firm's event prior to the actual announcement. Therefore, in our paper we measure the shareholder wealth effect using two-day cumulative abnormal returns, ($CAR(-1, 0)$), around the investment

announcement period. Our overall results still hold when we consider one-day abnormal returns on the day of the investment announcement as a measure of the shareholder wealth effect.

6. The results are similar when we use $CAR(-1, 1)$ or $CAR(-2, 2)$ to measure the shareholder wealth effect.
7. Our control variables firm size and long-term debt are statistically significant as $CAR(-1, 0)$ explanatory variables when the industry-fixed effect is excluded.
8. Theoretically, managerial monitoring provided by institutional investors would alleviate agency costs and thus enhance corporate value (e.g. McConnell and Servaes, 1990). Chung *et al.* (2003) further conjecture that the market value of firms with high institutional ownership is positively related to capital and R&D expenditures. However, using a sample of US firms, Chung *et al.* (2003) find that institutional ownership itself do not exert a significant effect on the valuation of capital investment and thus argue that this lack of significance possibly because they use a measurement of an aggregation of all institutional holdings to capture institutional investors' monitoring effect. Accordingly, our finding that the coefficient on IOR^{IT} itself is insignificant may also be due to our measurement of an aggregation of all institutional holdings. Motivated by Kochhar and David (1996) who suggest that not all institutional investors are truly independent of corporate managerial influence, we leave this issue of how alternative types of institutional investors affect the wealth effect of capital investment announcements for the future research. We would like to thank an anonymous reviewer for this suggestion.

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