Acquisition Premiums of Executive Compensation in China: a Matching View

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Abstract: More aggressive acquiring firms paid higher executive compensation than non or less aggressive acquiring firms. This paper applies the generalized propensity score (GPS) methodology to estimate the relationship between a firm's acquisition and its executive compensation. Allowing for continuous treatment, that is, different levels of the firms' acquisition activities, we apply the GPS method on a panel data set of Chinese Public Listed Companies (PLCs) and find that there is a causal effect of firms' acquisition activities on executive compensation. However, there is a divergent interests between the board directors and executive managers which may bring serious agency problem in the acquisition decision. The self-selection effect plays a dominant role in the acquisition premiums of top 3 board directors, while the learning-by-acquiring effect on compensation is more prominent for executive managers than board directors. As the executive managers as a whole, can benefit more executive management positions as well as higher growth of executive compensation from aggressive acquisition than board directors and top 3 executive managers.

Keywords: Acquisition Decision; Executive Compensation; Generalized Propensity Score; Agency problem

JEL Classification: C14, G34, J33, M12

1. Introduction

This paper investigates the effect of corporate acquisitions on executive compensation in China. Prior to the start of reforms in 1978, all ranks of members of Chinese society were employed by government and state-owned enterprises (SOEs) as their wages were centrally determined by the Bureau of Labor and Personnel through a national wage grid system (Meng, Shen, & Xue, 2013). High-ranking officials and powerful elites, however benefited from preferential treatment and sundry perquisites (Adithipyangkul, Alon, & Zhang, 2011). One of the key elements of economic liberalization has been the privatization and capitalization of SOEs based on market rules. A well-functioning market in corporate executives first emerged in China in the 1980s, prompted by state experimentation with an array of managerial incentives to accompany the gradual withdrawal of the state from its ownership of corporate enterprises (Xu, 2011). Since the early 1990s, there has been a miraculous development of capital market[1], which has immediately become the engine of China's growth in the first decade of the 2000s. The Chinese Public Listed Companies (PLCs) had accounted for 43 per cent of China's GDP in 2010, which was only 14 per cent ten years ago (Bryson et al., 2012b).

During the modernization of economic system, corporate acquisition has become an important phenomenon in the Chinese stock market (Peng, Kang, & Jiang, 2013). Table 1 shows that annual completed deals of Chinese PLCs have increased from 51

[1] There is a dramatic development of the publicly listed sector of companies in China since the early 1990s. In 1992, only 53 companies were publicly listed in the Chinese capital market which had subsequently grown to 1163 in 2001 and 2126 in 2010 (Bryson, Forth, & Zhou, 2012b).

billion RMB Yuan in 2003 to 276 billion RMB Yuan in 2008. In 2003, about 24% Chinese PLCs acquired stocks or assets, as the acquisition intensity (denoted as the acquisition-asset ratio) was about 7% for all acquiring PLCs. Five years later, the proportion of acquiring PLCs increased to 33%, as the acquisition intensity also increased to more than 12% for all acquiring PLCs in 2008. Among the most important and high profile corporate investments, corporate acquisitions are different from internal research and development (R&D) or capital expenditures and create large value impacts easily observable to outsiders (Zhao, 2013).

INSERT TABLE 1 AROUND HERE

Jensen and Meckling (1976) put forward the agency problem between board directors and executive managers, arguing that the separation of ownership and control in modern corporations demands close monitoring of managers' behavior by principals to protect shareholders' benefits. Managers have the opportunity and incentives to act in their own interests at the expense of shareholders. In order to reduce shareholders' monitoring cost on executive management, especially on the more complicated acquisition management with high uncertainty, higher compensation for executive management in acquiring PLCs, i.e. acquisition premiums may be incentive for the risky acquisition. As Jensen and Meckling (1976) suggest, "the future expenditures are likely to involve uncertainty (i.e., they are subject to probability distributions) and therefore some allowance must be made for their risk." Hence, as the privatization of Chinese SOEs, the growing uncertainty and risk of executive management should be compensated by higher payment, which would be

more prominent for executive management handling more complicated acquisition decisions. Moreover, managerial power and social network theories posit that powerful executives with higher social capital can influence the compensation decisions made by the board of directors or the compensation committee (Belliveau, O'Reilly, & Wade, 1996; Finkelstein, & Hambrick, 1989). When the executive management is dealing with acquisition decision, the executive power and social capital may decrease the uncertainty and increase the success odds. Hence, acquisition premiums of executive compensation could be rewards for being trust, powerful and more external network and elite institutional ties which reflects executive higher ability to search and match acquisition offers in the market, rather than incentives to reduce their opportunism (Peng et al., 2013; Sun et al., 2010). Therefore, associated with greater uncertainty and agency problems, corporate acquisitions offer an ideal setting to examine the efficacy of executive compensation in managerial incentive alignment in China.

As to why acquiring firms can pay more to executive managers than non-acquiring firms, i.e. acquisition premiums, there are two alternative but not mutually exclusive strands of literatures. The first strand points to the cause-effect relation between acquisition and executive compensation. So the compensation-increasing effect of acquisition results from the higher incentive for more serious agency problem in the acquiring firms and the higher demands for risk taking, trust power and external network for executive management in acquisition (Sun, Zhao, & Yang, 2010). Moreover, the acquisition premiums are rewards for

executive management's specific knowledge and expertise of new market through learning-by-acquiring that non-acquiring firms do not have.

Based on this, we build up our hypotheses 1 &2 by assuming that the monitoring cost and risk are increasing with the acquisition scale. The larger is acquisition, the more demand for executive management's incentive to take risk, trust, power and social capital. The big acquisition also provides better chances to jump a better strategic status in the coordination and centralization institutions. The compensation-increasing effect of acquisition results from knowledge and expertise of new market that non-acquiring firms do not have. Following the law of declining marginal productivity, the effect of learning-by-acquiring would increase fast at the stage of small acquisition intensity but slow down later as the acquisition intensity exceed the adaptation ability. Whether or not acquiring has a positive effect on executive compensation might, however, not simply depend on a firm's acquisition status, but might be a function of the extent of the firm's acquisition activities. In this paper, we will work on the basis of the latter argument and analyze the effect of acquisition on firms' executive compensation growth at each acquisition-asset ratio in the interval from zero to one or the maximum level. If we can show that acquisition improves executive compensation only within a sub-interval of the range of firms' acquisition-asset ratio whereas it has no or even a negative effect within another sub-interval due to high risk, this can at least partly explain why those studies that confine themselves to firms' acquisition status do not find any impact of firms' acquisition activities on executive compensation growth. Hence, we have hypothesis

of acquisition premiums as:

Hypothesis 1: With the moderation of capital market, the executive compensation of Chinese PLCs could increase very fast to reflect more risk taking of the executive management and more incentive in agency problem.

Hypothesis 2: Acquiring firms pay more to executive managers than non-acquiring firms for executives' special knowledge and expertise, so there are positive acquisition premiums.

The second strand points to self-selection of the firms with more resources into acquisition markets. The reason for this is that acquisition need more resources than less successful firms can bear. A recent survey of micro-econometric studies confirms that the more productive firms self-select into acquisition markets (Zhao, 2013). The compensation-increasing effect of acquisition may only reflect the better financial resources and even better corporate governance of acquiring firms, rather than a spurious cause-effect relation between acquisition and executive compensation.

Based on this, we draw up the hypotheses 3&4. We need use matching method to compare executive compensation of matched PLCs with different acquisition. Matched PLCs have very similar characteristics of financial resources and governance. Hence, the different acquisition premiums of matched firms can reflect the compensation-increasing effect disentangled the self-selection problem. We have

hypotheses as follow:

Hypothesis 3: If acquisition decision is only self-selection, i.e. without the effect of the hypothesis 1 or 2, when we compare executive compensation of matched PLCs with different treatment levels of acquisition intensity, we could find no difference in growth rates of executive compensations over the interval of acquisition intensity.

Hypothesis 4: If acquisition is not only self-selection, when we compare executive compensation of matched PLCs with different acquisition, the compensation-increasing effect may decline after arriving a maximum point and show a non-linear pattern of learning-by-acquiring curve between acquisition premiums and acquisition intensity.

In Chinese transition process, the market-based compensation is still a relatively new subject of inquiry so that there are few studies of executive compensation (Adithipyangkul et al., 2011; Sun et al., 2010). In this paper, we regard the dramatic capitalization process as a natural social experiment to investigate the executive compensation in this largest transition economy. Our contribution to literature is to disentangle the effects of acquisition on executive compensation from the self-selection problem by comparing similar PLCs with different acquisition, i.e. matching method. Matching can avoid the self-selection problem to get the treatment effects of acquisition on executive compensation as in a designed experiment, even

though our data are non-experimental. In this paper, we analyze the causal relationship between firms' executive compensation growth rates and their acquisition-asset ratios, using a large data set for Chinese Public Listed Companies (PLCs) and applying the newly developed continuous treatment methodology. We show that there is a causal effect of firms' acquisition activities on executive compensation. However, too aggressive acquisition which exceeds their learning-by-acquiring range cannot improve executive compensation. The self-selection effect really exists but not the main force behind the increasing acquisition premiums. The remainder of this paper is organized as follows: the second sector introduces the empirical model; the third section presents the data and some descriptive statistics, while the empirical results are discussed in the fourth section. Some concluding remarks are provided in the fifth section.

2. Empirical methodology

Following Hirano and Imbens (2004) and Bia and Mattei (2008), we apply a three-stage approach to implement the generalized propensity score (GPS) method. The GPS method allows for continuous treatment, that is, in our case, different levels of firms' acquisition intensity. We estimate the average potential growth of executive compensation for each level of the firms' acquisition intensity (the dose–response function). Although the assignment of the acquisition offers may be random in the capital market (Peng et al., 2013), substantial factors would change the exogeneity of acquisition intensity in the executive compensation decision system and make the

acquiring PLCs a self-selected sample where the firms' acquisition intensity is no longer independent of corporate finance and governance. In using the GPS matching programs, we can effective reduce, if not to eliminate, the bias generated by unobservable confounding factors (Bia, & Mattei, 2008).

For each PLC i in the acquiring sample, we observe a $p \times 1$ vector of pretreatment covariates in year t, X_{it}, including variables of characteristics of corporate finance (Fin_{it}) and governance ($Gover_{it}$); the treatment received, A_{it} is the acquisition intensity; and the value of the outcome variable associated with this treatment, W_{it} is the annul executive compensation of the PLC_{it}. The first step is to estimate the conditional distribution of the treatment given the covariates. We assume that the treatment (or its transformation) has a normal distribution conditional on the covariates. The generalized propensity score $r(a, x)$ is estimated by using regression as follows:

$$(1) \qquad A_{it} = \beta_0 + \beta_1 Fin_{it} + \beta_2 Gover_{it} + \beta_3 Year_t + \beta_4 Ind_j + \varepsilon_{it}$$

$$= X_{it}\beta + \varepsilon_{it}, \quad \varepsilon_{it} \sim (0, \sigma^2 I)$$

where A_{it} is the acquisition intensity of PLC i in year t; characteristics of corporate finance (Fin_{it}) and governance ($Gover_{it}$) factors; year ($Year_t$) and industry dummies (Ind_j) to capture time dynamics and industry fixed effects; and the random residual error ε_{it} . To simplify the notation, we will drop the subscript of i *and* t in the sequel. β_1 is the vector of coefficients of corporate financial variables (Fin_{it}) including:

$lnCash_{it}$ (log form annual cash holding, including cash and tradable financial assets); $lnIntast_{it}$ (log form intangible asset); $Leverage_{it}$ (book value of total debt deflated by the book value of total asset); $lnCapexp_{it}$ (the log capital expenditure);Q_{it} (Tobins' Q ratio, market value of total assets deflated by book value of total assets). β_2 is the vector of coefficients of corporate governance variables ($Gover_{it}$) including: $BoardSize_{it}$ (the number of directors of a company); $Meetingtimes_{it}$ (board meeting times per annum); $Inddprop_{it}$ (portion of number of independent directors among board directors); $Magtholding_{it}$ (the shares percentage holding by senior management); $Duality_{it}$ (CEO duality, 0=CEO holds the Chair of the board of directors, 1= splitting two positions between two different individuals). We present descriptive statistics of the above variables in both acquiring sample and full sample in Appendix.

As in Hirano and Imbens (2004), the propensity function is defined as the conditional density of the acquisition intensity *a*, given the observed covariates, *x*: r(a, x)= $f_{A|X}$(a | x). Then the generalized propensity score is defined as $R = r(A, X)$. The GPS has a *balancing property* that within strata with the same value of r(a, x), the probability that A = a does not depend on the value of X: $X \perp I(A = a) \mid r(a, x)$, where $I(\cdot)$ is the indicator function[2]. It suggests that within the matched cases of acquisition intensity, the acquisition intensity is independent from the corporate finance and

[2] Hence, the key assumption of the GPS method is a generalisation of the strong unconfoundedness assumption made by Rosenbaum and Rubin (1983) for binary treatments (Imbens, 2000). Hirano and Imbens (2004) show that, in combination with a suitable *unconfoundedness assumption*, this balancing property implies that assignment to acquisition intensity is unconfounded, given the GPS. Assuming that the assignment to the treatment is weakly unconfounded, Hirano and Imbens (2004) prove that adjusting for the GPS eliminates any biases associated with differences in the pretreatment variables.

governance. Let the acquisition intensity A take on values in the interval A= $[a_0, a_1]$. The acquisition intensity is assumed to be conditionally independent with the executive compensation, measured at an arbitrarily chosen level a of the acquisition intensity. Based on the GPS method, it is possible to estimate a dose-response function that depicts the average potential executive compensation $E[W(a)]$ evaluated at any level or dose of the continuous acquisition intensity.

In the second stage, we estimate the conditional expectation of the executive compensation as a function of two scalar variables, the treatment level A and the GPS R: $\beta(a, r) = E(W \mid A = a, R = r)$. We model the conditional expectation of the outcome, W_i, given A_i and R_i, as a flexible function of its two arguments. We use polynomial approximations of order two model:

$$(2) \qquad \phi\{E(Wi \mid A_i, R_i)\} = \psi(A_i, R_i; \alpha) = \alpha_0 + \alpha_1 A_i + \alpha_2 A_i^2 + \alpha_3 R_i + \alpha_4 R_i^2 + \alpha_5 A_i * R_i$$

where $\phi(\cdot)$ is a link function that relates the predictor, $\psi(A_i, R_i; \alpha)$, to the conditional expectation, $E(W_i \mid A_i, R_i)$. As Hirano and Imbens (2004) emphasize, there is no direct meaning to the estimated coefficients in the selected model, except that testing whether all coefficients involving the GPS are equal to zero can be interpreted as a test of whether the covariates introduce any bias.

In the third stage, we estimate the dose–response function by averaging the estimated conditional expectation over the GPS at each level of the acquisition intensity we are interested in. The last step consists of averaging the estimated

regression function over the score function evaluated at the desired level of the acquisition intensity. Specifically, in order to obtain an estimate of the entire dose–response function, we estimate the average potential executive compensation for each level of the treatment from tenth percentile to the maximum as:

$$(3) \qquad E[\widehat{W(a)}] = \frac{1}{N}\sum_{i=1}^{N}\hat{\beta}\{a, \hat{r}(a, X_i)\} = \frac{1}{N}\sum_{i=1}^{N}\phi^{-1}[\hat{\psi}\{a, \hat{r}(a, X_i);\ \hat{\alpha}\}$$

where $\hat{\alpha}$ is the vector of the estimated parameters in the second stage; β(a, r) = E {W(a) | r(a, X) = r} = E (W | A = a, R = r) as in the second stage. Hirano and Imbens (2004) state that asymptotic standard errors of the estimated dose–response function could be calculated by using expansions based on the estimating equations; these should take into account the estimation of the GPS as well as the α parameters. For practical reasons, this paper uses bootstrap methods (100 observations each time) to obtain standard errors and confidence intervals of the dose–response function that take into account estimation of the GPS and the α parameters.

3. Data description

The empirical tests employ the CCER (China Center for Economic Research) PLC database of financial statement and corporate governance. This dataset includes all PLCs in the Chinese stock market during the fiscal years 2003-2008. We exclude PLCs subject to special treatment (ST, that is, firms reporting two consecutive annual losses) and financial institutions (Global Industry Standard Classification between 401010 and 403030) because investing and financing activities are ambiguous for

these firms.

We have three measures of executive compensation: total annual compensation of top three board directors (*compen1*); total annual compensation of top three executive directors (*compen2*); and total annual compensation of all executive mangers (*compen3*). The main concern on the acquisition premiums of executive compensation is their form and components. First of all, with more equity-based payment, firms get more benefit from acquisition, and competitors help to improve the performance of acquiring firms in stock market (Datta, Iskandar‐Datta, & Raman, 2001). CEO compensation in the United States is dominated by stock options. In Europe, a substantial proportion of total compensation is based on Long-term Incentive Plans (LTIPs), although share options have become increasingly important there too (Conyon, Fernandes, Ferreira, Pedro, & Murphy, 2012).

However, the incentive options available to firms in China in the early 2000s differ somewhat from those used in the United States and Europe. In China, firms were unable to offer stock options until 2006 and the trading of managerial stock holdings was tightly restricted until the early 2000s. Hence, Chinese PLCs has seldom used stock option as incentive for CEOs, which can provide a comparatively simple experimental environment for this research. Equity incentives are rare in China so we rely solely on cash compensation. Another concern is whether there is a performance bonds in the incentive package of CEO. Bryson, Forth, and Zhou (2012a) find that only one-tenth of corporations deploy performance bonds, the mean (median) value of which is about 14(6) percent of the cash compensation received by the CEO of a

listed corporation in 2003. Thus, cash compensation and bonuses constitute a greater proportion of total compensation in China than they do in the USA and Europe (Bryson et al., 2012a). We focus on CEOs' annual cash compensation and bonuses as the proxy of executive compensation in Chinese PLCs in this paper.

Table 2 shows that executive compensation in China has increased very fast. For example, the top 3 board directors of Chinese PLCs, typically comprising the Chairman, the Executive Vice-Chairman and the Chief Board Officer, earned average 0.43 million RMB in 2003 which had increased to average 1.02 million in 2008 with annual growth rate of 17.2%. The acquiring PLCs paid almost the same to the top 3 board directors in 2003 (0.47 million RMB), while those in the acquiring PLCs had about 16% higher earnings (1.18 million) in 2008 than the average of all, and faster annual growth rate (18.49%) over the entire period. Using different measures of executive compensations such as top 3managers, typically comprising the CEO, the Executive Vice-President and the Chief Finance Officer[3], and all executive directors would get similar conclusion. It is consistent with Hypothesis 1 that the executive compensation could increase very fast to reflect more risk taking and incentive over the capitalization process. This movement of executive compensation in tandem with acquisition naturally arise an interesting question whether the acquisition of Chinese PLCs increase their executive compensation and what is the mechanism within this relation.

INSERT TABLE 2 AROUND HERE

[3] The top 3 executive managers here are not in the board.

In table 3, we categorize the treatment of acquisition intensity into 5 levels: 0%, 0-1%, 1-3%, 3-8% and above 8%. Allowing for zero values of the treatment implies that untreated sample might be included in the study. Because the GPS methods are designed for analyzing the effect of treatment intensity, they specifically refer to the subpopulation of treated units. This implies that including untreated units might lead to misleading results. Hence, we follow Bia and Martti (2008), and only apply the GPS on the treated group and leave the untreated group as a baseline to compare.

For the next 4 groups, we categorize the treatment interval according to the quartiles of the distribution of the acquisition intensity. Only about one quarter acquiring PLCs have acquisition intensity more than 8%. Table 3 associates the three measures of executive compensation in PLCs with their acquisition intensity. In 2003, acquiring PLCs paid more executive compensation than non-acquiring PLCs except the top quartile group (above 8%). The highest executive compensation is found in the 0-1% interval of acquisition intensity (for example, 0.55 million for the top 3 board directors), while the lowest executive compensation are in the untreated group (0.42 million) and the top quartile group (0.40 million). The 1-3% and 3%-8% intervals of acquisition intensity also have higher executive compensation than in the untreated group. Hence, our findings basically support Hypothesis 2 on positive compensation-increasing effects of acquisition intensity. The non-linear association between executive compensation level and acquisition intensity, however casts doubts on the self-selection Hypothesis 3, because the most aggressive acquiring PLCs do not pay the highest executive compensation.

Except the 0-1% interval, the higher acquisition intensity has higher annual growth of executive compensation after 2003. For the top 3 border directors, the annual growth rates of executive compensation over the period 2003-2008 was only 15.14%, compared with 16.09% in the untreated sample. For the higher acquisition intervals more than 1%, the annual growth of executive compensation is much higher than the untreated and the 0-1% interval group. Similar situations are found for top 3 managers and all executive managers. Hence, as the acquisition-asset ratios increase beyond 1%, the executive compensation grows faster than non-acquiring PLCs. The growth rates become higher as the acquisition intensity increases which is consistent with our Hypothesis on learning-by-acquiring. The more risk taking in the larger acquisition intensity is appreciated by paying the higher executive compensation. This complicated pattern of levels and growth of executive compensation associated with the acquisition intensity recall more advanced techniques to identify.

INSERT TABLE 3 AROUND HERE

4. Empirical Results

We present results of the first stage regression in Table 4. First of all, we have 1% extreme cases which have the acquisition intensity more than 100%, indicating the annual acquisition scale is more than the PLC's total asset. We can simply exclude acquisition intensity more than 100% and focus on the truncated/restricted sample with 1978 firm-year observations. Alternatively, we regard the full acquiring sample as the unrestricted treatment with 1998 firm-year observations. Because we used

Box-Cox transformation on the acquisition intensity, the 20 extremely large acquisition intensity cases would not violate our normality assumption. Thus, we can compare the unrestricted and restricted samples using the GPS method to test the sensitivity to the extremely large cases of acquisition.

Second, it is not a surprise to see the negative association between the asset variables (cash/intangible asset/leverage) and the acquisition intensity, because acquisition intensity is defined as a ratio of annual acquisition to total asset. The higher market value of the PLC increases the acquisition intensity. More board meeting time may be a proxy of better corporate governance and can afford higher acquisition intensity. More management holding share and the separation of CEO and board chairman can make the acquisition intensity more cautious.

Last but not least, the Box–Cox transformation finds the maximum likelihood estimates of the parameters regress the treatment variable A (acquisition intensity) on the control variables. The set of the potential treatment values is divided into 4 intervals as described in Table 3. The values of the evaluated at the representative point of each treatment interval are divided into 5 intervals to do the balancing property t to test that the conditional mean of the pre-treatment variables given the generalized propensity score is not different between units who belong to a particular treatment interval and units who belong to all other treatment intervals. Both Kolmogorov-Smirnov normality test and balancing property t test are significant at least at 5% level.

INSERT TABLE 4 AROUND HERE

The resulting dose-response function of stage 2 and 3 is depicted in Figure 1-3. The horizontal axis is the normalized 100 percentiles of the acquisition intensity interval (1-1858.69% for the unrestricted sample; 1-100% for the restricted sample). The vertical axis is the estimated annual growth rate of executive compensation (%). the estimated dose-response function shows an increasing trend in the relationship between the acquisition intensity and the executive compensation growth rate for the top 3 board directors. The estimated annual growth rate of executive compensation amounts to about 25% at 10^{th} percentile of the unrestricted sample (Figure 1a) which exceeds the mean growth rate actually observed within the group of non-acquiring PLCs by 10 percentage points (see panel a of Table 3), Chinese PLCs that acquire a relatively small share of their total asset (acquisition intensity 0-1%, bottom quartile) exhibit a fast increase in their expected executive compensation growth rate. The slope of the dose-response function is relatively big within this interval of the acquisition intensity. The maximum value of the expected executive compensation growth rate reaches at the median of acquisition intensity (3%), where the expectation value of the annual growth rate amounts to 34%. Chinese PLCs of which the acquisition intensity exceeds this threshold value of acquisition intensity 3% exhibit a compensation growth rate that falls slightly below its maximum value, probably due to the high costs of monitoring and control they are faced with and which confine their compensation growth potential.

For the restricted sample of top 3 board directors, there is a similar increasing trend from the 26% to 39%, also faster before the 25^{th} percentile acquisition intensity

(1%). However, the increasing trend of executive compensation is more prominent and uncertain in the restricted sample than in the unrestricted sample. Hence, the top 3 board director sample is quite consistent with the self-selection Hypothesis 3, especially after the 25th percentile point (1%), because the annual growth rate does not change much over the acquisition intensity interval. Additionally, the 20 extremely large acquisition intensities have significant effects on executive compensation which are more self-selected and more certain.

In Figure 2a, the estimated dose-response function shows a similar increasing trend of the top 3 executive managers to that of top 3 board directors. The estimated annual growth rate increase from about 25% at 10th percentile of the unrestricted sample to the maximum value of 37%, also with a faster increase during the 0-1% interval (bottom quartile). After then, the estimated growth rate is quite stable around 36% over the rest of the interval. For the restricted sample (Figure 2b), with increasing uncertainty, the estimated growth rate sharply increase from 27% to 65%, and there is an acceleration of growth of executive compensation after the 75th percentile of acquisition intensity (>8%). Hence, after the 25th percentile point (1%), the top 3 executive managers unrestricted sample is still consistent with the self-selection Hypothesis 3, while the restricted executive manger sample is more consistent with learning-by-acquiring Hypothesis 4 which shows a non-linear increasing relation between executive compensation and acquisition intensity.

Generally speaking, Figure 3 (for all executive managers) is similar to the top3 executive managers, but the increasing trend has become more prominent. In Figure

3a, the estimated annual growth rate increase from about 19% at 10th percentile of the unrestricted sample to the maximum value of 36%, also with a faster increase during the 0-1% interval (bottom quartile). For the restricted sample (Figure 3b), the estimated growth rate rises from 21% to 95% with increasing uncertainty. The acceleration of growth of executive compensation happened earlier than the top 3 executive manager after the median of acquisition intensity (>3%). Thus, both samples of all executive mangers show a learning-by-acquiring curve as in Hypothesis 4.

The dose-response function displayed in Figure 1-3 suggests a rather deterministic relationship between Chinese PLC's acquisition intensity and its executive compensation. Its functional form implies the interest divergence of board directors and executive management. Because the board directors are concerned with both capital value of the PLC and their individual compensation, they will be more cautious on acquisition decision than executive managers by recognizing some predetermined optimal acquisition intensity. However, from a managerial point of view, the more acquisition intensity may be means more incentive, power, external network, learning-by-acquiring, and then more cash compensation. Hence, the typical agency problem is that executive managers are less sensitive to the "excessive" acquisition than owners. And, it is doubtful that executive managers take more cost of search and match in the acquisition market to improve the post-acquisition performance and capital returns for owners. Thus, the process of organizational learning on how to deal with the challenges of a rising acquisition intensity has

probably not yet finished for Chinese PLCs.

INSERT Figures 1-3 AROUND HERE

5. Conclusions

This paper introduces the generalized propensity score (GPS) methodology developed by Imbens (2000) and Hirano and Imbens (2004) to the literature of firms' acquisition behavior and executive compensation. A dose-response function of the GPS method is estimated to test the alternative but not mutually exclusive hypotheses as to whether more aggressive acquiring firms pay more to executive managers than non (less aggressive) acquiring firms, i.e. acquisition premiums.

For top 3 board directors, the learning-by-acquiring effect on compensation is only found in the bottom quartile (0-1%) of the acquisition interval. As the Chinese PLCs exceeds this threshold value of acquisition intensity (1%), the growth rates of the top 3 border directors' compensation slightly decrease or slowly increase with unaffordable risk for the two samples. It suggests that self-selection effect plays a dominant role in the acquisition premiums of top 3 board directors. Thus, board directors can learn from some controllable and low intensive acquisition and benefit from higher growth of compensation, while they need to concern too aggressive acquisition which may contain their compensation growth and bring too much uncertainty.

We find different pattern of acquisition premiums in executive managers. The learning-by-acquiring effect on their compensation is more prominent for executive

managers, not only for top executive managers but also for all of them. The self-selection effect could only be found in those extremely relatively large acquisitions. It is consistent with the agency theory that management may have different interest from the owners. As the executive managers as a whole, can benefit even more executive management positions as well as higher growth of executive compensation from aggressive acquisition than board directors and top executive managers. It may be an incentive for the implicit collusion among executive managers and bring serious moral hazard problem in the acquisition decision process. Unfortunately, we have no detailed information for the number of all executive managers in this dataset and have to leave it for further research in the future.

There are other some caveats to the empirical example presented in this paper, primarily related to data restrictions. Firstly, the number of observations in our data set may be the largest in relevant research but still relatively small. In particular, the number of Chinese PLCs of which the acquisition intensity exceeds 100% is very limited (20 cases, only 1% of the PLCs sampled), casting doubts on its so strong self-selection effect in our study and may bring biases from these extremely large cases. Secondly, as we control the heterogeneity of individual time-invariant fixed effect by using compensation growth, we actually drop the data of 2003. There are only about 400 observations each year which may be not for the same acquiring PLCs. Although the estimated dose-response function shows a plausible relationship between the PLC's acquisition intensity and the executive compensation growth rate, the estimated confidence interval is relatively large at each point at which the

dose-response function was evaluated. Moreover, the confidence interval increases with the acquisition intensity and we apply 100 percentiles rather than real intensity. It is therefore questionable whether or not the expected compensation growth rate is significantly larger than the respective growth rate of more conservative PLCs, and whether executive managers also concern the higher risk of too aggressive acquisition. Tracking the firms over a longer time period and building up a balanced panel data set could be a way to get further insights into the acquisition and executive compensation relationship, in particular with respect to its temporal dimension (e.g., learning processes connected with acquisition activities). This analysis, however, is beyond the scope of this paper.

In summary, the generalized propensity score method applied in this paper constitutes a new econometric technique that offers numerous opportunities for future research and promises to provide new insights into the acquisition-executive compensation relationship.

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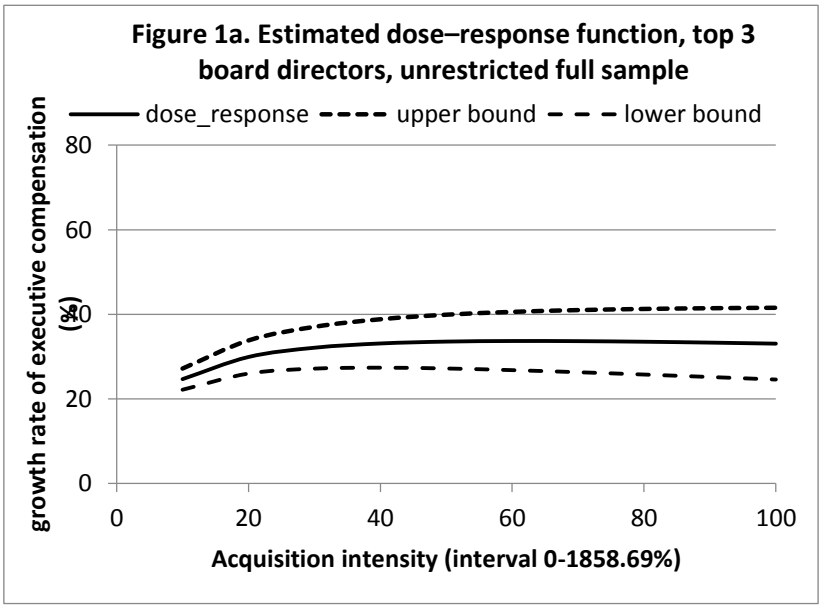
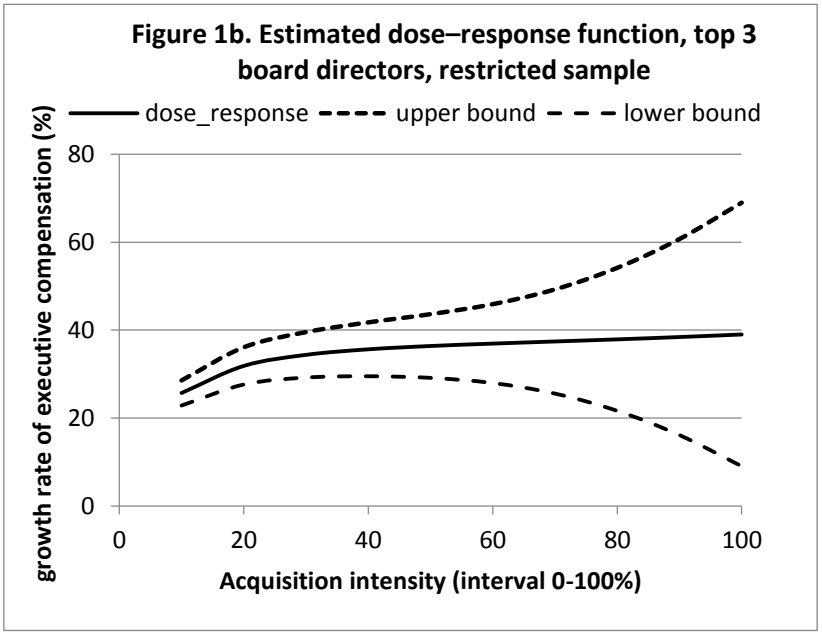
Figure 1. Estimated dose–response function, estimated derivative, and one standard deviation confidence bands



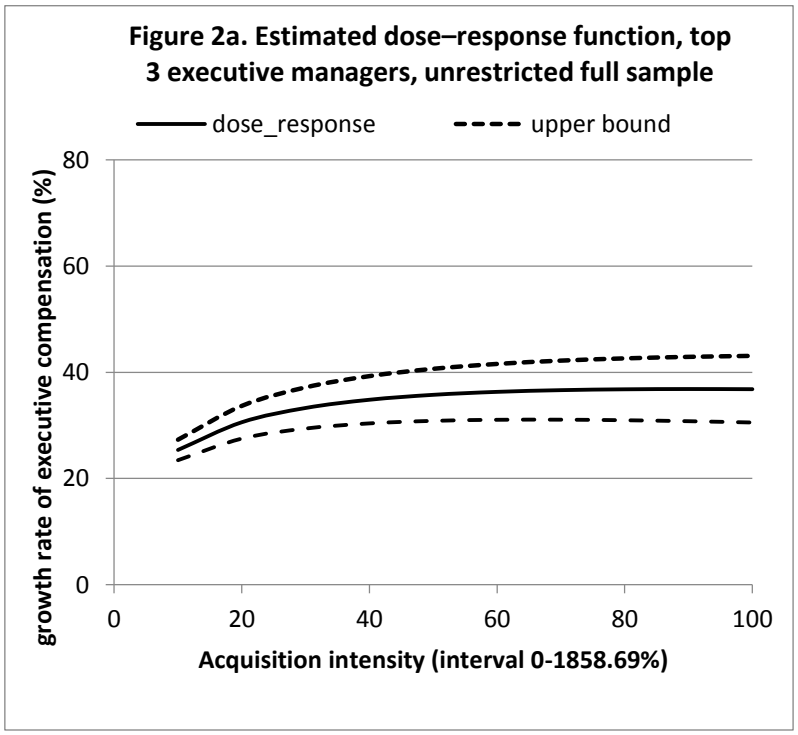


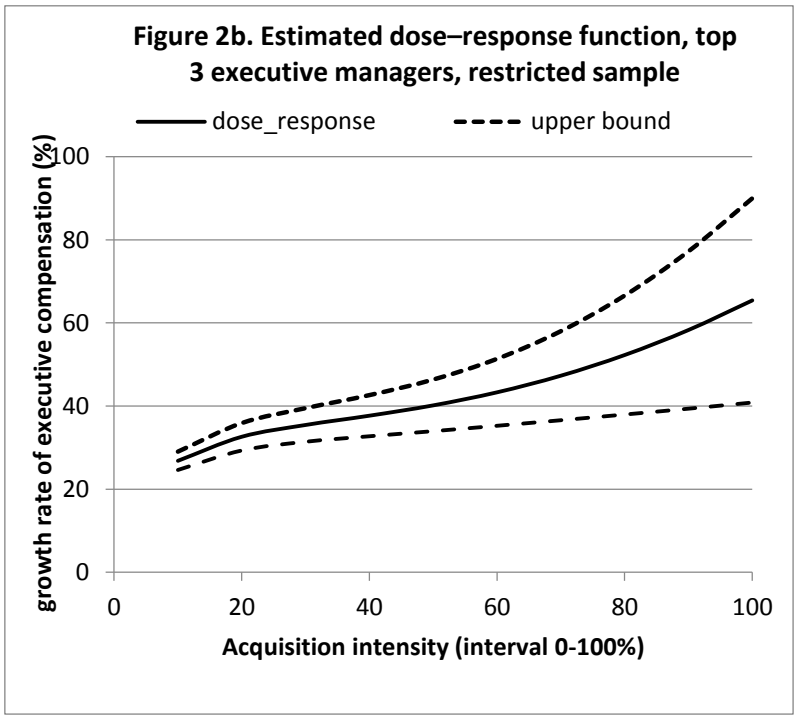
Notes:

Solid lines: estimated conditional expectation of logarithmic earnings of top 3 board directors growth rate (t – t-1) given the acquisition-asset ratio in t and the estimated generalized propensity score (GPS).

Dotted lines: simulated one standard deviation, using the standard errors of the dose-response function estimated via bootstrapping (100 replications).

Figure 2. Estimated dose–response function, estimated derivative, and one standard deviation confidence bands



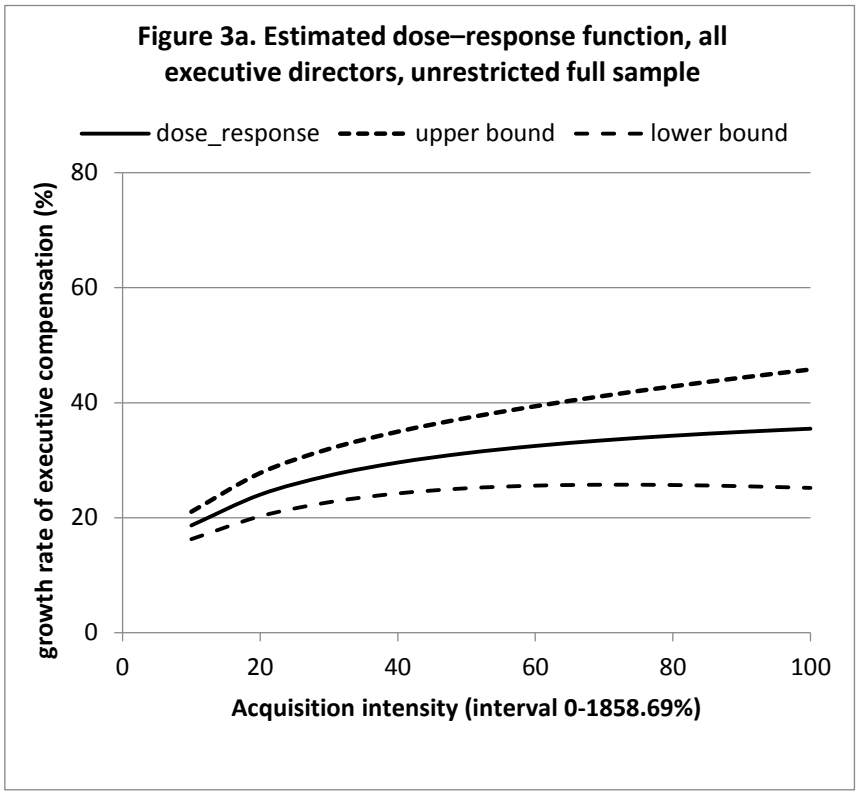


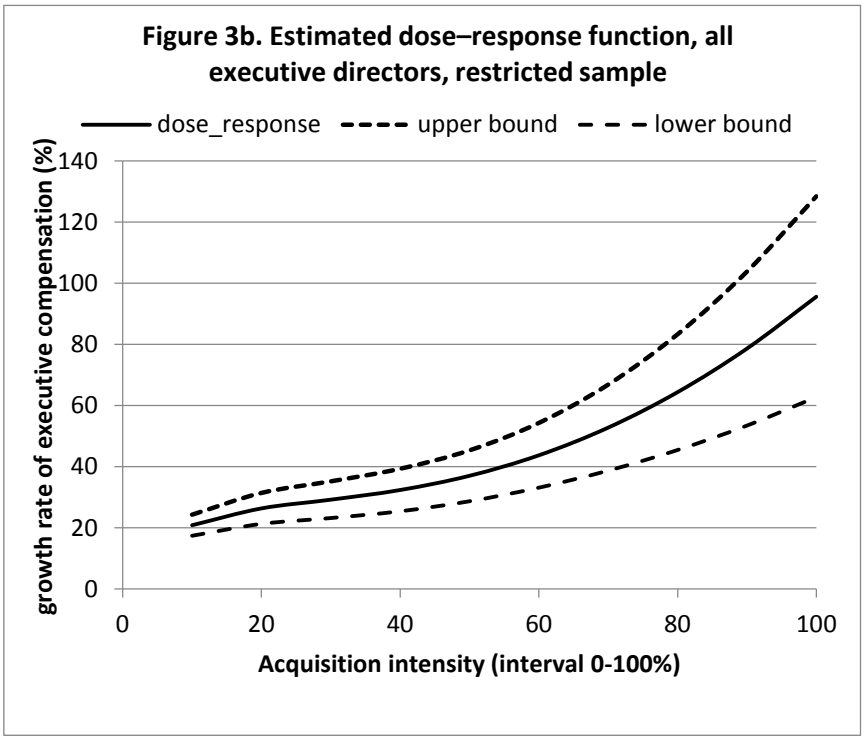
Notes:

Solid lines: estimated conditional expectation of logarithmic earnings of top 3 executive managers growth rate (t – t-1) given the acquisition-asset ratio in t and the estimated generalized propensity score (GPS).

Dotted lines: simulated one standard deviation, using the standard errors of the dose-response function estimated via bootstrapping (100 replications).

Figure 3. Estimated dose–response function, estimated derivative, and one standard deviation confidence bands





Notes:

Solid lines: estimated conditional expectation of logarithmic earnings of all executive directors growth rate ($t - t$-1) given the acquisition-asset ratio in t and the estimated generalized propensity score (GPS).

Dotted lines: simulated one standard deviation, using the standard errors of the dose-response function estimated via bootstrapping (100 replications).

Table 1. Corporate acquisition of Chinese PLCs, 2003-2008

Year	All PLCs	Acquiring PLCs share	Total acquisition volume, billion RMB	Average acquisition volume, million RMB	Acquisition intensity (%)	
					All PLCs	Acquiring PLCs
2003	1,261	23.71	51	170	2.06	7.41
2004	1,352	21.89	76	258	1.41	5.6
2005	1,399	17.08	36	151	1.15	5.73
2006	1,430	20.42	78	269	1.62	7.08
2007	1,537	30.97	280	587	5.69	16.51
2008	1,583	32.53	276	536	4.42	12.25
2003-2008	8,562	24.73	798	377	2.85	10.13

Data source: the China Center for Economic Research (CCER) PLC database 2003-2008.

Table 2. Executive Compensation of Chinese PLCs, 2003-2008

Year	Top 3 Board directors		Top 3 Managers		All executive directors	
	All PLCs	Acquiring PLCs	All PLCs	Acquiring PLCs	All PLCs	Acquiring PLCs
2003	0.43	0.47	0.51	0.55	1.32	1.43
2004	0.54	0.58	0.61	0.64	1.62	1.73
2005	0.61	0.63	0.66	0.68	1.10	1.12
2006	0.65	0.69	0.74	0.76	1.20	1.21
2007	0.87	0.95	0.97	1.03	1.62	1.75
2008	1.02	1.18	1.11	1.22	1.93	2.21
Average annual growth rate (%)	17.20	18.49	15.73	15.92	7.60	8.71

Data source: the China Center for Economic Research (CCER) PLC database 2003-2008.

Table 3. Acquisition intensity and annual growth rates of executive compensation in China, 2003-2008

Acquisition intensity/ Year	2003	2004	2005	2006	2007	2008	Annual growth rate (%)
a. Acquisition intensity and the executive compensation of top 3 board directors							
0	0.42	0.52	0.60	0.64	0.83	0.93	16.09
0-1% (25th percentile)	0.55	0.62	0.74	1.02	1.21	1.17	15.14
1%-3% (50th percentile)	0.46	0.62	0.57	0.67	0.93	1.16	18.37
3%-8% (75th percentile)	0.44	0.62	0.57	0.66	0.89	1.23	20.36
8%+	0.40	0.47	0.64	0.45	0.80	1.14	20.74
b. Acquisition intensity and the executive compensation of top 3 managers							
0	0.49	0.60	0.66	0.74	0.94	1.05	15.29
0-1% (25th percentile)	0.63	0.70	0.87	1.00	1.32	1.32	14.64
1%-3% (50th percentile)	0.55	0.60	0.66	0.68	0.96	1.19	15.53
3%-8% (75th percentile)	0.51	0.71	0.55	0.89	0.93	1.20	16.98
8%+	0.50	0.53	0.60	0.47	0.92	1.19	17.50
c. Acquisition intensity and the executive compensation of all executive directors							
0	1.28	1.58	1.09	1.19	1.55	1.77	6.48
0-1% (25th percentile)	1.80	1.94	1.45	1.70	2.52	2.37	5.50
1%-3% (50th percentile)	1.51	1.67	1.13	1.13	1.66	2.16	7.16
3%-8% (75th percentile)	1.24	1.89	0.85	1.35	1.46	2.22	11.65
8%+	1.15	1.36	1.01	0.69	1.43	2.10	12.04

Data source: the CCER PLC database 2003-2008.

Table 4. Determinants of the acquisition-asset ratio (results of the first step)

Treatment: acquisition intensity (%)	Unrestricted sample		Restricted sample	
	Coef.	Std.Err.	Coef.	Std.Err.
Log Cash	-0.194***	***0.034***	-0.157***	***0.034***
Log Intangible Asset	-0.018***	***0.007***	-0.011*	***0.007***
Leverage	-0.681***	***0.246***	-0.768***	***0.241***
Log Capital Expenditure	-0.025	***0.029***	-0.025	***0.028***
Tobin's Q	0.167***	***0.044***	0.141***	***0.043***
Board Size	0.033	***0.029***	0.012	***0.029***
Board Meeting times	0.046***	***0.012***	0.051***	***0.011***
Independent Director	0.404	***0.358***	0.308	***0.350***
Management holding	-1.018**	***0.465***	-0.782*	***0.453***
Duality	-0.265*	***0.136***	-0.187	***0.134***
Industry dummy	yes		yes	
year dummy	yes		yes	
Box-Cox transformation of treatment (acquisition intensity)	yes		yes	
Observation number	1998		1978	
Log likelihood	-4012.7		-3917.4	
Wald-Chi2	160.33***		136.75***	
Kolmogorov-Smirnov normality test	**		**	
Balancing property t test	***		***	

Notes: The Box–Cox transformation finds the maximum likelihood estimates of the parameters of the Box–Cox transform regressing the treatment variable A (acquisition intensity) on the control variables listed above. The set of the potential treatment values is divided into 4 intervals. The values of the evaluated at the representative point of each treatment interval are divided into 5 intervals to do the balancing property t to test that the conditional mean of the pre-treatment variables given the generalized propensity score is not different between units who belong to a particular treatment interval and units who belong to all other treatment intervals. * 10% level of significance; ** 5% level of significance; *** 1% level of significance.
Source: own estimations using the CCER PLC database 2003-2008.

Appendix. Variable Statistics Description

Acquiring sample (AS>0, Obs=2117)					
Variable	Obs	Mean	Std. Dev.	Min	Max
Growth of earnings top 3 board directors (%)	1918	18.08	58.71	-426.97	465.15
Growth of earnings top 3 managers (%)	1969	19.78	48.76	-259.03	464.77
Growth of earnings all executive directors (%)	1954	14.41	62.16	-290.61	471.23
Acquisition intensity (%)	2097	10.13	50.67	0.00	1858.65
Log Cash	2097	19.48	1.43	-8.52	24.55
Log Intangible Asset	2095	15.97	6.67	-9.21	23.88
Leverage	2097	0.50	0.18	0.00	1.90
Log Capital Expenditure	2000	18.37	1.87	8.71	26.13
Tobin's Q	2117	1.74	1.02	-0.03	4.59
Board Size	2098	6.31	1.64	2.00	17.00
Meeting times	2098	9.43	3.80	1.00	36.00
Independent Director	2098	0.55	0.13	0.00	1.00
Management holding	2098	0.03	0.09	0.00	0.78
Duality	2098	0.90	0.30	0.00	1.00
Full sample (AS>0 or AS=0, obs=8562)					
Variable	Obs	Mean	Std. Dev.	Min	Max
Growth of earnings top 3 board directors (%)	6668	15.93	61.39	-914.40	919.92
Growth of earnings top 3 managers (%)	6826	17.21	51.04	-916.09	917.70
Growth of earnings all executive directors (%)	6802	7.45	64.62	-933.31	919.52
Acquisition intensity (%)	7456	2.85	27.25	0.00	1858.65
Log Cash	7456	19.28	1.48	-8.52	25.21
Log Intangible Asset	7453	15.28	7.32	-9.21	23.89
Leverage	7456	0.50	0.40	0.00	16.33
Log Capital Expenditure	7068	18.08	1.90	8.58	26.13
Tobin's Q	8562	2.14	1.38	-9.12	8.05
Board Size	7458	6.32	1.62	0.00	19.00
Meeting times	7458	8.32	3.45	1.00	36.00
Independent Director	7457	0.55	0.13	0.00	1.00
Management holding	7458	0.03	0.10	0.00	0.95
Duality	7458	0.90	0.30	0.00	1.00