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Directors' and Officers' Liability Insurance, Managerial Compensation and Firm Performance

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A B S T R A C T

While the debate on whether directors' and officers' liability insurance (DOLI) enhances monitoring, corporate governance, and improves firm performance remains alive, existing research lacks consideration of the self-selection of firms' demand for DOLI, and thus incurs self-selection estimation bias. This research corrects for self-selection bias in estimating the linkage between a firm's DOLI coverage, managerial compensation and firm performance by applying Rubin's (1973, 1977) matching theory, and propensity score matching by Rosenbaum and Rubin (1983, 1985a,b). Four matching algorithms, Nearest Matching, Caliper Matching, Mahalanobis Distance Matching and Mahalanobis Distance Matching with Caliper are applied to match financial characteristic variables determining firms' demand for DOLI. Based on data of TWSE-listed nonfinancial companies covering the period of 2008~2010, empirical evidence shows that, before matching, firms with DOLI do not have superior profitability but have higher managerial pay. After matching, evidence shows that underperformance in profitability and higher managerial pay of firms with DOLI still prevails. The principal outcome is consistent with a negative view of DOLI, such that DOLI coverage incurs a moral hazard problem associated with managerial overpay and deteriorating firm performance.

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1. Introduction

There are innumerable firms with large or small size doing business around the globe. These firms employ countless people ranging from key decision makers, corporate representatives and directors to run the business, and thus they are liable for corporations' actions in an ever changing and complex business environment. Since investors may be dissatisfied with a corporation's decision and operating consequences (i.e. information disclosure insufficiency, errors on performing corporate duties, among others), directors, management and key employees face litigation risk (i.e., legal defense and counterplea costs, and loss of compensation).. Moreover, competitors, creditors, customers, and government agencies may also file complaints to decision makers. Under this situation, corporate board and management both face substantial litigation risks that could seriously result in financial loss or even lead them to bankruptcy or jail.[1]

Because the corporate board and the management's personal assets are at risk in cases of lawsuits, and the potential for resulting large fines against the corporation, firms may demand insurance against the risks of lawsuits for key decision makers as a rational decision. Otherwise, faced with this uncertainty and risk, this could reduce the attractiveness for having outstanding entrepreneurs available to run the business and avoid resignations. Directors' and officers' liability insurance (DOLI) is purchased to protect the corporation's directors and decision makers against legal liability. DOLI covers expenses and losses borne by the insured and insurer to indemnify the insured as long as the insured behaves faithfully for the corporation.[2]

In practice, in Taiwan's Corporate Governance Best Practice Principles for TWSE/TPEx Listed Companies, it is mentioned that a listed company shall take out directors liability insurance with respect to liabilities resulting from exercising their duties during their terms of occupancy so as to reduce and spread the risk of material harm to the company and shareholders arising from the wrongdoings or negligence of a director. The securities markets authority, the Financial Supervision and Commission (FSC) further requires that all companies applying for listing on TWSE/TPEx should be required to purchase DOLI since 2018, and this will be extended to apply to all existing listed companies on TWSE/TPEx in 2019. According to the statistics of the FSC, the coverage rate of all TWSE/TPEx listed firms increased from about 72% to 76% in 2016-2017.

DOLI supplies personal liability insurance that provides general coverage to a firm's directors and key decision makers. Purchased by the corporation on behalf of the directors and the management, DOLI protects the personal wealth of the insured persons. However, without DOLI, imposed liability is thought to help align decision makers' incentives with the interests of shareholders, but the strength of the liability threat is mitigated by the corporation's purchase of DOLI. On the one hand, shareholders threaten companies' decision makers with the liability of management and operating consequences every day, but on the other hand, DOLI provides insurance for them to indemnify management and directors for court costs and judgments. Thus, the discrephancy between what academics perceive, and what is done in providess a puzzle for the merits of firms' DOLI coverage.

[1] In Taiwan, director's duties are loaded according to amendments of Company Act in 2001. Investor Protection Act and the establishment of Investors Protection Center, accepts being an agency on behalf of the prosecution or arbitration for at least 20 investors. According to the Institute for Securities and Futures Investors Protection Center, during 1998 and 2008, the claimant accumulated reach 60 cases, complainants involved around 65,000 people and the total claim amount accumulated is 25 billion NTD. The most presented type of claim is financial statements false, up to 23 claimant cases, and the defendants ranging from directors and supervisors, CEOs, accountants to underwriters and the former is the most frequent target.

[2] Boyer (2003) indicated that the insurer is professional in dealing with the litigation process, the investigation and the monitoring of insured companies. Thus, existence of DOLI insurers not only decreases the severity of adverse selection but assures that the managers or other key persons of the insured company behave faithfully for the interests of the whole company, follow government legal and regulatory requirements, and protects shareholder wealth.

Academically, existing studies have suggested that purchasing DOLI enhances board efficiency, corporate governance and financial consequences. For example, Bhagat, Brickley and Coles (1987) suggest that DOLI protects management, directors and other decision makers from litigation risks and costs, pushes them to be willing to take appropriate risk and eliminates the value loss from underinvestment. Priest (1987) claims that because of liability exposure without coverage, managers may be overly conservative and thus relinquish positive-NPV projects. Gutiérrez (2003) suggests that because insurers of DOLI monitor (before and after purchasing DOLI) the behavior of the management and directors (Myers and Smith, 1982), DOLI can be serve as a substitute for corporate governance. O' Sullivan (1997) indicates that the adoption of DOLI leads to firms appointing independent directors, which in turn improves the board's monitoring, and benefits shareholders. This research integrates positive views on DOLI as a monitoring hypothesis.

However, Chalmers, Dann and Harford (2002) indicate that the purchase of DOLI leads to moral hazard problems and opportunistic behavior by managers. The moral hazard problem occurs because a party has the tendency to take on more risk when the cost is not entirely borne by the party who takes the risk. In other words, moral hazard problems occur when an individual does not take the full consequence and responsibility of actions and thus has a tendency to perform less carefully. Moreover, if managerial actions are inappropriate, directors, given the protection of DOLI, might reduce their effort in managerial monitoring and advising. Under this situation, managers and directors both have incentives to work for their own benefits at the expense of shareholders and other stakeholders. Core (1997) and O'Sullivan (2002) also indicate that the protection from DOLI wears down directors' incentive for managerial monitoring. Bradley and Chen (2011) and Rees, Radulescu and Egger (2011) suggest that the purchase of DOLI lowers directors' liability risks and increases agency problems with weakened managerial accountability and board functioning effectiveness. This research integrates negative views on DOLI as a moral hazard hypothesis.

Empirically, Bhagat, Brickley and Coles (1987) found evidence of positive share price responses to firms' announcements of purchasing DOLI. However, Chalmers, Dann and Harford (2002) examined the purchase of DOLI around IPOs of 72 U.S. firms, and found that long-run stock performance is negatively related to the amount of DOLI purchased. Chung and Wynn (2008) found that higher managerial legal liability coverage is correlated with less timely recognition of earnings news. Wynn (2008) found that Canadian firms with higher legal coverage are less likely to provide bad news forecasts. Lin, Officer, Wang and Zou (2013) found that there is a positive relationship between DOLI and firms' credit spreads for bank loans. This implies that banks may evaluate the behavior and degree of a company's purchase of DOLI as a signal of higher moral hazard and credit risk. Boubakri and Bouslimi (2016) found that a company's purchase of DOLI is a signal of greater litigation risk and agency costs. When a company issues new shares, compared with a company without DOLI coverage, analysts are more pessimistic about the earnings forecast of the company with greater DOLI coverage. Chan, Su and Liu (2014) found that the relationship between DOLI and audit fees is positive. Companies with greater coverage of DOLI may cause accountants to cast doubt on a company's operating and litigation risk, perceiving the company as having higher audit risk. Therefore, the greater the coverage of DOLI, the higher the audit fees. Liao, Tang and Lee (2016) found that the more a company is insured by DOLI, the greater the moral hazard problem for a company's management , leading to a higher probability of financial statement restatement. Liao, Tang and Li (2017) also found that a greater degree of DOLI to be associated with less favorable credit ratings. A company's potential moral hazard caused by DOLI may also be reflected on inefficient investment (overinvestment), reducing the relationship between managers' compensation and firm performance (Li and Liao, 2014；Chan and Chen, 2014). DOLI coverage also helps firms to enjoy benefits on investment efficiency, financial disclosure quality, stock

price crash risk and tightening the relationship between managerial compensation and R&D expenditure (Chi, 2015；Chen, Zhu and Li, 2015；Chan, Chang, Chen and Wang, 2019；Wang and Chen, 2016).

According to agency theory, to align the interests of directors/management and shareholders, an increase in compensation should be associated with an increase in shareholders' wealth. This means that directors and the management may get more (less) pay for their better (worse) performance. Holmstrom (1979) and Jensen and Murphy (1990) argued that it is appropriate for firms to determine directors' and management's compensation based on firm performance. However, Core, Holthausen, and Larcker (1999) suggest that firms with greater agency problems tend to pay their executives more (although the company is not performing well). The coverage of DOLI may incentivize directors and top management to use their rights to allocate company's resources for the sake of personal benefits. Due to the coverage of DOLI, they are less worried about the possible adverse consequences and thus may pay less attention to the enhancement of shareholders' rights and wealth. DOLI reduces the responsibilities of directors and the management for firms' mismanagement or major decision-making mistakes, making them more likely to act in the direction of capturing shareholders' wealth and benefiting their own interests, such as making or giving themselves relatively higher compensation. After all, the high level of compensation for directors and the management is not entirely funded by their own resources. If the directors and the management lack the protection of DOLI, they are likely to encounter shareholders' opposition against high-paying decisions at the annual general meeting, and shareholders arguing that there is excessive payment to directors and managers.

From the above, the monitoring hypothesis suggests that DOLI may alleviate the agency problem through external monitoring provided by DOLI insurers, while the moral hazard hypothesis asserts that DOLI may worsen the agency problem because directors/management partially bear the consequences and responsibilities from their risky behaviors under the protection of the DOLI. If the effects derived from of the former hypothesis dominates the latter, then firms with DOLI tend to have lower directors and management compensation after controlling for other contributing factors of compensation. If the effects derived from of the former hypothesis is dominated by the latter, then firms with DOLI would tend to have higher director and management compensation, indicating that shareholders' wealth is entrenched by directors and management.

Among existing studies, the investigation of causal effects with the adoption of DOLI on the quality of board oversight and firms' performance is rare. However, causal inference is a challenge for empirical researchers, called the sample self-selection (of adopting DOLI) problem. Specifically, to some degree, companies demanding and purchasing DOLI is an endogenous self-selection process. In fact, among existing studies, there indeed exist several factors determining a firm's demand for DOLI. For example, O'Sullivan (1997) found that purchase of DOLI is positively correlated with firm size and negatively correlated with insider ownership. Core (1997) found that firms with prior litigation involved with directors, firms with higher insider voting control, and firms with lower insider ownership percentages tend to purchase DOLI and also to take on a greater coverage. Since firms demand for DOLI has been empirically supported by existing studies, it is inappropriate to deliberately ignore the firms' self-selection of demand DOLI to examine the impact of DOLI on financial consequences. Bhagat and Black (2002) and Hermalin and Weisbach (2003) also indicated that endogeneity of the main predictor is an epidemic problem for the explanation of empirical evidence in almost all extant studies, because the estimated coefficient on the main predictor is likely to be biased, because the endogeneity of the main predictor is not directly controlled for. Overcoming the endogeneity problem is crucial for empirically investigating the consequences of firm's adopting DOLI.

The traditional solving of the sample selection problem is based on Heckman's (1979) two-stage estimation. The first stage is estimating a probability function and then the resulting inverse Mill's ratio

is obtained and serves as additional explanatory variable in the performance evaluation equation (the second stage). Based on Hofler, Elston and Lee (2011), however, two-stage estimation needs to satisfy the identification requirement. Researchers have at least one variable in the probability equation that is not included in the performance evaluation equation.

This research applies the matching theory to control for the sample selection of the decision of firm's adopting DOLI. The matching theory, which is mainly developed in medical and biological research fields, has been widely applied in economics, finance and accounting field. In medical and biological studies, observations participating in an experiment are called the treatment, non-participants of the experiment yet have similar characteristics with participants that are called the control. The change (difference) owing to the experiment between treatment and control is referred to as the experimental or treatment effect. The matching theory facilitates the treatment samples (here is a sample with DOLI) and control samples (here is a sample without DOLI) to ensure they are as similar (on characteristics) as possible. As the treatment and control share similar characteristics, all samples can be considered as randomly sampled from same population and the resulting difference between two groups of samples is the treatment effect, the causal effects of experiment (insured by DOLI). See Rubin (1973, 1977) for details.

When the dimension of matching is large, the matching, once successful, often reduces the available samples substantially. Rosenbaum and Rubin (1983, 1985a,b) proposed Propensity Score Matching (PSM) to resolve this difficulty as it adopts multi-dimensional matching instead of one-dimensional matching. The PSM involves two steps, the first step is to obtain probabilities (propensity scores) of all samples including in the experiment by estimating propensity score function, such that characteristic variables determining samples to be treated are predictors and binary variable of samples to be treated is predicted. Then, for each sample of treatment (firm with DOLI), samples in the control (firm without DOLI) are selected as matched samples according to the closeness of the propensity scores. See Shen and Chang (2009) for the details.

The main purpose of this research is to investigate managerial pay difference and financial performance difference between TWSE listed nonfinancial firms with and without DOLI coverage. The data is ranged from 2008 to 2010. By employing matching methods developed by Rubin (1973, 1977), Rosenbaum and Rubin's (1983, 1985a,b) PSM, four matching algorithms, Nearest Matching, Caliper Matching, Mahalanobis Distance Matching and Mahalanobis Distance Matching with Caliper are used to match the financial characteristics of two groups firms (with DOLI versus without DOLI) to correct for self-selection bias. The causal inference of DOLI coverage on firm's performance and corporate governance can be achieved as each pair of financial characteristics is approximately the same in the two groups.

2. Matching Theory and Propensity Score Matching

2.1 Basic Concept of Matching

Matching theory addresses the problem of bias due to non-random selection on observables of samples. Based on Dehejia and Wahba (2002), Shen and Chang (2009), let Y_{i1} denote target variable (i.e. management compensation and financial performance) of firm i when firm i is subject to treatment, that's with DOLI. Y_{i0} is the value of same target variable firm i which is exposed to the control, that's without DOLI. The target variable difference between i with DOLI versus without DOLI, regarded as treatment (or experimental) effect of DOLI coverage, is defined as $\tau_i = Y_{i1} - Y_{i0}$. The expected treatment effect over the treated population is (omit subscript i below for simplicity)

$$\tau\big|_{T=1} \equiv E(\tau|T=1) = E(Y_1|T=1) - E(Y_0|T=1)$$

which is defined as average treatment effect on the treated (ATET), where $T=1(0)$ if the sample is treated (with DOLI) and $T=0$ if the sample is control (without DOLI). The basic problem in identifying ATET is that the target variable is observed under either the treatment or control regimes, but not both. While the researcher can obtain $E(Y_1|T=1)$ yet $E(Y_0|T=1)$, employ $\tau^d \equiv E(Y_1|T=1)-E(Y_0|T=0)$ as a proxy estimator for $\tau|_{T=1}$ is inevitable. If the treated and control samples do not systematically differ from each other, they can be regarded as drawn from same population, that's $Y_1, Y_0 \perp T$, where $\perp$ is the symbol for independence. Under this situation, $E(Y_1|T=1)=E(Y_0|T=1)$, in terminology of Rubin (1973), Ignorability of Treatment Condition (ITC) is satisfied, and thus $\tau^d = \tau|_{T=1}$. However, if the treated and control samples are systematically different, treated and control samples are considered as non-random sampling of different populations, thus τ^d is not a unbiased proxy estimator for $\tau|_{T=1}$, the difference between τ^d and $\tau|_{T=1}$ is defined as the sample selection bias.

Based on the ITC, Rubin (1973) proposed a proposition that conditional on observable covariates X , assignment of samples to treatment has become random, such that $Y_1, Y_0 \perp T|X$, that's the Conditional Independence (CI) holds, and

$$\begin{aligned}\tau|_{T=1} &\equiv E(Y_1|T=1)-E(Y_0|T=1)\\ &= E_x\left[\left\{E(Y_1|X,T=1)-E(Y_0|X,T=1)\right\}|T=1\right]\\ &= E_x\left[\left\{E(Y_1|X,T=1)-E(Y_0|X,T=0)\right\}|T=1\right]\\ &= E_x\left[\tau^d|_{T=1,X}|T=1\right]\end{aligned}$$

As long as two treated and control samples have similar characteristics, comparing treated and control is approximate to comparing two group of samples in a random-sampling experiment, $\tau^d = \tau|_{T=1}$.

2.2 Dimension Reduction through Propensity Score

As the number of observable covariates *X* increases, the chance of finding exact control matches for each treatment decreases. It is more difficult to find control samples which have exactly the same observed characteristics for a given treatment sample as the number of characteristics gets larger. Rosenbaum and Rubin (1983, 1985a,b) suggested to use propensity score - the conditional probability of being treatment given a set of covariates, to reduce the dimension of matching. Let $P(X)$ be the probability of sample being treatment (purchasing DOLI),

$$P(X)=P(T=1|X)=E(T=1|X)$$

According to Rubin (1973), conditioning on propensity score $P(X)$, the projection of observable covariates, assignment of samples to either treatment or control has been random,

$$Y_i, Y_i \perp T|X \;\Rightarrow Y_1, Y_0 \perp T|P(X), \text{ and}$$

$$\tau|_{T=1} = E_{P(X)}\left[\tau^d|_{T=1,P(X)}|T=1\right]$$

The ITC and CI extend to the use of propensity score. Sample selection bias is mitigated as well as the difficulty of multi-dimension matching.[3] The Probit or Logit estimation is suggested for obtaining

[3] Rubin and Thomas (1992) demonstrated that using estimated probability of being treated based on observable characteristics *X*, $\hat{P}(X)$, instead of *P(X)*, still reduces selection bias.

propensity scores.

2.3 Matching Algorithm

Given observed characteristics X and propensity scores $P(X)$ for all samples of insured firm versus uninsured firms, the sample with DOLI is paired with one or more samples without DOLI following four matching criteria. Define sample i is subject to treatment, that's a firm with DOLI, and sample j is exposed to the control, that's a sample without DOLI. Propensity score of samples i and j are P_i and P_j, respectively. The first criteria, Nearest-Neighbor Matching (Nearest hereafter), matching each treated sample to one control sample that has the nearest propensity score. Second, Caliper Matching (Caliper hereafter), matching each treated sample to control samples with propensity scores falling within a pre-specified caliper.[4] Third, Mahalanobis Metric Matching (Mahala hereafter). Instead of using the propensity score, a measure of distance (Mahalanobis Distance, MD) between treated i and control j is calculated and then match each treated sample to a control sample that has the least MD between each other. Fourth, Mahalanobis Metric Matching with Caliper (Mahala Caliper hereafter), it matches each treated sample to control samples with MDs that is smaller than a pre-specified caliper. Specifically, as long as $d(i, j) < \eta$, treated *i* and control *j* are matched samples.

2.4 Verification of Matching Effectiveness

After obtaining after-matching samples of firm without DOLI, it is easily to verify the effectiveness of matching by examining the null hypothesis of $H_0 : (\overline{X}_i - \overline{X}_j) = 0$, where $\overline{X}_i$ and $\overline{X}_j$ are sample means of a given characteristic variable of treated *i* and control *j*. Two groups of samples are statistically equal on if the null is not rejected. The researcher can also exercise the following calculation

$$\frac{(\overline{X}_{iB} - \overline{X}_{jB}) - (\overline{X}_{iA} - \overline{X}_{jA})}{(\overline{X}_{iB} - \overline{X}_{jB})} \times 100$$

where $\overline{X}_{iB}$ and $\overline{X}_{jB}$ are the means of one characteristic variable of treated and control samples before matching. $\overline{X}_{iA}$ and $\overline{X}_{jA}$ are the means of one characteristic variable of treated and control samples after matching. This calculation measures the percentage change from before-matching to after-matching for a given characteristic variable. The larger average percentage across all characteristic variables means that specific matching algorithm is more effective.

3. Variables, Econometric Model and Data

3.1 Directors' and Officers' Liability Insurance (DOLI)

With **t**he succession of corporate scandals such as Enron and World.Com case, corporate governance is a focal issue of financial markets and government regulatory reform. The U.S. passed the Sarbanes-Oxley Act to increase the responsibility of the key persons of the company. In Taiwan, with an amendment to the Companies Law and the Securities and Futures Investors Protection Act, investors pay much more attention to their interests of investment; thus the number of complaints and the amount of resulting compensation increases year by year, leaving directors (gray and independent) and supervisors who are exposed to be in a high-risk status. An immense scandal on the Taiwan financial market, an event of accounting fraud of Procomp Informatics LTD, led to a dozen of independent directors and supervisors resigning from listed companies. In order to protect themselves, directors and supervisors require the company to purchase directors' and officers' liability insurance to protect themselves.

[4] According Shen and Chang (2009), η is specified as quarter of standard error of all estimated propensity scores.

In January 2004, under the background of strengthening corporate governance around the globe, the Taiwan Stock Exchange (TWSE) amended the provisions of the newly listed companies to set at least two seat of independent directors and supervisors. Meanwhile, TWSE developed "Corporate Governance Best-Practice Principles for TWSE/GTSM Listed Companies", in Article 39, *A TWSE/TPEx listed company shall take out directors liability insurance with respect to liabilities resulting from exercising their duties during their terms of occupancy so as to reduce and spread the risk of material harm to the company and shareholders arising from the wrongdoings or negligence of a director. A TWSE/TPEx listed company shall report the insured amount, coverage, premium rate, and other major contents of the liability insurance it has taken out or renewed for directors, at the next board meeting.* This stipulates that the company could purchase liability insurance for their directors and officers.

The development and prevalence of DOLI in Europe and the United States is mature, according to a survey by Tillinghast (2004). In the U.S, around 99% of the companies have insured DOLI, and in Canada this ratio is about 89%. In Asia such as Japan, South Korea, Singapore and Hong Kong, the DOLI insured rate is about 70%. In Taiwan, because the concept and market of DOLI has just prevailed and opened in recent years, the number of insured TWSE-listed companies accounted for only 20% of total number of all TWSE-listed companies.

To investigate the effects of firm's purchase of DOLI on firm performance and corporate governance, two measures of DOLI are employed. The first is a dummy variable, DOLI_D, such that when a firm buys (any amount) directors' and officers' liability insurance (from any insurance companies, domestic or foreign), it is equal to 1 and 0 otherwise. The second is DOLI coverage, the total amount of DOLI insured, DOLI_M.

3.2 Propensity Score Function (PSF)

To address the problem of sample selection, Rosenbaum and Rubin's (1983, 1985a,b) propensity score matching (PSM) is employed. The use of PSM requires estimating the propensity scores function based on the Probit model, which is

$$\text{Prob}(DOLI\_D=1) = \beta_0 + \beta_1 lnAsset + \beta_2 DEBT + \beta_3 MVBV + \beta_4 MANAHOLD + \beta_5 OBS \quad (1)$$

where $DOLI\_D$ is a dummy variable of adopting DOLI, and $\Pr ob(\cdot)$ is the cumulative probability density function of a normal distribution. Five self-selection variables of determining firm's demand for DOLI, serve as explanatory variables in PSF. Reasons for employing five variables are described as followed.

First, *LnAsset*, defined as natural logarithm of total assets. Core (1997) indicated that the scale of a company is a determinant of DOLI demand. Because the larger the scale, the expected loss or compensation of a claim is larger, and the stress and risks of directors and officers are also larger. Thus, the larger the scale, the degree of demanding and the probability of purchasing DOLI is higher. Second, *DEBT*, debt ratio, defined as firm's total liability divided by total assets. Core (1997) and O' Sullivan (2002) indicated that firms with higher distress probability are more likely to purchase DOLI coverage, because this insurance lowers expected costs of bankruptcy. Financial distress is an important concern for a company to meet its indemnity obligations to its directors and officers. The higher the financial distress, the more insurance the company is expected to carry, as its own funds will not be enough to indemnify the managers in lawsuits. The most frequent measure of financial situation is the leverage, measured as the ratio of debt to equity. Therefore, the higher this measure, the higher the risk of financial distress; thus, the higher would be the demand for DOLI. Third, *MVBV* is the ratio of market value to book value. According to Core (1997), firms with large growth opportunities tend to be more likely to purchase insurance and to carry higher limits, because the value of adopting positive NPV projects more than offsets the costs of any reduced monitoring by directors. Moreover, because more of their value

consists of volatile and intangible growth options, firms with greater growth opportunities have higher litigation risk and thus higher demand for DOLI.

Fourth, *MANAHOLD*, defined as number of shares held by the management divided by total number of shares outstanding. Based on O' Sullivan (2002), in companies with DOLI, executives and directors are expected to become less risk averse and consequently are less likely to reject attractive new risky projects. Significant managerial ownership is likely to result in the purchase of DOLI. However, managerial ownership is also expected to be negatively associated with DOLI, because when an owner is also a manager, the firm is less likely to seek to exploit shareholders, and consequently there is expected to be a reduced need for DOLI insurer monitoring. Finally, *OBS* is outside block shareholders, defined as the number of shares hold by outside (not directors, not supervisors and not managers or CEOs) block shareholders (more than 5%) divided by total number of shares outstanding. According to O' Sullivan (2002), since the presence of large external shareholders is expected to result in more effective monitoring of managerial behavior (Schleifer and Vishny, 1986), a reduced demand for the monitoring of DOLI for such companies.

3.3 Effects of DOLI on Firm Performance and Managerial Pay

Following Hofler, Elston and Lee (2011) and Shen and Chang (2009), two approaches are implemented to evaluate the effects of a firm's adopting DOLI on firm performance and corporate governance.

The first, compute the mean differences in three measures of top management pay (*PayT*, *PayA* and *PayR*) and corporate performance measures (*ROE*) between two groups (DOLI insured samples DOLI versus uninsured samples), based on before- and after-matching samples. Second, performs multiple regression estimation relating firm's performance/top management pay to firm's adopting DOLI, control variables and industry/year dummies. Two regression specifications are:

$$\begin{aligned} ROE_{i,t} = {} & \beta_0 + \beta_1 \mathbf{DOLI}_{i,t} + \beta_2 IDD_{i,t} + \beta_3 lnAsset_{i,t} \\ & + \beta_4 DEBT_{i,t} + \beta_5 SALESG_{i,t} + \beta_6 RD_{i,t} \\ & + \beta_7 AGE_{i,t} + \beta_8 BOARD_{i,t} + \beta_9 MANAHOLD_{i,t} \\ & + \beta_{10} PLEDGE_{i,t} + \beta_{11} INSTHOLD_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

where *ROE* is returns on equity, and **DOLI** is vector of variables measuring firm's adopting DOLI, including *DOLI_D* and *DOLI_M*. *IDD* is a dummy describing if a firm introduces independent director, it is equal to 1 and 0 otherwise. Fama (1980), Weisbach (1988), Hermalin and Weisbach (1991, 1998), Raheja (2005), Harris and Raviv (2006) and Adams and Ferreira (2007, 2009) indicated that independent directors enhance corporate governance and firm performance. Other controls are the following. Total assets (*LnAsset*), controls for the scale effect. Debt ratio (*DEBT*), controls for the leverage effect. Research and development expense ratio (*RD*), controls for the innovation effect, defined as firm's R&D expense divided by net sales. Sales growth (*SALESG*), controls for the growth opportunity, defined as growth rate of net sales (Morck, Shleifer and Vishny, 1988; Demsetz and Villalonga, 2001; McConnell and Servaes, 1990). The years of a firm's establishment, *AGE*, controls for leaning and reputational effects on performance.

Yermack (1996) found the inverse relationship between board size and corporate value; thus the board size (*BOARD*), defined as the total number of directors, serves as a control variables for firm performance. While shareholding by the management (*MANAHOLD*), defined as number of shares held by the management divided by total number of shares outstanding, is a measure for severity of agency problem and thus influence performance. With similar reason, pledge ratio for director's shareholdings (*PLEDGE*), defined as the average number of shares pledged by directors divided by the number of

shares hold by directors, also serves as a control for performance (Fich and Shivdasani, 2006; Claessens, Djankov and Lang, 2000). Because institutional investors have informational and knowledge advantages and thus have positive stimulus for performance, so *INSTHOLD is included*, defined as the number of shares hold by institutions (including domestic financial institutions, foreign Financial Institutions, domestic trust funds and offshore trust funds) divided by total number of shares outstanding. The data of the research covers 3 years and 18 industries; thus 2 yearly dummies and 17 industrial dummies are incorporated into the regression estimation.

To evaluate the effects of DOLI on managerial pay, the following regression equation is estimated:

$$\begin{aligned}\mathbf{PAY}_{i,t} = {} & \beta_0 + \beta_1 \mathbf{DOLI}_{i,t} + \beta_2 LnAsset_{i,t} + \beta_3 DEBT_{i,t} \\ & + \beta_4 CDDummy_{i,t} + \beta_5 ROE_{i,t} + \beta_6 MVBV_{i,t} \\ & + \beta_7 STDRET_{i,t} + \beta_8 MANAHOLD_{i,t} + \beta_9 INSTHOLD_{i,t} \\ & + \beta_{10} BOARD_{i,t} + \beta_{11} IDR_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

where **PAY** is a vector of variables measuring firm's managerial pay, including *payT*, defined as the total amount of managerial compensation, *PayA*, the average amount of compensation per person and *PayR*, total amount of managerial compensation divided by firm's earnings. *CDDummy* is a dummy whenever a sample of firm pays cash dividend; it is equal to one, and zero otherwise. *MVBV* is the ratio of market value to book value. *STDRET* is standard deviation of firm's daily stock returns. Other variables are defined as before. *IDR*, the independent director ratio, controls for the effects of board independence on managerial pay. Definition and Mnemonics of all variables are summarized in Table 1.

Table 1 Mnemonics and Definition of Variables

Variable	Definition
DOLI_D	A dummy variable which equal to 1 if firm purchases directors' and officers' liability insurance (DOLI), otherwise, it is equal to 0
DOLI_M	Total amount of firm's purchasing directors' and officers' liability insurance (DOLI)
IDD	A dummy variable which equal to 1 if firm has one or more independent directors. When firm has none independent director, it is equal to 0.
ROE	Firm's profitability measure, which is proxied by returns on equity
LnAsset	Natural logarithm of total assets
DEBT	Total liability divided by total equity
RD	Firm's R&D expense divided by net sales
SALESG	The growth rate of net sales
AGE	The years of firm's establishment
CDDummy	When a sample of firm pays cash dividend, it is equal to one, otherwise, it is zero.
MVBV	The ratio of market value to book value
STDRET	Standard deviation of firm's daily stock returns
BOARD	Total number of directors
MANAHOLD	The number of shares hold by the management divided by total number of shares outstanding
PLEDGE	The average number of shares pledged by directors and supervisors divided by average number of shares hold by directors and supervisors
INSTHOLD	The number of shares hold by institutions (including domestic financial institutions, foreign Financial Institutions, domestic trust funds and offshore trust funds) divided by total number of shares outstanding
OBS	The number of shares hold by outsider (not directors, not supervisors and not managers or CEOs) block shareholders (more than 5%) divided by total number of shares outstanding
PayT	The total amount of managerial compensation
PayA	The average amount of compensation per manager
PayR	Total amount of managerial compensation divided by earnings

Note: The definition of variables refers to the Taiwan Economic Journal (TEJ).

3.4 Sample and Data

Firm samples are 795 listed nonfinancial companies on the Taiwan Stock Exchange (excluding banking, insurance, securities and financial holding companies). The reason why financial industry companies are excluded is that there are obvious differences among accounting systems, accounting subjects and performance evaluation methods, government regulation and industrial competition. The data of DOLI coverage, financial and governance variables is collected from the Taiwan Economic Journal (TEJ). The reason why the earlier data (2008-2010) is used for analysis is that the Taiwan government authorities have adopted encouragement and compulsive ways to strengthen corporate governance in the following year. Therefore, in an earlier stage, firms' purchasing of DOLI is not subject to policy promotion and is also not in a situation of passive acceptance of mandatory policy direction but is an active and rational decision-making result. However, such a short data period loses opportunities to evaluate the long-term impact of DOLI on performance and governance and the ability in inference of long-term effect of DOLI is limited.

4. Empirical Results

4.1 Basic Statistics

The data totally has 2,385 firm-year samples, 396 for samples with DOLI insured and 1,989 for samples without DOLI. Table 2 reports basic statistics. Before matching, firms with DOLI tend to have higher *LnAsset* (16.094 versus 15.616), *MVBV* (1.8494 versus 1.5318) and *MANAHOLD* (1.5919% versus 1.4351%) and lower *DEBT* (74.820% versus 82.266%) and *OBS* (18.358% versus 20.471%). This means that firms with lower outside block shareholdings, lower debt ratio, higher managerial shareholdings, higher growth opportunity and larger assets tend to purchase, and the probability of demand and purchasing DOLI is higher. As before mentioned, Core (1997) and O' Sullivan (2002) indicated that *LnAsset*, *DEBT*, *MVBV* and *MAHAHOLD* are expected to be positively associated with demanding DOLI; *OBS* is expected to be negatively associated with demanding DOLI. Except for *DEBT*, the evidence here is consistent with prediction by Core (1997) and O' Sullivan (2002). As concern for firm performance and three measures of managerial pay, evidence shows that firms with adopting DOLI tend to have higher profitability (*ROE*: 6.5312% versus 6.4616%). Firm with adopting DOLI tend to be paid a higher total amount to their management (*PayT*: 9.9262 versus 9.3373) and a higher average amount per manager (*PayA*: 8.2925 versus 8.0000). However, if we consider managerial pay in terms of a percentage to earnings, firms adopting DOLI have a lower pay ratio (*PayR*: 10.673% versus 12.047%).

The evidence also shows that firms adopting DOLI tend to have a higher probability of introducing independent directors (*IDD*: 0.5429 versus 0.3621) and a higher ratio of independent director in their boards (*IDR*: 16.944% versus 11.284%). Firms with DOLI tend to be firms with a higher research and development ratio (*RD*: 6.2745% versus 3.0696%), lower sales growth rate (*SALESG*: 8.6636% versus 60.779%), to be younger (*AGE*: 25.301 versus 27.730), have a higher probability of pay cash dividends (*CDDummy*: 0.7595 versus 0.6856), smaller volatility of daily stock returns (*STDRET*: 2.8316 versus 2.8689), larger board size (*BOARD*: 7.2096 versus 7.1282), lower pledge ratio of directors and supervisors shareholdings (*PLEDGE*: 10.840% versus 10.840%), and higher institutional investor's shareholdings (*INSTHOLD*: 43.636% versus 39.597%).

Table 3 reports pair-wise Pearson correlation matrix. The first column shows that, the correlation between *DOLI_D*, *LnAsset* and *MVBV* are significantly positive (0.1413 and 0.0928, respectively), meaning firms with larger asset and larger growth opportunity tend to purchase DOLI. Second, the correlation between *DOLI_D* and *OBS* is significantly negative (-0.0659), meaning that firms with lower outside block shareholdings adopt DOLI. Third, the correlation between *DOLI_D* and *DEBT* is negative, and the correlation between *DOLI_D* and *MANAHOLD* is positive; but both are not significant. Generally, the results of Table 3 shows no contradiction with the result of Table 2.

Table 2 Descriptive Statistics

	All Samples				Samples with DOLI				Samples without DOLI			
Variable	Mean	Ste. Dev.	Min.	Max.	Mean	Ste. Dev.	Min.	Max.	Mean	Ste. Dev.	Min.	Max.
DOLI_D	0.1660	0.3722	0.0000	1.0000	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000
DOLI_M	2.0395	4.5869	0.0000	14.089	12.283	0.9169	4.9053	14.089	0.0000	0.0000	0.0000	0.0000
IDD	0.3946	0.4889	0.0000	1.0000	0.5429	0.4988	0.0000	1.0000	0.3621	0.4807	0.0000	1.0000
IDR	12.301	16.198	0.0000	75.000	16.944	16.761	0.0000	60.000	11.284	15.897	0.0000	75.000
ROE	6.4740	20.176	-313.05	233.71	6.5312	23.525	-240.55	57.450	6.4616	19.380	-313.05	233.71
LnAsset	15.700	1.2913	11.700	20.890	16.094	1.4353	13.034	20.368	15.616	1.2426	11.700	20.890
DEBT	80.950	299.10	0.1300	11451	74.820	122.80	3.9000	2010.0	82.266	324.70	0.1300	11451
RD	3.6411	25.003	0.0000	997.30	6.2745	51.221	0.0000	997.30	3.0696	13.816	0.0000	547.74
SALESG	51.461	1633.9	-100.00	75718	8.6636	49.508	-89.970	451.52	60.779	1802.8	-100.00	75718
AGE	27.326	14.328	1.0000	65.000	25.301	12.629	3.0000	61.000	27.730	14.612	1.0000	65.000
CDDummy	0.6992	0.4587	0.0000	1.0000	0.7595	0.4279	0.0000	1.0000	0.6856	0.4644	0.0000	1.0000
MVBV	1.5907	1.3305	0.0900	24.060	1.8494	1.4643	0.1000	12.810	1.5318	1.2914	0.0900	24.060
STDRET	2.8620	1.2704	0.7485	25.900	2.8316	1.4937	0.7485	25.900	2.8689	1.2144	0.8077	25.696
BOARD	7.1429	2.2928	3.0000	21.000	7.2096	2.1826	3.0000	15.000	7.1282	2.3165	4.0000	21.000
MANAHOLD	1.4635	2.3619	0.0000	19.670	1.5919	2.1569	0.0000	14.720	1.4351	2.4045	0.0000	19.670
PLEDGE	10.641	19.036	0.0000	99.970	10.840	18.217	0.0000	90.100	10.597	19.217	0.0000	99.970
INSTHOLD	40.328	22.680	0.6200	100.00	43.636	23.913	3.6500	96.210	39.597	22.340	0.6200	100.00
OBS	20.092	12.316	0.0000	89.580	18.358	11.195	0.0000	81.330	20.471	12.519	0.0000	89.580
PayT	9.4467	1.0913	4.6052	14.088	9.9262	1.1992	6.9078	14.088	9.3373	1.0348	4.6052	13.284
PayA	8.0543	0.6847	3.9120	11.123	8.2925	0.7547	5.6560	11.123	8.0000	0.6560	3.9120	10.512
PayR	11.790	42.603	0.0100	907.34	10.673	33.111	0.1400	297.10	12.047	44.506	0.0100	907.34

Note: See Table 1 for the definition of variables. Yearly data is ranged from 2008 to 2010. There are 2,385 firm-year samples, 396 for samples with DOLI and 1,989 for samples without DOLI.

Table 3 Correlation Matrix

Variable	*DOLI_D*	*DOLI_M*	*IDD*	*IDR*	*ROE*	*LnAsset*	*DEBT*	*RD*	*SALESG*	*AGE*	*CDDummy*	*MVBV*	*STDRET*	*BOARD*	*MANAHOLD*	*PLEDGE*	*INSTHOLD*	*OBS*	*PayT*	*PayA*	*PayR*
DOLI_D	1.0000																				
DOLI_M	0.9967*	1.0000																			
IDD	0.1420*	0.1429*	1.0000																		
IDR	0.1342*	0.1362*	0.9409*	1.0000																	
ROE	0.0013	0.0006	0.1280*	0.1391*	1.0000																
LnAsset	0.1413*	0.1603*	0.0010	-0.0290	0.1302*	1.0000															
DEBT	-0.0095	-0.0087	-0.0477*	-0.0442*	-0.3228*	-0.0312	1.0000														
RD	0.0491*	0.0479*	0.0761*	0.0590*	-0.0510*	-0.0609*	-0.0182	1.0000													
SALESG	-0.0122	-0.0122	-0.0179	-0.0166	0.0236	0.0142	0.0000	-0.0035	1.0000												
AGE	-0.0631*	-0.0654*	-0.5061*	-0.5025*	-0.0549*	0.1344*	0.0447*	-0.0991*	0.0000	1.0000											
CDDummy	0.0623*	0.0608*	0.1561*	0.1688*	0.4977*	0.1956*	-0.1224*	-0.0484*	0.0104	-0.0429*	1.0000										
MVBV	0.0928*	0.0924*	0.1326*	0.1529*	0.0197	-0.0347	0.4332*	0.0735*	0.0012	-0.1663*	0.1647*	1.0000									
STDRET	-0.0114	-0.0115	0.1099*	0.1316*	-0.1498*	-0.1111*	0.0744*	0.0168	0.0201	-0.1878*	-0.2167*	0.0030	1.0000								
BOARD	0.0136	0.0197	0.1080*	0.0118	0.0318	0.3353*	-0.0367*	-0.0025	-0.0240	0.1231*	0.0934*	-0.0107	-0.0874*	1.0000							
MANAHOLD	0.0256	0.0239	0.1676*	0.1490*	0.0649*	-0.1594*	-0.0323	0.0274	-0.0129	-0.2554*	0.0861*	-0.0136	0.0718*	-0.0456*	1.0000						
PLEDGE	0.0049	0.0061	-0.1184*	-0.1390*	-0.0659*	0.1361*	0.0124	-0.0259	0.0492*	0.1545*	-0.1043*	-0.0915*	-0.0376*	0.0038	-0.1018*	1.0000					
INSTHOLD	0.0686*	0.0785*	0.0388*	0.0589*	0.1582*	0.4301*	-0.0024	-0.0491*	-0.0040	-0.0492*	0.2113*	0.1712*	0.0072	0.2480*	-0.1823*	-0.0212	1.0000				
OBS	-0.0659*	-0.0667*	-0.0247	0.0386*	0.0631*	-0.1255*	-0.0003	-0.0501*	0.0043	0.0387*	-0.0097	0.0661*	0.0304	-0.1376*	-0.0909*	-0.0230	0.2362*	1.0000			
PayT	0.2100*	0.2265*	0.1672*	0.1489*	0.2469*	0.5965*	-0.0929*	-0.0197	0.0121	-0.1486*	0.3432*	0.1094*	-0.1010*	0.1895*	0.1060*	0.0668*	0.2610*	-0.1625*	1.0000		
PayA	0.1663*	0.1785*	0.1192*	0.1138*	0.3038*	0.5090*	-0.1054*	-0.0252	0.0062	-0.1263*	0.3936*	0.1243*	-0.1073*	0.2154*	0.0469*	0.0160	0.2811*	-0.1506*	0.7834*	1.0000	
PayR	-0.0126	-0.0148	-0.0176	-0.0185	-0.2043*	-0.1171*	0.0263	0.0516*	-0.0079	-0.0154	-0.2724*	-0.1085*	0.0288	-0.0430*	0.0370	0.0463*	-0.0970*	-0.0609*	-0.0064	-0.0654*	1.0000

Note: This table reports pair-wise Pearson correlation coefficients among variables. See Table 1 for the definition of variables. Yearly data is used and ranged from 2008 to 2010. There are 2,385 firm-year samples. Correlation coefficient followed by an asterisk means that it is at least 10% significantly different from zero.

Based on self-selection factors, this study estimates propensity score function (PSF), the probability function of firm's adopting DOLI. Table 4 reports the estimated results of PSF by Probit model.[5] We observe that, first, the estimated coefficient of *LnAsset* is significantly positive (0.153), meaning that firms with larger scale tend to demand and purchase DOLI, consistent with the predictions of Core (1997). Second, the estimated coefficient of *DEBT* is significantly negative (-0.0003), meaning that firms with DOLI tend to have a lower debt to equity ratio. Third, the estimated coefficient of *MVBV* is significantly negative (0.1333), representing that firms with higher growth opportunity tend to adopt DOLI, consistent with the prediction of Core (1997) and O' Sullivan (2002). Fourth, the estimated coefficient of *MANAHOLD* is positive and significant (0.0337), meaning that higher managerial ownership enhances buying DOLI. Finally, the estimated coefficient of *OBS* is negative and significant (-0.0068), meaning that firms with lower outside block shareholdings have a tendency of buying DOLI. Overall, the results of Table 4 are consistent with the direction described by the Table 2 and Table 3. While existing literature that some factors indeed affect the demand of DOLI, such as Core (1997) and O' Sullivan (2002), the empirical findings are generally consistent with them.

Table 4 Propensity Score Estimation: Probit Model

Variable	Estimated Coefficients
Constant	-3.4332*** (-8.35)
LnAsset	0.1530*** (6.20)
DEBT	-0.0003* (-1.84)
MVBV	0.1333*** (5.37)
MANAHOLD	0.0337** (2.43)
OBS	-0.0068** (-2.32)
Num. of Observations	2,095
Pseudo R^2	0.0368

Note: This table reports Probit estimation of propensity score function, based on all samples of firms. The number in parentheses below estimated coefficients are t-statistics. ***, ** and * denote the significance at the 1%, 5% and 10% levels, respectively.

Table 5 compares means of self-selection variables between two groups of firms, based on before- and after-matching samples. Before matching, the differences for three variables, *LnAsset*, *MVBV* and *OBS* are significantly different from zero (0.4450, 0.3318 and -1.7520). And it is not surprising that, after matching, the means of two pairs become approximately equal. Under Nearest matching, differences of all five self-selection variables between two groups of firms are insignificantly different from zero and their difference magnitudes are also reduced in absolute term.[6] Under Caliper, Mahala and Mahala Caliper matching, the results are similar with that under Nearest matching. Because under these for matching methods the differences for self-selection variables lose their significance, they are all effective matchings. However, the last method has its drawback. It reduces a lot of samples for after-matching control firms.

[5] Logit estimation result of PSF is similar.
[6] One exception is *MANAHOLD*.

Table 5 Self-selection Variables: Before-matching and After-matching Samples

	Before Matching			After Matching											
				Matching Algorithm											
				Nearest			Caliper			Mahala			Mahala Caliper		
Variable	Firm with DOLI	Firm without DOLI	Diff. (t-value)	Firm with DOLI	Firm without DOLI	Diff. (t-value)	Firm with DOLI	Firm without DOLI	Diff. (t-value)	Firm with DOLI	Firm without DOLI	Diff. (t-value)	Firm with DOLI	Firm without DOLI	Diff. (t-value)
LnAsset	16.094	15.649	0.4450*** (6.17)	16.094	16.048	0.0460 (0.45)	16.089	16.059	0.0300 (0.30)	16.094	16.027	0.0670 (0.67)	15.582	15.572	0.0100 (0.05)
DEBT	74.820	83.402	-8.5820 (-0.50)	74.820	71.413	3.4070 (0.45)	74.690	71.129	3.5610 (0.46)	74.820	64.871	9.9490 (1.47)	45.819	51.589	-5.7700 (-0.68)
MVBV	1.8587	1.5269	0.3318*** (4.44)	1.8587	1.8141	0.0446 (0.41)	1.8114	1.7444	0.0670 (0.73)	1.8587	1.7969	0.0618 (0.62)	1.2842	1.2847	-0.0005 (0.00)
MANAHOLD	1.5615	1.3654	0.1961 (1.51)	1.5615	1.7789	-0.2174 (-1.21)	1.5661	1.7881	-0.2220 (-1.23)	1.5615	1.5261	0.0354 (0.24)	0.5542	0.5395	0.0147 (0.07)
OBS	18.209	19.961	-1.7520*** (-2.73)	18.209	17.602	0.6070 (0.77)	18.205	17.521	0.6840 (0.87)	18.209	18.087	0.1220 (0.16)	13.988	14.082	-0.0940 (-0.06)

Note: The numbers are means for firms with versus without DOLI, respectively, and their differences. There are a total of 2,385 firm-year samples, of which 396 are firm with DOLI, and 1,989 are firms without DOLI. The numbers under After Matching denote the means of the sample that have been matched by adopting the Nearest, Caliper, Mahala and Mahala Caliper methods, respectively. The numbers of observations for the firm without DOLI are 388, 386, 388 and 19 based on using the above four matching methods. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 6 reports percentage changes of gaps of self-selection variables between samples with versus without adopting DOLI through four matching algorithms. Recall that the percentages help to evaluate the effectiveness of the matching methods. Larger percentage change suggests the success of matching. Two interesting results can be highlighted as follows. First, the Mahala and Mahala Caliper are expected to be the more effective two matching algorithms because the average percentage changes of the two groups are larger, 65.1% and 83.5%, respectively. It is worth noting that the superior results are not without costs. For example, the degree of freedom is substantially reduced from 1,989 to 19 when Mahala Caliper method is adopted. Next, the Nearest and Caliper methods are less reliable matchings because of their lower average percentage changes, which are 58.2% and 55.9%, respectively. Though their percentage changes are smaller, they do not lose as many observations as Mahala Caliper method, and still retain 388 and 386, respectively. Therefore, there is a trade-off between the effectiveness in matching and the losses in the degrees of freedom. Mahala Caliper produces a better selection of the samples of firms without DOLI, but it loses a lot of observations; by contrast, Nearest and Caliper matching produce a slightly worse selection but maintain a lots more observations. Mahala is the best, because its percentage change is high enough and the retaining number of samples is also rich, 388.

Table 7 reports the basic statistical results of three profitability measures differences between firms with DOLI versus without DOLI. Before matching, as shown in the second column, because the three differences are all positive and only ROA is significantly (1.7684), means that firm with DOLI tends to have significantly superior performance in returns on assets. This result substantially changed when different matching methods are applied. First, the evidence in columns 3 shows that the outperformance for firm with DOLI interestingly switched to underperformance, because the 3 of 2 differences for profitability measures are negative but insignificant (-1.6568 and -3.2298). The outcomes of Caliper and Mahala Caliper are similar. Second, under Mahala, the differences are all negative and ROE are significant (-3.2977), means that firm with DOLI significantly underperform ones without DOLI in returns on equity. To sum up, before matching, firm with DOLI significantly perform better returns on assets but not in returns on equity and returns on sales. And when Nearest, Caliper and Mahala Caliper are employed, this outperformance is gone.

Table 6 Percentage Changes of Self-selection Variables through Matching

	Matching Algorithm			
Variable	Nearest	Caliper	Mahala	Mahala Caliper
LnAsset	89.6	93.2	85.0	97.6
DEBT	60.3	58.5	-15.9	32.8
MVBV	86.6	79.8	81.4	99.8
MANAHOLD	-10.8	-13.2	81.9	92.5
OBS	65.4	61.0	93.1	94.7
Average	58.2	55.9	65.1	83.5

Note: The numbers are the percentage changes of means of self-selection variables after the matching. The larger the percentage changes, the more efficient in matching, i.e., reducing difference between the two groups: firms with DOLI versus without DOLI. Average denotes the average of the five percentage changes of self-selection characteristic variables.

Table 7 Differences of Firm Performance and Managerial Pay between Firms with DOLI versus without DOLI

Variable	Before Matching	Matching Algorithm			
		Nearest	Caliper	Mahala	Mahala Caliper
PayT	0.5939***	0.3545***	0.3413***	0.3050***	-0.0729
	(9.98)	(4.28)	(3.77)	(4.31)	(-0.25)
PayA	0.2983***	0.2030***	0.1942***	0.1311***	-0.0412
	(7.84)	(3.65)	(3.37)	(2.72)	(-0.22)
PayR	-0.9478	2.6224	2.6280	3.9013**	-25.831
	(-0.38)	(0.76)	(0.70)	(1.96)	(-0.87)
ROE	0.5003	-1.6568	-2.1017	-3.2977**	1.2537
	(0.44)	(-0.95)	(-1.20)	(-2.50)	(0.36)

Note: The numbers are the differences of the means for the two groups: firms with DOLI versus without DOLI. The bootstrap t-statistics are presented in the parentheses by repeating sampling 1000 times. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

4.2 Regression Estimation of DOLI on performance

Table 8 reports the pooled OLS estimation results of the effect of firm's adopting DOLI on firm's returns on equity. Under before-matching samples and samples under four matching methods, for each set of samples we consider four slightly different model specifications. For Model (1), only *DOLI_D* and 6 variables, *IDD*, *LnAsset*, *DEBT*, *RD*, *SALESG* and *AGE* are included in the model. For model (2), only *DOLI_D* and 4 controls, *BOARD*, *MANAHOLD*, *PLEDGE* and *INSTHOLD* are included in the model. For model (3), *DOLI_D* and all 10 controls are included in the model. For model (4), shares similarity with in model (3), plus 2 yearly dummies and 17 industrial dummies.

Under before matching samples, no matter which model specification is, estimated coefficients of DOLI dummy are negative (-1.6394, -1.3077, -1.7071 and -1.7209, respectively) but insignificant and shows that even consider various sets of controls for firm's performance, firm with DOLI does not outperform firm without DOLI. Other estimated coefficients of control variables generally share consistent results, firm with introducing independent director (*IDD*: 5.0796), larger scale, lower debt to equity ratio, lower R&D expense to sales, higher sales growth rate of net sales, smaller size of the board of directors, higher managerial shareholdings, lower pledge ratio of directors and supervisors and higher institutional investor's shareholdings tends to have superior profitability. Estimation result under before matching samples does not shift as employing after-matching samples under Nearest, Caliper, Mahala and Mahala Caliper matching. Under Nearest matching, regardless of which model specification, coefficient on *DOLI_D* is insignificantly negative but significant in model (2), means that after controlling for self-selection factors (fixed to equivalent in self-selection factors, in terms of means), firm with DOLI tends to perform worse on returns on equity. Under remaining three matching algorithms, similar results are still obtained, especially in Mahala matching, shows all significant underperformance on *ROE* (-2.7515, -4.1871, -2.8911 and -1.9477) of firm with DOLI.

Table 9, similar with Table 8, the only difference is the main explanatory variable, switches from DOLI dummy (*DOLI_D*) to purchasing amount of DOLI (*DOLI_M*). In Table 9, under before matching samples, without respect to which model specification is employed, the estimated coefficient on *DOLI_M* is insignificantly negative, shows that higher purchasing amount of DOLI is not correlated with returns on equity. Yet, under Nearest, Caliper, Mahala and Mahala Caliper matchings, regardless of which model specification is used, estimated coefficient on *DOLI_M* are negative. And it is special that under Mahala, all coefficients are significantly negative, represents that after controlling for self-selection factors, firm with higher purchasing amount of DOLI tends to be firms with underperformance in returns on equity. To sum up of regression estimation, before matching, firm's adopting DOLI (and

higher purchasing amount) is uncorrelated with business profitability. Yet, after controlling factors determining firm's adopting DOLI, the statistical connection between DOLI and profitability is emerged. After matching regression result is consistent with the negative view that DOLI incurs moral hazard problem and deteriorates firm performance.

As a robustness check, Table 10 reports Heckman's (1979) two-stage estimation results of the effects of DOLI on profitability (proxied by *ROE*). The first stage is a probability model determining samples are in firm with DOLI or firm without DOLI (employing 5 self-selection variables: *LnAsset*, *DEBT*, *MVBV*, *MANAHOLD*, and *OBS*). The second stage, similar with Table 8 and 9, explained variables are firm's profitability measure, ROE. And similar as before, four models specifications remain. In Table 10, evidence shows that in the first stage, the estimated coefficients of *LnAsset*, *MVBV* and *MANAHOLD* are significantly positive (0.1527, 0.1330 and 0.0336, respectively), implies that firm with larger scale, higher growth opportunity and higher managerial ownership tends to purchasing DOLI. Estimated coefficients of *DEBT* and *OBS* are significantly negative (-0.0003 and -0.0068, respectively), means that firm with lower debt to equity ratio and higher outside block shareholdings tends to have DOLI coverage. This finding is consistent with the predictions of Core (1997) and O' Sullivan (2002). For the second stage, after controlling for self-selection bias, regardless of which models, estimated coefficients of *DOLI_D* are positive and significant (47.640, 43.289, 43.118 and 37.024), means that firm with DOLI tends to perform better than firm without DOLI. This contradicts with the former result in OLS regression results that firm with DOLI is underperformed. However, when firm's purchasing amount of DOLI is considered (*DOLI_M*), estimated coefficients return to significantly negative (-3.1332, -3.6355, -3.1836 and -2.8472), evidence of underperformance of firm with DOLI is still presented.

Table 8 Does Firms with DOLI (*DOLI_D*) Perform Better? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D	-1.6394	-1.3077	-1.7071	-1.7209	-1.5323	-2.6438*	-1.3738	-1.3922	-1.7421	-2.8712*	-1.6072	-1.5706	-2.7515**	-4.1871***	-2.8911***	-1.9477*	-1.9212	-1.9212	-4.7754*	-5.7082**
	(-1.34)	(-1.02)	(-1.41)	(-1.46)	(-1.28)	(-1.67)	(-1.16)	(-1.24)	(-1.49)	(-1.84)	(-1.40)	-(1.42)	(-2.53)	(-2.95)	(-2.71)	(-1.86)	(-0.81)	(-0.81)	(-1.72)	(-2.03)
IDD	5.0796***	4.5253***	5.2973***	5.6216***	3.7601***	4.7509***	4.6800***	5.3338***	3.4844***	4.5557***	4.3197***	5.0308***	3.3835**	5.1990***	4.4907***	5.2330***	2.3261	2.3261	3.1556	3.3681
	(5.06)	(5.39)	(5.18)	(4.95)	(2.60)	(3.26)	(3.17)	(3.45)	(2.47)	(3.16)	(3.03)	(3.32)	(2.29)	(3.58)	(2.97)	(3.58)	(1.04)	(1.04)	(1.45)	(1.49)
LnAsset	1.9777***		1.6420**	1.6905**	2.1415***		1.6013*	1.6434**	1.8838***		1.3264*	1.4387**	2.5188***		2.0341***	2.0462***	2.1686***		1.4586*	1.3732*
	(3.98)		(2.57)	(2.50)	(2.81)		(1.89)	(2.28)	(2.60)		(1.65)	(2.03)	(5.21)		(3.55)	(3.72)	(3.00)		(1.76)	(1.74)
DEBT	-0.0210***		-0.0211***	-0.0208***	-0.1075***		-0.1068***	-0.1088***	-0.1064***		-0.1056***	-0.1080***	-0.1180***		-0.1193***	-0.1196***	-0.1286***		-0.1290***	-0.1283***
	(-3.70)		(-3.71)	(-3.65)	(-7.40)		(-6.98)	(-7.38)	(-7.28)		(-6.84)	(-7.24)	(-18.6)		(-17.7)	(-18.9)	(-18.9)		(-18.7)	(-20.0)
RD	-0.0456***		-0.0406***	-0.0443***	-0.0398***		-0.0348***	-0.0426***	-0.0403***		-0.0356***	-0.0428***	-0.0452***		-0.0397***	-0.0480***	-0.0430***		-0.0380***	-0.0423***
	(-2.89)		(-2.90)	(-3.31)	(-4.34)		(-4.37)	(-4.96)	(-4.30)		(-4.35)	(-4.84)	(-3.27)		(-3.26)	(-4.13)	(-3.63)		(-3.62)	(-4.31)
SALESG	0.0003		0.0003	0.0002	0.0254***		0.0242***	0.0224***	0.0256***		0.0244***	0.0227***	0.0512***		0.0509***	0.0402**	0.0711**		0.0725**	0.0656**
	(1.25)		(1.53)	(1.16)	(4.57)		(4.31)	(5.00)	(4.40)		(4.17)	(4.79)	(2.63)		(2.67)	(2.22)	(2.44)		(2.57)	(2.22)
AGE	0.0028		0.0801*	0.0209	-0.0309		0.0566	0.0285	-0.0391		0.0435	0.0180	-0.0985*		-0.0029	-0.1359*	-0.1058		-0.0165	-0.0800
	(0.07)		(1.83)	(0.45)	(-0.42)		(0.74)	(0.31)	(-0.53)		(0.58)	(0.20)	(-1.86)		(-0.05)	(-1.91)	(-1.26)		(-0.20)	(-0.72)
BOARD		-0.1621	-0.5719***	-0.5943***		-0.5369*	-1.0095***	-0.9049***		-0.5047	-0.9132***	-0.8583***		-0.4097	-1.0375***	-0.9597***		-0.4070	-1.0246***	-1.0037***
		(-1.03)	(-3.81)	(-3.90)		(-1.69)	(-3.70)	(-3.39)		(-1.60)	(-3.58)	(-3.29)		(-1.64)	(-4.88)	(-4.04)		(-0.84)	(-3.12)	(-2.68)
MANAHOLD		0.6483***	0.7226***	0.8400***		1.0214***	0.9703***	1.0463***		0.9572***	0.8990***	0.9777***		0.7118***	0.6750***	0.8417***		1.6133***	1.4380***	1.5633***
		(4.62)	(4.76)	(5.10)		(4.30)	(4.26)	(4.17)		(4.18)	(4.16)	(4.03)		(3.06)	(2.88)	(3.44)		(4.14)	(3.62)	(3.72)
PLEDGE		-0.0446*	-0.0649	-0.0604***		0.0298	0.0227	0.0232		0.0228	0.0201	0.0197		0.0144	-0.0177	-0.0007		0.0755	-0.0017	0.0212
		(-1.85)	(-2.80)	(-2.65)		(0.78)	(0.66)	(0.65)		(0.61)	(0.60)	(0.56)		(0.36)	(-0.52)	(-0.02)		(1.34)	(-0.04)	(0.48)
INSTHOLD		0.1539***	0.1230	0.1121***		0.2171***	0.1616***	0.1365***		0.2059***	0.1563***	0.1359***		0.1867***	0.1665***	0.1449***		0.2018***	0.1939***	0.1733***
		(7.40)	(4.91)	(4.08)		(5.82)	(5.32)	(4.23)		(5.68)	(5.13)	(4.20)		(5.86)	(5.48)	(4.82)		(3.92)	(3.98)	(3.74)
Yearly and Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.1386	0.0482	0.1632	0.1955	0.3519	0.0638	0.3828	0.4318	0.3597	0.0607	0.3885	0.4288	0.3947	0.0740	0.4348	0.4818	0.4944	0.0648	0.5365	0.5689
Num. of Obs.	2,138	2,141	2,138	2,138	774	775	774	774	772	773	772	772	776	776	776	776	407	407	407	407

Note: This table reports the pooled OLS estimation results of the effects of DOLI (*DOLI_D*) on returns on equity. The data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 9 Does Firms with Greater DOLI Coverage Perform Better? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_M	-0.1478	-0.1164	-0.1543	-0.1545	-0.1418	-0.2344*	-0.1304	-0.1270	-0.1565	-0.2519**	-0.1470	-0.1400	-0.2427***	-0.3565***	-0.2560***	-0.1790**	-0.3070	-0.6668***	-0.5402**	-0.6067**
	(-1.48)	(-1.12)	(-1.56)	(-1.60)	(-1.45)	(-1.84)	(-1.35)	(-1.37)	(-1.63)	(-2.01)	(-1.56)	(-1.53)	(-2.66)	(-3.10)	(-2.86)	(-2.04)	(-1.42)	(-2.63)	(-2.22)	(-2.49)
IDD	5.0899***	4.5406***	5.3093***	5.6288***	3.7861***	4.8033***	4.7107***	5.3529***	3.5058**	4.6053***	4.3453***	5.0472***	3.3890**	5.2296***	4.5035***	5.2380***	2.4023	5.1283**	3.2521	3.4650
	(5.08)	(5.42)	(5.19)	(4.95)	(2.62)	(3.31)	(3.19)	(3.47)	(2.49)	(3.21)	(3.05)	(3.34)	(2.29)	(3.62)	(2.98)	(3.58)	(1.07)	(2.26)	(1.50)	(1.53)
LnAsset	1.9971***		1.6626***	1.7100**	2.1688***		1.6243*	1.6671**	1.9133***		1.3521*	1.4650**	2.5657***		2.0848***	2.0835***	2.2925***		1.6594**	1.5970**
	(4.01)		(2.59)	(2.52)	(2.86)		(1.93)	(2.33)	(2.66)		(1.69)	(2.07)	(5.29)		(3.64)	(3.79)	(3.06)		(1.96)	(1.97)
DEBT	-0.0210***		-0.0211***	-0.0208***	-0.1075***		-0.1067***	-0.1088***	-0.1063***		-0.1056***	-0.1079***	-0.1180***		-0.1193***	-0.1195***	-0.1284***		-0.1287***	-0.1280***
	(-3.70)		(-3.71)	(-3.65)	(-7.40)		(-6.98)	(-7.37)	(-7.27)		(-6.84)	(-7.23)	(-18.6)		(-17.6)	(-18.8)	(-19.1)		(-18.8)	(-20.1)
RD	-0.0455***		-0.0405***	-0.0442***	-0.0397***		-0.0347***	-0.0425***	-0.0403***		-0.0355***	-0.0427***	-0.0450***		-0.0395***	-0.0478***	-0.0429***		-0.0378***	-0.0418***
	(-2.89)		(-2.89)	(-3.30)	(-4.34)		(-4.37)	(-4.96)	(-4.31)		(-4.35)	(-4.84)	(-3.27)		(-3.26)	(-4.12)	(-3.63)		(-3.63)	(-4.31)
SALESG	0.0003		0.0003	0.0002	0.0254***		0.0242***	0.0224***	0.0256***		0.0244***	0.0227***	0.0510***		0.0507***	0.0402**	0.0715**		0.0728***	0.0659**
	(1.25)		(1.52)	(1.15)	(4.57)		(4.31)	(5.00)	(4.40)		(4.17)	(4.79)	(2.63)		(2.67)	(2.22)	(2.47)		(2.61)	(2.26)
AGE	0.0018		0.0792*	0.0203	-0.0327		0.0548	0.0271	-0.0409		0.0418	0.0165	-0.1008*		-0.0052	-0.1368*	-0.1109		-0.0225	-0.0871
	(0.04)		(1.81)	(0.43)	(-0.44)		(0.72)	(0.29)	(-0.56)		(0.56)	(0.18)	(-1.91)		(-0.09)	(-1.93)	(-1.33)		(-0.27)	(-0.79)
BOARD		-0.1615	-0.5730***	-0.5951***		-0.5324*	-1.0097***	-0.9063***		-0.4998	-0.9134***	-0.8596***		-0.4059	-1.0422***	-0.9650***		-0.4022	-1.0468***	-1.0200***
		(-1.03)	(-3.81)	(-3.90)		(-1.68)	(-3.70)	(-3.40)		(-1.59)	(-3.58)	(-3.30)		(-1.61)	(-4.90)	(-4.05)		(-0.82)	(-3.19)	(-2.73)
MANAHOLD		0.6486***	0.7230***	0.8399***		1.0195***	0.9669***	1.0434***		0.9556***	0.8961***	0.9753***		0.7111***	0.6749***	0.8400***		1.6277***	1.4576***	1.5697***
		(4.62)	(4.76)	(5.10)		(4.30)	(4.26)	(4.18)		(4.18)	(4.17)	(4.04)		(3.06)	(2.88)	(3.44)		(4.19)	(3.65)	(3.74)
PLEDGE		-0.0445*	-0.0649***	-0.0604***		0.0302	0.0227	0.0230		0.0232	0.0201	0.0195		0.0151	-0.0173	-0.0004		0.0785	-0.0009	0.0205
		(-1.84)	(-2.80)	(-2.65)		(0.79)	(0.66)	(0.65)		(0.62)	(0.60)	(0.56)		(0.38)	(-0.51)	(-0.01)		(1.41)	(-0.02)	(0.46)
INSTHOLD		0.1543***	0.1231***	0.1122***		0.2186***	0.1618***	0.1368***		0.2074***	0.1565***	0.1361***		0.1887***	0.1666***	0.1452***		0.2098***	0.1955***	0.1742***
		(7.41)	(4.91)	(4.09)		(5.87)	(5.33)	(4.24)		(5.73)	(5.14)	(4.21)		(5.93)	(5.50)	(4.84)		(4.00)	(4.03)	(3.75)
Yearly and Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.1389	0.0483	0.1635	0.1957	0.3523	0.0645	0.3831	0.4320	0.3600	0.0614	0.3888	0.4291	0.3956	0.0751	0.4358	0.4824	0.4953	0.0674	0.5383	0.5706
Num. of Obs.	2,138	2,141	2,138	2,138	774	775	774	774	772	773	772	772	776	776	776	776	407	407	407	407

Note: This table reports the pooled OLS estimation results of the regression analysis relating firm's returns on equity to DOLI purchasing amount (*DOLI_M*) and control variables. The data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 10 Does Firms with DOLI Perform Better? Two-stage Estimation

		Second Stage Main Predictor							
		DOLI_D				*DOLI_M*			
Variable	First Stage	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D		47.640***	43.289***	43.118***	37.024***				
		(4.87)	(5.66)	(4.39)	(3.89)				
DOLI_M						-3.1332***	-3.6355***	-3.1836***	-2.8472***
						(-3.91)	(-4.43)	(-4.16)	(-3.78)
IDD		4.7142***	3.8929***	5.1735***	5.6572***	4.6417***	3.8564***	5.1062***	5.6186***
		(4.63)	(4.24)	(5.25)	(5.71)	(4.44)	(4.05)	(5.02)	(5.68)
LnAsset	0.1527***	0.0250		-0.1500	0.1435	0.1604		-0.0326	0.2574
	(6.18)	(0.04)		(-0.24)	(0.24)	(0.26)		(-0.05)	(0.41)
DEBT	-0.0003*	-0.0208***		-0.0210***	-0.0208***	-0.0207***		-0.0209***	-0.0207***
	(-1.84)	(-10.9)		(-11.6)	(-12.4)	(-10.6)		(-11.2)	(-11.9)
RD		-0.0525***		-0.0470***	-0.0496***	-0.0529***		-0.0476***	-0.0500***
		(-4.10)		(-3.87)	(-3.87)	(-4.03)		(-3.79)	(-4.09)
SALESG		0.0003		0.0003	0.0002	0.0003		0.0003	0.0002
		(1.09)		(1.27)	(0.90)	(1.05)		(1.21)	(0.90)
AGE		0.0733*		0.1289***	0.0691	0.0683*		0.1236***	0.0625
		(1.88)		(3.36)	(1.57)	(1.70)		(3.12)	(1.42)
BOARD			-0.4475**	-0.6543***	-0.6644***		-0.4498**	-0.6582***	-0.6705***
			(-2.26)	(-3.38)	(-3.46)		(-2.19)	(-3.29)	(-3.49)
MANAHOLD	0.0336**		0.3139	0.3665	0.5244**		0.2804	0.3453	0.5039**
	(2.42)		(1.21)	(1.40)	(2.12)		(1.03)	(1.27)	(1.98)
PLEDGE			-0.0499**	-0.0564**	-0.0549**		-0.0493**	-0.0563**	-0.0550**
			(-2.18)	(-2.57)	(-2.56)		(-2.07)	(-2.49)	(-2.56)
INSTHOLD			0.1096***	0.1166***	0.1071***		0.1121***	0.1174***	0.1078***
			(4.83)	(5.25)	(4.79)		(4.76)	(5.12)	(4.80)
MVBV	0.1330***								
	(5.36)								
OBS	-0.0068**								
	(-2.30)								
Yearly and Ind. Dummies		NO	NO	NO	YES	NO	NO	NO	YES
Chi-square		256.94	115.56	320.60	419.80	257.00	120.38	317.37	419.30
Num. of Obs.		2,091	2.093	2.091	2.091	2,091	2.093	2,091	2,091

Note: This table reports the Heckman's (1979) two-stage estimation results of the effects of DOLL (*DOLI_D* and *DOLI_M*) on returns on equity. The data is yearly ranged from 2008 to 2010. Four model specifications of regression estimation for each explained variables. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

4.3 Comparisons of Managerial Pay

Table 7 presents the basic statistical results of difference for three measures of managerial pay between firm with DOLI versus without DOLI. Before matching, as shown in the second column, the differences is significantly positive for *PayT* and *PayA* (0.5939 and 0.2983, respectively), means that firm with DOLI has significantly higher total amount and average amount per manager. However, the difference between *PayR* is negative but insignificant. The evidence generally shows that firm with DOLI has higher level of managerial compensation. In columns 3 to 5 of Table 7, the evidence of higher managerial pay for firm with DOLI does not changed when first three matching methods are applied. The differences for *PayT* and *Pay*A are all significantly positive and for *PayR* is also positive under Mahala matching. In column 6, although the differences are negative, they are all insignificant. Besides, while Mahala Caliper matching losses many degree of freedom due to sample cutting, its estimation is less reliable, relative to first three methods. In summary, before matching, firm with DOLI statistically and significantly pay higher level to the management, and after-matching samples, firm with DOLI still pay inflated level (although decrease in magnitudes) to the management. Firm's adopting DOLI does not limit higher managerial pay.

4.4 Regression Estimation of DOLI on Managerial Pay

Table 11 reports the pooled OLS estimation results of the effects of DOLI on firm's total managerial pay (*PayT*). The evidence shows that before matching, no matter model specification is, estimated

coefficients of *DOLI_D* are all significant and positive (0.3244, 0.4758, 0.2690 and 0.1788, respectively), represents that firm with DOLI is associated with higher total managerial pay. This result is not altered under four sets of after-matching samples. 13 of 16 estimated coefficients of *DOLI_D* are significant positive and all of them are positive without significantly negative coefficients. This evidence shows that firm with DOLI is associated with inflated total managerial pay. Similar with Table 11, Table 12 reports the pooled OLS estimation results of the effects of DOLI on firm's average managerial pay (*PayA*). Similarly, before matching, no matter model specification is, estimated coefficients on *DOLI_D* are all significant and positive (0.1426, 0.2282, 0.1326 and 0.0805, respectively), represents that firm with DOLI is associated with higher average pay per manager. This result does not shift under four sets of after-matching samples. 10 of 16 estimated coefficients on *DOLI_D* are significant positive and all of them are positive and without significantly negative coefficients. Firms with DOLI tend to have higher average managerial pay.

Table 13 reports pooled OLS estimation results of the effects of DOLI on total managerial pay to earnings (*PayR*). Before matching, only in model (1), estimated coefficient of *DOLI_D* is significantly positive (3.4027). Under Mahala, in model (1), (3) and (4), coefficients on *DOLI_D* are significantly positive (3.7581, 3.9186 and 4.0159). However, several coefficients on DOLI dummy are negative means that firm with DOLI is associated with lower ratio of management pay ratio. Although we get overpay in total amount and average amount managerial pay, yet, the ratio of managerial pay to firm's earnings is not inflated. Table 14 reports the pooled OLS estimation results of the regression analysis relating firm's total amount of managerial pay (*PayT*) to firm's purchasing amount of DOLI (*DOLI_M*) and control variables. Table 15 and Table 16 are similar with Table 14, and the only difference is that the dependent variables are replaced by firm's average amount of management pay (*PayA*) and ratio of managerial pay to earnings (*PayR*). From three table, also parallel to Table 11, 12 and 13, evidence generally shows that firm with DOLI is associated with higher total amount and average amount of managerial pay, but not with the ratio of managerial pay to earnings. Based on underperformance of profitability, firm with DOLI is overpaid in total amount and average amount managerial pay, and the ratio of managerial pay to firm's earnings is not inflated. As a robustness check, Table 17 reports Heckman's (1979) two-stage estimation results of the effects of DOLI on firm's total amount of managerial pay (*PayT*). The first stage is a probability model determining samples are in firm with DOLI or firm without DOLI, the second stage, explained variable is *PayT*. In Table 17, first stage, coefficients of *LnAsset*, *MVBV* and *MANAHOLD* are significantly positive (0.1512, 0.1333 and 0.0365, respectively), represent that firm with larger scale, higher growth opportunity and higher managerial ownership tends to purchasing DOLI. Estimated coefficients of *DEBT* and *OBS* are significantly negative (-0.0003 and -0.0065, respectively), means that firm with lower debt to equity ratio and higher outside block shareholdings tends to purchasing DOLI. At the second stage, when *DOLI_D* is considered, regardless of which models, all estimated coefficients of *DOLI_D* are positive and significant (5.3007, 7.6460, 3.2296 and 1.9946), means that firm with DOLI is associated with higher total amount of management pay. When firm's purchasing amount of DOLI (*DOLI_M*) is considered, estimated coefficients are all significantly positive (0.1456, 0.1871, 0.1791 and 0.1918), means that higher DOLI coverage is associated higher total managerial pay.

Table 11 Does Firms with DOLI Have Lower Total Managerial Pay (*PayT*)? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D	0.3244***	0.4758***	0.2690***	0.1788***	0.2676***	0.2534***	0.2705***	0.1630***	0.2639***	0.2516***	0.2685***	0.1626**	0.2760***	0.2977***	0.2664***	0.1586***	0.2163	0.4685**	0.1708	0.0259
	(7.09)	(7.86)	(5.95)	(4.04)	(4.21)	(3.27)	(4.32)	(2.58)	(4.14)	(3.24)	(4.28)	(2.57)	(4.58)	(3.98)	(4.49)	(2.79)	(1.38)	(2.48)	(1.11)	(0.18)
LnAsset	0.4552***		0.5079***	0.5147***	0.4734***		0.5279***	0.5283***	0.4736***		0.5282***	0.5292*	0.4997***		0.5597***	0.5607***	0.5864***		0.6473***	0.6204***
	(25.8)		(27.0)	(28.0)	(16.4)		(17.7)	(17.9)	(16.4)		(17.7)	(17.9)	(17.3)		(18.7)	(21.0)	(20.4)		(20.3)	(19.0)
DEBT	-0.0003***		-0.0003***	-0.0004***	0.0000		-0.0001	0.0000	0.0000		-0.0001	0.0000	0.0000		0.0000	-0.0001	0.0002		0.0003	0.0000
	(-7.45)		(-8.12)	(-6.67)	(-0.11)		(-0.28)	(0.11)	(-0.12)		(-0.31)	(0.02)	(0.13)		(0.01)	(-0.44)	(0.91)		(0.84)	(0.09)
CDDummy	0.3494***		0.3034***	0.2733***	0.2035**		0.1811**	0.2443***	0.1916**		0.1714*	0.2484***	0.2716***		0.2289***	0.2808***	0.2834**		0.2696**	0.3767***
	(7.49)		(6.64)	(6.24)	(2.25)		(2.07)	(3.10)	(2.07)		(1.92)	(3.09)	(3.28)		(2.75)	(3.60)	(2.43)		(2.37)	(3.49)
OP	0.0103***		0.0091***	0.0093***	0.0154***		0.0131***	0.0116***	0.0162***		0.0137***	0.0109***	0.0131***		0.0133***	0.0136***	0.0130***		0.0138***	0.0102**
	(4.53)		(3.90)	(4.53)	(4.31)		(3.88)	(3.76)	(3.86)		(3.44)	(3.02)	(3.33)		(3.40)	(3.89)	(2.66)		(2.83)	(2.26)
MVBV	0.0907***		0.1000***	0.1203***	0.1277***		0.1395***	0.1526***	0.1348***		0.1467***	0.1607***	0.0991***		0.1187***	0.1305***	0.1029***		0.1334***	0.1608***
	(5.98)		(6.53)	(7.27)	(5.97)		(6.41)	(7.13)	(5.55)		(5.76)	(5.91)	(4.29)		(5.16)	(5.22)	(3.66)		(4.52)	(4.85)
STDRET	0.0133		-0.0027	-0.0297	-0.0069		-0.0187	-0.0744*	-0.0094		-0.0204	-0.0755**	-0.0036		-0.0102	-0.0659*	-0.0054		-0.0067	-0.0784
	(1.02)		(-0.20)	(-1.53)	(-0.22)		(-0.57)	(-1.95)	(-0.29)		(-0.62)	(-1.97)	(-0.13)		(-0.35)	(-1.95)	(-0.14)		(-0.17)	(-1.55)
MANAHOLD		0.0685***	0.0732***	0.0538***		0.0702***	0.0727***	0.0528***		0.0698***	0.0726***	0.0530***		0.0466***	0.0808***	0.0465***		0.0570**	0.0823***	0.0667***
		(6.76)	(8.60)	(6.60)		(5.23)	(5.85)	(5.16)		(5.20)	(5.82)	(5.18)		(2.65)	(5.66)	(3.50)		(2.22)	(4.45)	(3.64)
INSTHOLD		0.0116***	-0.0030***	-0.0024**		0.0160***	-0.0018	0.0001		0.0159***	-0.0018	0.0001		0.0148***	-0.0032**	-0.0028*		0.0146***	-0.0072***	-0.0048**
		(10.2)	(-3.02)	(-2.39)		(7.80)	(-0.97)	(0.07)		(7.73)	(-0.99)	(0.05)		(7.38)	(-2.07)	(-1.79)		(4.94)	(-3.65)	(-1.98)
BOARD		0.0627***	-0.0030	-0.0013		0.0618***	-0.0196	-0.0273		0.0619***	-0.0197	-0.0272		0.0674***	-0.0119	-0.0109		0.1103***	0.0425**	0.0316
		(5.91)	(-0.32)	(-0.14)		(2.89)	(-1.01)	(-1.41)		(2.89)	(-1.01)	(-1.41)		(3.48)	(-0.72)	(-0.70)		(3.58)	(2.24)	(1.47)
IDR		0.0065***	0.0050***	-0.0009		0.0032	0.0033*	-0.0035*		0.0031	0.0031	-0.0035*		0.0011	-0.0002	-0.0089***		0.0008	-0.0005	-0.0064**
		(4.48)	(4.25)	(-0.71)		(1.27)	(1.72)	(-1.75)		(1.25)	(1.61)	(-1.76)		(0.42)	(-0.12)	(-4.77)		(0.21)	(-0.23)	(-2.61)
Yearly & Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.4442	0.1523	0.4784	0.5314	0.4398	0.1540	0.4699	0.5446	0.4403	0.1528	0.4701	0.5439	0.4816	0.1439	0.5064	0.6090	0.5987	0.1723	0.6375	0.7039
Num. of Obs.	2,079	2,123	2,079	2,079	774	782	774	774	772	780	772	772	775	782	775	775	407	414	407	407

Note: This table reports the pooled OLS estimation results of the regression analysis relating firm's total managerial pay (*PayT*) to DOLI dummy (*DOLI_D*) and control variables. The data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 12 Does Firms with DOLI Have Lower Average Managerial Pay (*PayA*)? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D	0.1426***	0.2282***	0.1326***	0.0805***	0.1164***	0.1003**	0.1167***	0.0429	0.1144***	0.0984**	0.1156***	0.0431	0.1191***	0.1183**	0.1251***	0.0607	0.0398	0.1714	0.0857	0.0254
	(4.58)	(5.97)	(4.19)	(2.62)	(2.75)	(2.02)	(2.73)	(1.03)	(2.70)	(1.98)	(2.71)	(1.03)	(2.95)	(2.45)	(3.04)	(1.49)	(0.34)	(1.43)	(0.76)	(0.19)
LnAsset	0.2309***		0.2366***	0.2389***	0.2533***		0.2560***	0.2548***	0.2531***		0.2561***	0.2551***	0.2594***		0.2608***	0.2586***	0.2829***		0.2796***	0.2626***
	(22.9)		(19.0)	(19.3)	(14.6)		(11.9)	(12.0)	(14.5)		(12.0)	(12.0)	(15.4)		(12.6)	(12.8)	(12.7)		(10.8)	(10.1)
DEBT	-0.0002***		-0.0002***	-0.0003***	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0001	0.0000	0.0001		0.0002	0.0000
	(-7.20)		(-7.05)	(-9.04)	(-0.04)		(0.08)	(0.30)	(0.11)		(0.20)	(0.32)	(0.01)		(0.30)	(0.12)	(0.34)		(0.80)	(0.22)
CDDummy	0.2677***		0.2547***	0.2438***	0.2016***		0.1974***	0.2504***	0.1867***		0.1833***	0.2472***	0.2167***		0.2061***	0.2226***	0.2081***		0.2366***	0.3033***
	(8.41)		(7.99)	(7.88)	(3.29)		(3.22)	(4.73)	(2.98)		(2.94)	(4.55)	(4.06)		(3.74)	(4.09)	(2.60)		(2.90)	(3.70)
OP	0.0121***		0.0119***	0.0117***	0.0147***		0.0142***	0.0127***	0.0161***		0.0156***	0.0130***	0.0140***		0.0146***	0.0147***	0.0142***		0.0151***	0.0128***
	(6.36)		(6.06)	(6.79)	(5.52)		(5.44)	(5.66)	(5.53)		(5.47)	(5.01)	(5.22)		(5.29)	(5.36)	(3.74)		(3.97)	(3.44)
MVBV	0.0500***		0.0531***	0.0762***	0.0706***		0.0725***	0.0887***	0.0707***		0.0731***	0.0889***	0.0601***		0.0666***	0.0784***	0.0672***		0.0690***	0.0884***
	(4.30)		(4.53)	(6.53)	(4.59)		(4.60)	(6.16)	(4.52)		(4.49)	(4.97)	(3.42)		(3.72)	(3.85)	(2.94)		(2.80)	(3.14)
STDRET	0.0080		0.0070	-0.0059	-0.0110		-0.0105	-0.0253	-0.0134		-0.0125	-0.0258	0.0030		0.0086	-0.0128	-0.0153		-0.0015	-0.0266
	(0.86)		(0.71)	(-0.42)	(-0.55)		(-0.51)	(-1.17)	(-0.67)		(-0.60)	(-1.18)	(0.15)		(0.40)	(-0.53)	(-0.59)		(-0.06)	(-0.91)
MANAHOLD		0.0273***	0.0214***	0.0134***		0.0248***	0.0197***	0.0132**		0.0245***	0.0193***	0.0132**		0.0042	0.0161*	0.0049		-0.0022	0.0001	-0.0005
		(4.40)	(4.46)	(2.80)		(3.16)	(2.85)	(2.11)		(3.11)	(2.79)	(2.10)		(0.44)	(1.87)	(0.56)		(-0.17)	(0.01)	(-0.04)
INSTHOLD		0.0075***	-0.0009	-0.0001		0.0101***	-0.0003	0.0014		0.0101***	-0.0004	0.0014		0.0084***	-0.0017	-0.0010		0.0085***	-0.0031**	-0.0014
		(10.8)	(-1.25)	(-0.09)		(7.76)	(-0.25)	(1.16)		(7.70)	(-0.29)	(1.14)		(6.68)	(-1.54)	(-0.95)		(4.73)	(-2.19)	(-0.93)
BOARD		0.0458***	0.0147**	0.0130**		0.0507***	0.0127	0.0036		0.0507***	0.0125	0.0036		0.0621***	0.0270**	0.0200*		0.0816***	0.0558***	0.0461***
		(7.06)	(2.49)	(2.21)		(3.91)	(1.06)	(0.29)		(3.91)	(1.04)	(0.29)		(5.16)	(2.44)	(1.77)		(4.27)	(3.60)	(2.68)
IDR		0.0031***	0.0009	-0.0022***		0.0019	0.0005	-0.0031**		0.0019	0.0004	-0.0031**		0.0026*	0.0002	-0.0037***		0.0032	0.0011	-0.0016
		(3.51)	(1.21)	(-2.70)		(1.24)	(0.41)	(-2.25)		(1.22)	(0.29)	(-2.26)		(1.65)	(0.19)	(-2.75)		(1.42)	(0.65)	(-0.90)
Yearly & Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.3955	0.1367	0.4040	0.4563	0.3959	0.1513	0.4017	0.4890	0.3977	0.1504	0.4032	0.4879	0.4113	0.1503	0.4218	0.4923	0.4639	0.1825	0.4915	0.5654
Num. of Obs.	2,079	2,123	2,079	2,079	774	782	774	774	772	780	772	772	775	782	775	775	407	414	407	407

Note: This table reports the pooled OLS estimation results of the regression analysis relating firm's total pay per manager (*PayA*) to DOLI dummy (*DOLI_D*) and control variables. The data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 13 Does Firms with DOLI Have Lower Managerial Pay Ratio (*PayR*)? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D	3.4027*	-0.4250	2.5361	1.3241	1.5156	-1.1175	1.5626	-1.7863	1.5623	-1.1343	1.5907	-1.7913	3.7581*	3.4707	3.9186*	4.0159*	-5.5250	-3.9883	-5.7728	-2.4258
	(1.67)	(-0.19)	(1.21)	(0.62)	(0.49)	(-0.30)	(0.48)	(-0.43)	(0.50)	(-0.30)	(0.49)	(-0.43)	(1.82)	(1.59)	(1.86)	(1.93)	(-0.63)	(-0.44)	(-0.63)	(-0.29)
LnAsset	-2.3043***		-1.8995**	-1.8180*	-1.1953		-1.6585	-1.9226	-1.1848		-1.6391	-1.9247	-2.2435***		-1.8867**	-2.1229**	-2.2629**		-1.7812	-2.0896
	(-3.57)		(-2.08)	(-1.78)	(-1.03)		(-0.85)	(-0.83)	(-1.02)		(-0.84)	(-0.83)	(-3.88)		(-2.52)	(-2.51)	(-2.19)		(-1.23)	(-1.32)
DEBT	-0.0224		-0.0238	-0.0178	-0.0312		-0.0293	-0.0450	-0.0312		-0.0294	-0.0448	0.0236		0.0270	0.0327	0.0544		0.0524	0.0507
	(-1.13)		(-1.21)	(-0.88)	(-0.64)		(-0.64)	(-0.87)	(-0.64)		(-0.64)	(-0.87)	(0.70)		(0.82)	(0.93)	(0.83)		(0.87)	(0.76)
CDDummy	-26.017***		-26.988***	-27.917***	-50.687***		-50.481***	-51.126***	-50.641***		-50.447***	-51.167***	-35.251***		-35.490***	-33.428***	-54.363***		-54.382***	-52.934***
	(-4.42)		(-4.65)	(-4.68)	(-3.17)		(-3.21)	(-3.16)	(-3.17)		(-3.21)	(-3.16)	(-3.71)		(-3.72)	(-3.55)	(-3.00)		(-3.01)	(-2.98)
OP	-0.7464***		-0.7956***	-0.9891***	-0.7211***		-0.7651***	-1.2203***	-0.7137***		-0.7592***	-1.2278***	-0.4877***		-0.4476***	-0.5138***	-0.4026***		-0.3654**	-0.4527***
	(-5.89)		(-5.39)	(-5.30)	(-3.61)		(-3.00)	(-3.34)	(-3.56)		(-2.96)	(-3.33)	(-4.26)		(-3.80)	(-3.98)	(-2.75)		(-2.34)	(-2.93)
MVBV	-0.6017		-0.6591	1.0819*	-0.1471		-0.1827	3.0162**	-0.3047		-0.3250	3.1881**	-0.5357		-0.3472	0.8055	-0.4055		-0.0784	0.8809
	(-1.35)		(-1.40)	(1.75)	(-0.22)		(-0.26)	(2.42)	(-0.40)		(-0.41)	(2.32)	(-1.00)		(-0.67)	(1.43)	(-0.56)		(-0.11)	(1.19)
STDRET	-0.3454		-0.6431	-1.8707**	-0.8089		-0.8047	-4.2705	-0.7829		-0.7867	-4.3192	-0.5079		-0.4128	-1.9119*	-0.6555		-0.6706	-2.5123
	(-0.71)		(-1.36)	(-2.25)	(-0.67)		(-0.66)	(-1.53)	(-0.64)		(-0.65)	(-1.54)	(-0.67)		(-0.51)	(-1.69)	(-0.62)		(-0.60)	(-1.35)
MANAHOLD		0.3645	0.6727*	0.4838		-0.0177	0.2022	-0.1624		-0.0181	0.2006	-0.1588		0.5279	0.5766	0.5469		1.1992	1.0184	0.5997
		(0.93)	(1.75)	(1.30)		(-0.04)	(0.41)	(-0.27)		(-0.04)	(0.41)	(-0.27)		(0.92)	(1.00)	(0.88)		(1.10)	(1.07)	(0.64)
INSTHOLD		-0.1651***	-0.0097	-0.0270		-0.1635**	0.0587	0.0292		-0.1628**	0.0582	0.0282		-0.1969***	-0.0444	-0.0594		-0.2430**	-0.0422	-0.0342
		(-3.41)	(-0.16)	(-0.40)		(-2.11)	(0.44)	(0.19)		(-2.09)	(0.43)	(0.18)		(-3.58)	(-0.79)	(-0.95)		(-2.46)	(-0.40)	(-0.28)
BOARD		-0.3544	0.1754	0.2134		-0.2863	0.0158	-0.0096		-0.2887	0.0125	-0.0049		-0.2618	0.2586	0.3372		0.1174	0.3593	0.4739
		(-1.31)	(0.76)	(0.90)		(-0.70)	(0.04)	(-0.02)		(-0.70)	(0.03)	(-0.01)		(-1.01)	(1.10)	(1.41)		(0.25)	(0.84)	(0.85)
IDR		-0.0529	0.1204*	0.0445		-0.1489*	-0.0218	-0.0736		-0.1493*	-0.0190	-0.0753		-0.1540***	-0.0305	-0.0579		-0.1872*	-0.0789	-0.1063
		(-0.81)	(1.80)	(0.49)		(-1.72)	(-0.31)	(-0.60)		(-1.72)	(-0.27)	(-0.61)		(-2.61)	(-0.65)	(-0.96)		(-1.89)	(-1.01)	(-1.00)
Yearly & Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.0974	0.0104	0.1014	0.1213	0.1356	0.0098	0.1370	0.1832	0.1366	0.0097	0.1371	0.1833	0.2179	0.0434	0.2211	0.2452	0.2671	0.0465	0.2722	0.2950
Num. of Obs.	1,689	1,726	1,689	1,689	654	662	654	654	653	661	653	653	653	660	653	653	334	341	334	334

Note: This table reports the pooled OLS estimation results of the regression analysis relating firm's ratio of total Managerial pay to earnings (*PayR*) to DOLI dummy (*DOLI_D*) and control variables. The data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 14 Does Firms with Greater DOLI Coverage Have Lower Total Managerial Pay (*PayT*)? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_M	0.0279***	0.0418***	0.0234***	0.0161***	0.0239***	0.0256***	0.0241***	0.0154***	0.0236***	0.0255***	0.0239***	0.0154***	0.0244***	0.0291***	0.0236***	0.0150***	0.0299**	0.0834***	0.0266***	0.0188
	(7.48)	(8.43)	(6.31)	(4.43)	(4.59)	(4.03)	(4.68)	(2.96)	(4.52)	(4.00)	(4.64)	(2.95)	(4.93)	(4.74)	(4.83)	(3.23)	(2.31)	(4.87)	(2.09)	(1.57)
LnAsset	0.4522***		0.5052***	0.5127***	0.4690***		0.5238***	0.5257***	0.4693***		0.5241***	0.5266***	0.4951***		0.5550***	0.5575***	0.5745***		0.6360***	0.6109***
	(25.6)		(26.9)	(27.9)	(16.2)		(17.5)	(17.8)	(16.2)		(17.5)	(17.7)	(17.1)		(18.5)	(20.9)	(19.4)		(19.4)	(18.3)
DEBT	-0.0003***		-0.0003***	-0.0004***	0.0000		-0.0001	0.0000	0.0000		-0.0001	0.0000	0.0000		0.0000	-0.0001	0.0002		0.0003	0.0000
	(-7.42)		(-8.10)	(-6.67)	(-0.12)		(-0.30)	(0.08)	(-0.14)		(-0.33)	(-0.01)	(0.11)		(-0.01)	(-0.48)	(0.92)		(0.86)	(0.13)
CDDummy	0.3515***		0.3055***	0.2750***	0.2085**		0.1861**	0.2477***	0.1967**		0.1764**	0.2518***	0.2766***		0.2342***	0.2841***	0.2960**		0.2841***	0.3900***
	(7.54)		(6.69)	(6.28)	(2.32)		(2.13)	(3.15)	(2.14)		(1.98)	(3.14)	(3.34)		(2.82)	(3.65)	(2.56)		(2.51)	(3.65)
OP	0.0103***		0.0091***	0.0093***	0.0153***		0.0130***	0.0116***	0.0160***		0.0137***	0.0108***	0.0131***		0.0134***	0.0137***	0.0128***		0.0138***	0.0103**
	(4.52)		(3.91)	(4.54)	(4.29)		(3.89)	(3.77)	(3.85)		(3.44)	(3.02)	(3.33)		(3.42)	(3.90)	(2.63)		(2.85)	(2.31)
MVBV	0.0898***		0.0994***	0.1199***	0.1271***		0.1395***	0.1529***	0.1341***		0.1466***	0.1610***	0.0985***		0.1184***	0.1305***	0.1005***		0.1315***	0.1593***
	(5.95)		(6.51)	(7.26)	(5.98)		(6.43)	(7.15)	(5.53)		(5.77)	(5.92)	(4.27)		(5.15)	(5.23)	(3.56)		(4.45)	(4.77)
STDRET	0.0132		-0.0024	-0.0295	-0.0079		-0.0192	-0.0745*	-0.0103		-0.0208	-0.0756**	-0.0029		-0.0089	-0.0644*	-0.0098		-0.0097	-0.0818
	(1.03)		(-0.18)	(-1.52)	(-0.25)		(-0.59)	(-1.95)	(-0.32)		(-0.63)	(-1.97)	(-0.10)		(-0.31)	(-1.91)	(-0.27)		(-0.25)	(-1.61)
MANAHOLD		0.0683***	0.0730***	0.0537***		0.0710***	0.0728***	0.0531***		0.0706***	0.0727***	0.0534***		0.0470***	0.0805***	0.0466***		0.0528**	0.0799***	0.0647***
		(6.75)	(8.59)	(6.59)		(5.29)	(5.88)	(5.19)		(5.26)	(5.85)	(5.21)		(2.68)	(5.64)	(3.51)		(2.12)	(4.34)	(3.56)
INSTHOLD		0.0115***	-0.0030***	-0.0024**		0.0158***	-0.0018	0.0001		0.0158***	-0.0018	0.0000		0.0146***	-0.0033**	-0.0028*		0.0133***	-0.0074***	-0.0050**
		(10.1)	(-3.04)	(-2.42)		(7.75)	(-1.01)	(0.04)		(7.68)	(-1.02)	(0.02)		(7.32)	(-2.10)	(-1.82)		(4.59)	(-3.72)	(-2.07)
BOARD		0.0625***	-0.0028	-0.0011		0.0612***	-0.0196	-0.0271		0.0613***	-0.0197	-0.0271		0.0677***	-0.0113	-0.0103		0.1123***	0.0441**	0.0342
		(5.91)	(-0.31)	(-0.13)		(2.88)	(-1.01)	(-1.41)		(2.89)	(-1.02)	(-1.41)		(3.53)	(-0.69)	(-0.67)		(3.80)	(2.35)	(1.61)
IDR		0.0063***	0.0049***	-0.0009		0.0027	0.0031	-0.0037*		0.0027	0.0028	-0.0037*		0.0008	-0.0004	-0.0090***		-0.0003	-0.0009	-0.0068***
		(4.38)	(4.17)	(-0.75)		(1.10)	(1.60)	(-1.83)		(1.09)	(1.49)	(-1.84)		(0.30)	(-0.21)	(-4.84)		(-0.09)	(-0.36)	(-2.73)
Yearly & Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.4458	0.1570	0.4796	0.5322	0.4425	0.1601	0.4724	0.5460	0.4429	0.1588	0.4725	0.5453	0.4843	0.1515	0.5088	0.6105	0.6016	0.2004	0.6399	0.7052
Num. of Obs.	2,079	2,123	2,079	2,079	774	782	774	774	772	780	772	772	775	782	775	775	407	414	407	407

Note: This table reports the pooled OLS estimation results of the effects of DOLI on the total amount of managerial pay (*PayT*). Data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 15 Does Firms with Greater DOLI Coverage Have Lower Average Managerial Pay (*PayA*)? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_M	0.0122***	0.0198***	0.0114***	0.0072***	0.0102***	0.0101**	0.0102***	0.0043	0.0100***	0.0100**	0.0101***	0.0043	0.0103***	0.0116***	0.0109***	0.0058*	0.0081	0.0318***	0.0117	0.0102
	(4.75)	(6.25)	(4.35)	(2.83)	(2.91)	(2.47)	(2.89)	(1.25)	(2.86)	(2.43)	(2.86)	(1.25)	(3.11)	(2.90)	(3.20)	(1.73)	(0.83)	(3.09)	(1.22)	(0.94)
LnAsset	0.2296***		0.2354***	0.2380***	0.2514***		0.2542***	0.2542***	0.2513***		0.2543***	0.2544***	0.2575***		0.2587***	0.2573***	0.2793***		0.2748***	0.2576***
	(22.8)		(18.9)	(19.3)	(14.4)		(11.8)	(12.0)	(14.4)		(11.9)	(11.9)	(15.4)		(12.5)	(12.8)	(12.1)		(10.2)	(9.53)
DEBT	-0.0002***		-0.0002***	-0.0003***	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0001	0.0000	0.0001		0.0002	0.0000
	(-7.19)		(-7.04)	(-9.03)	(-0.05)		(0.07)	(0.28)	(0.10)		(0.18)	(0.30)	(0.00)		(0.29)	(0.11)	(0.34)		(0.81)	(0.25)
CDDummy	0.2686***		0.2557***	0.2446***	0.2036***		0.1994***	0.2514***	0.1887***		0.1854***	0.2482***	0.2187***		0.2084***	0.2239***	0.2125***		0.2423***	0.3099***
	(8.44)		(8.03)	(7.91)	(3.33)		(3.26)	(4.76)	(3.02)		(2.98)	(4.58)	(4.10)		(3.79)	(4.12)	(2.66)		(2.96)	(3.81)
OP	0.0121***		0.0119***	0.0117***	0.0146***		0.0142***	0.0127***	0.0160***		0.0156***	0.0130***	0.0140***		0.0146***	0.0148***	0.0141***		0.0151***	0.0128***
	(6.36)		(6.07)	(6.79)	(5.52)		(5.45)	(5.67)	(5.53)		(5.48)	(5.01)	(5.23)		(5.31)	(5.37)	(3.74)		(3.99)	(3.49)
MVBV	0.0497***		0.0529***	0.0760***	0.0704***		0.0724***	0.0888***	0.0704***		0.0730***	0.0890***	0.0598***		0.0665***	0.0785***	0.0663***		0.0683***	0.0876***
	(4.28)		(4.52)	(6.52)	(4.59)		(4.61)	(6.17)	(4.51)		(4.49)	(4.97)	(3.41)		(3.72)	(3.85)	(2.90)		(2.77)	(3.11)
STDRET	0.0080		0.0071	-0.0058	-0.0114		-0.0107	-0.0253	-0.0138		-0.0127	-0.0258	0.0032		0.0091	-0.0122	-0.0170		-0.0026	-0.0282
	(0.86)		(0.72)	(-0.41)	(-0.57)		(-0.52)	(-1.17)	(-0.69)		(-0.61)	(-1.18)	(0.16)		(0.43)	(-0.51)	(-0.66)		(-0.10)	(-0.98)
MANAHOLD		0.0272***	0.0213***	0.0134***		0.0251***	0.0197***	0.0133**		0.0248***	0.0193***	0.0133**		0.0043	0.0159*	0.0050		-0.0038	-0.0008	-0.0014
		(4.39)	(4.44)	(2.79)		(3.20)	(2.86)	(2.13)		(3.16)	(2.79)	(2.12)		(0.46)	(1.85)	(0.57)		(-0.30)	(-0.07)	(-0.13)
INSTHOLD		0.0075***	-0.0009	-0.0001		0.0100***	-0.0003	0.0014		0.0100***	-0.0004	0.0014		0.0083***	-0.0017	-0.0011		0.0080***	-0.0032**	-0.0015
		(10.8)	(-1.27)	(-0.11)		(7.74)	(-0.27)	(1.14)		(7.68)	(-0.31)	(1.12)		(6.64)	(-1.56)	(-0.97)		(4.51)	(-2.23)	(-1.00)
BOARD		0.0457***	0.0147**	0.0131**		0.0504***	0.0127	0.0036		0.0505***	0.0126	0.0037		0.0622***	0.0272**	0.0202*		0.0825***	0.0564***	0.0473***
		(7.06)	(2.51)	(2.23)		(3.91)	(1.06)	(0.29)		(3.91)	(1.05)	(0.30)		(5.20)	(2.47)	(1.80)		(4.42)	(3.68)	(2.79)
IDR		0.0030***	0.0009	-0.0022***		0.0017	0.0005	-0.0032**		0.0017	0.0003	-0.0032**		0.0025	0.0002	-0.0037***		0.0027	0.0010	-0.0018
		(3.44)	(1.16)	(-2.73)		(1.13)	(0.35)	(-2.29)		(1.11)	(0.23)	(-2.31)		(1.58)	(0.13)	(-2.78)		(1.23)	(0.57)	(-0.99)
Yearly & Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.3962	0.1390	0.4046	0.4567	0.3968	0.1537	0.4025	0.4894	0.3986	0.1527	0.4041	0.4883	0.4122	0.1533	0.4228	0.4928	0.4646	0.1930	0.4925	0.5664
Num. of Obs.	2,079	2,123	2,079	2,079	774	782	774	774	772	780	772	772	775	782	775	775	407	414	407	407

Note: This table reports the pooled OLS estimation results of the effects of DOLI on the managerial pay per manager (*PayA*). Data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 16 Does Firms with Greater DOLI Coverage Have Lower Managerial Pay Ratio (*PayR*)? Pooled OLS Estimation

	Before Matching				Matching Algorithm															
					Nearest				Caliper				Mahala				Mahala Caliper			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_M	0.2839*	-0.0449	0.2113	0.1132	0.1311	-0.1062	0.1351	-0.1281	0.1348	-0.1076	0.1372	-0.1284	0.3083*	0.2685	0.3215*	0.3294**	-0.3677	-0.3774	-0.3916	-0.1375
	(1.74)	(-0.25)	(1.26)	(0.66)	(0.53)	(-0.35)	(0.52)	(-0.39)	(0.54)	(-0.35)	(0.53)	(-0.39)	(1.86)	(1.55)	(1.91)	(1.96)	(-0.54)	(-0.54)	(-0.55)	(-0.21)
LnAsset	-2.3271***		-1.9172**	-1.8288*	-1.2155		-1.6802	-1.8947	-1.2056		-1.6612	-1.8968	-2.2929***		-1.9416***	-2.1785***	-2.1595*		-1.6703	-2.0570
	(-3.59)		(-2.09)	(-1.79)	(-1.04)		(-0.87)	(-0.83)	(-1.03)		(-0.85)	(-0.83)	(-3.88)		(-2.59)	(-2.58)	(-1.95)		(-1.16)	(-1.31)
DEBT	-0.0224		-0.0239	-0.0178	-0.0313		-0.0294	-0.0448	-0.0313		-0.0295	-0.0447	0.0235		0.0268	0.0325	0.0546		0.0526	0.0508
	(-1.13)		(-1.21)	(-0.88)	(-0.65)		(-0.64)	(-0.87)	(-0.65)		(-0.64)	(-0.87)	(0.69)		(0.81)	(0.93)	(0.84)		(0.87)	(0.76)
CDDummy	-26.008***		-26.979***	-27.912***	-50.684***		-50.476***	-51.155***	-50.637***		-50.442***	-51.197***	-35.243***		-35.473***	-33.411***	-54.329***		-54.355***	-52.912***
	(-4.42)		(-4.65)	(-4.68)	(-3.17)		(-3.21)	(-3.16)	(-3.17)		(-3.20)	(-3.16)	(-3.71)		(-3.72)	(-3.55)	(-3.00)		(-3.01)	(-2.98)
ROE	-0.7484***		-0.7969***	-0.9898***	-0.7238***		-0.7673***	-1.2186***	-0.7164***		-0.7614***	-1.2260***	-0.4911***		-0.4506***	-0.5171***	-0.3986***		-0.3607**	-0.4505***
	(-5.90)		(-5.40)	(-5.31)	(-3.63)		(-3.02)	(-3.37)	(-3.57)		(-2.98)	(-3.35)	(-4.30)		(-3.83)	(-4.01)	(-2.73)		(-2.32)	(-2.93)
MVBV	-0.6010		-0.6580	1.0822*	-0.1435		-0.1774	3.0084**	-0.3014		-0.3196	3.1796**	-0.5331		-0.3435	0.8130	-0.4287		-0.1020	0.8710
	(-1.35)		(-1.40)	(1.75)	(-0.22)		(-0.25)	(2.43)	(-0.40)		(-0.40)	(2.34)	(-0.99)		(-0.67)	(1.44)	(-0.59)		(-0.14)	(1.17)
STDRET	-0.3437		-0.6407	-1.8690**	-0.8107		-0.8051	-4.2650	-0.7847		-0.7871	-4.3134	-0.5052		-0.4068	-1.9075*	-0.6725		-0.6822	-2.5222
	(-0.71)		(-1.36)	(-2.25)	(-0.67)		(-0.67)	(-1.53)	(-0.64)		(-0.65)	(-1.54)	(-0.67)		(-0.50)	(-1.67)	(-0.63)		(-0.61)	(-1.36)
MANAHOLD		0.3655	0.6710*	0.4827		-0.0183	0.2017	-0.1576		-0.0187	0.2000	-0.1539		0.5279	0.5705	0.5406		1.2085	1.0142	0.5938
		(0.93)	(1.75)	(1.30)		(-0.04)	(0.41)	(-0.27)		(-0.04)	(0.41)	(-0.26)		(0.92)	(1.00)	(0.87)		(1.12)	(1.08)	(0.64)
INSTHOLD		-0.1648***	-0.0098	-0.0271		-0.1627**	0.0585	0.0290		-0.1620**	0.0580	0.0281		-0.1983***	-0.0448	-0.0599		-0.2381**	-0.0429	-0.0353
		(-3.40)	(-0.16)	(-0.41)		(-2.07)	(0.44)	(0.19)		(-2.05)	(0.43)	(0.18)		(-3.56)	(-0.79)	(-0.96)		(-2.31)	(-0.40)	(-0.29)
BOARD		-0.3546	0.1764	0.2142		-0.2854	0.0170	-0.0098		-0.2878	0.0136	-0.0050		-0.2684	0.2620	0.3387		0.1185	0.3736	0.4879
		(-1.31)	(0.77)	(0.90)		(-0.70)	(0.04)	(-0.02)		(-0.70)	(0.03)	(-0.01)		(-1.02)	(1.11)	(1.41)		(0.24)	(0.86)	(0.86)
IDR		-0.0525	0.1200*	0.0442		-0.1477*	-0.0226	-0.0740		-0.1481*	-0.0198	-0.0757		-0.1537***	-0.0312	-0.0586		-0.1849*	-0.0783	-0.1062
		(-0.80)	(1.80)	(0.49)		(-1.71)	(-0.33)	(-0.60)		(-1.71)	(-0.28)	(-0.62)		(-2.61)	(-0.66)	(-0.97)		(-1.87)	(-0.99)	(-1.00)
Yearly & Ind. Dummies	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES
Adj. R-square	0.0975	0.0104	0.1014	0.1223	0.1366	0.0098	0.1371	0.1382	0.1366	0.0098	0.1371	0.1832	0.2179	0.0431	0.2212	0.2453	0.2667	0.0469	0.2718	0.2949
Num. of Obs.	1,689	1,726	1,689	1,689	654	662	654	654	653	661	653	653	653	660	653	653	334	341	334	334

Note: This table reports the pooled OLS estimation results of the effects of DOLI on the ratio of total managerial pay to earnings (*PayR*). Data is yearly ranged from 2008 to 2010. Under before matching, samples under Nearest, Caliper, Mahala and Mahala Caliper matchings, each has 4 model specifications of regression estimation. Constant terms are omitted in the table. The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 17 Does Firms with DOLI Have Lower Managerial Pay (*PayT*)? Two-stage Estimation

		Second Stage Main Predictor							
		DOLI_D				*DOLI_M*			
Variables	First Stage	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D		5.3007***	7.6460***	3.2296***	1.9946***				
		(4.90)	(8.79)	(3.89)	(3.23)				
DOLI_M						0.1456**	0.1871**	0.1791***	0.1918***
						(2.47)	(2.19)	(4.97)	(4.91)
LnAsset	0.1512***	0.2552***		0.3754***	0.4329***	0.2562***		0.3892***	0.4468***
	(6.11)	(4.52)		(8.40)	(12.9)	(4.80)		(10.0)	(14.0)
DEBT	-0.0003*	0.0001		-0.0001	-0.0002**	0.0000		-0.0002	-0.0003***
	(-1.84)	(0.27)		(-0.77)	(-2.19)	(0.14)		(-1.34)	(-3.08)
CDDummy		0.3470***		0.3164***	0.2823***	0.3574***		0.3275***	0.2939***
		(3.71)		(5.05)	(6.01)	(4.03)		(6.06)	(6.38)
ROE		0.0100**		0.0090***	0.0092***	0.0099**		0.0090***	0.0092***
		(2.45)		(3.25)	(4.43)	(2.57)		(3.76)	(4.43)
MVBV	0.1333***	-0.0952*		-0.0155	0.0486	-0.0844		0.0083	0.0746**
	(5.36)	(-1.69)		(-0.38)	(1.53)	(-1.57)		(0.23)	(2.47)
STDRET		0.0097		-0.0032	-0.0284	0.0096		-0.0026	-0.0286
		(0.30)		(-0.14)	(-1.53)	(0.31)		(-0.14)	(-1.58)
MANAHOLD	0.0365**		0.0037	0.0436***	0.0361***		0.0057	0.0490***	0.0417***
	(2.57)		(0.12)	(2.68)	(2.96)		(0.20)	(3.46)	(3.86)
INSTHOLD			0.0038	-0.0021*	-0.0018*		0.0037	-0.0024**	-0.0022**
			(1.50)	(-1.71)	(-1.95)		(1.50)	(-2.27)	(-2.36)
BOARD			0.0169	-0.0072	-0.0039		0.0170	-0.0060	-0.0026
			(0.77)	(-0.70)	(-0.50)		(0.80)	(-0.68)	(-0.33)
IDR			0.0038	0.0048***	-0.0009		0.0037	0.0046***	-0.0011
			(1.22)	(3.22)	(-0.73)		(1.25)	(3.59)	(-0.95)
OBS	-0.0065**								
	(-2.19)								
Yearly & Ind. Dummies		NO	NO	NO	YES	NO	NO	NO	YES
Chi-square		151.75	113.51	730.53	1478.8	396.63	130.27	988.89	1930.4
Num. of Obs.		2.079	2.082	2.079	2.079	2.079	2.082	2.079	2.079

Note: This table reports the Heckman's (1979) two-stage estimation results of the effects of DOLI on managerial pay (PayT). The t-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels.

Similar with Table 17, in Table 18 and Table 19, the evidence of the first stage estimation shows that firm with larger size, higher growth opportunity, higher managerial ownership, lower debt to equity and lower outside block shareholdings tends to demand DOLI. In the second stage, firm with DOLI tends to have higher total amount and average amount of managerial pay but not have higher ratio of pay to earnings. To sum up, the fact that firms with DOLI and DOLI coverage have little effects on limiting managerial pay and firms with DOLI and greater DOLI coverage is also associated with underperformance on returns on equity. The evidence generally consistent with the negative view (moral hazard hypothesis) such that introduction with DOLI has little ability in enhancing corporate governance and improving firm performance but incurs more opportunistic managerial behaviors and severe agency problem. The outcome does not shift under four groups of matching samples and Heckman's (1979) two-stage estimation.

Applying sample matching techniques in any policy impact analysis is important. While regression correlation does not imply causation, regression estimation under sample matching to achieve "ceteris paribus" condition helps to increase the degree of causal inference. The empirical evidence of before-matching and after-matching findings are both generally consistent with negative view of firm's adopting DOLI on performance and governance, such as, Core (1997), O'Sullivan (2002), Chalmers, Dann and Harford (2002), Bradley and Chen (2011) and Rees, Radulescu and Egger (2011), all of them indicated that DOLI tends to increase agency problems within a lowered managerial accountability and decreased board effectiveness.

Table 18 Does Firms with DOLI Have Lower Managerial Pay (*PayA*)? Two-stage Estimation

		Second Stage Main Predictor							
		DOLI_D				*DOLI_M*			
Variables	First Stage	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D		2.3241***	4.0869***	2.1806***	1.6813***				
		(4.49)	(8.55)	(3.83)	(3.50)				
DOLI_M						0.0534*	0.0407	0.0567**	0.0662***
						(1.87)	(0.85)	(2.12)	(2.97)
LnAsset	0.1512***	0.1432***		0.1450***	0.1668***	0.1436***		0.1494***	0.1716***
	(6.11)	(5.31)		(4.74)	(6.37)	(5.53)		(5.17)	(7.08)
DEBT	-0.0003*	0.0000		0.0000	-0.0001	0.0000		-0.0001	-0.0001**
	(-1.84)	(-0.45)		(-0.53)	(-1.64)	(-0.57)		(-0.75)	(-2.04)
CDDummy		0.2667***		0.2638***	0.2518***	0.2705***		0.2673***	0.2558***
		(5.96)		(6.15)	(6.88)	(6.27)		(6.66)	(7.62)
ROE		0.0120***		0.0119***	0.0117***	0.0119***		0.0119***	0.0117***
		(6.15)		(6.25)	(7.22)	(6.37)		(6.69)	(7.88)
MVBV	0.1333***	-0.0315		-0.0268	0.0129	-0.0275		-0.0192	0.0219
	(5.36)	(-1.17)		(-0.95)	(0.52)	(-1.05)		(-0.71)	(0.95)
STDRET		0.0064		0.0066	-0.0048	0.0064		0.0068	-0.0048
		(0.41)		(0.44)	(-0.33)	(0.43)		(0.48)	(-0.36)
MANAHOLD	0.0365**		-0.0097	0.0009	-0.0022		-0.0092	0.0026	-0.0003
	(2.57)		(-0.59)	(0.08)	(-0.23)		(-0.57)	(0.25)	(-0.03)
INSTHOLD			0.0033**	-0.0003	0.0004		0.0033**	-0.0004	0.0003
			(2.38)	(-0.32)	(0.53)		(2.39)	(-0.46)	(0.40)
BOARD			0.0212*	0.0118**	0.0107*		0.0212*	0.0121*	0.0111**
			(1.75)	(1.66)	(1.74)		(1.77)	(1.83)	(1.98)
IDR			0.0018	0.0008	-0.0022**		0.0018	0.0007	-0.0023***
			(1.04)	(0.77)	(-2.34)		(1.05)	(0.76)	(-2.65)
OBS	-0.0065**								
	(-2.19)								
Yearly & Ind. Dummies		NO	NO	NO	YES	NO	NO	NO	YES
Chi-square		274.49	121.85	594.01	942.09	580.18	127.51	675.35	1116.2
Num. of Obs.		2.079	2.082	2.079	2.079	2.079	2.082	2.079	2.079

Note: This table reports the Heckman's (1979) two-stage estimation results of the effects of DOLI on average managerial pay (*PayA*). The *t*-statistics are reported in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels.

Table 19 Does Firms with DOLI Have Lower Managerial Pay (*PayR*)? Two-stage Estimation

		Second Stage Main Predictor							
		DOLI_D				*DOLI_M*			
Variables	First Stage	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DOLI_D		49.713**	-56.203***	38.861	20.384				
		(2.33)	(-3.79)	(1.42)	(0.75)				
DOLI_M						0.0565	0.6230	0.0241	0.3998
						(0.03)	(0.29)	(0.01)	(0.17)
LnAsset	0.1512***	-3.8989***		-3.3715**	-2.5942*	-3.9004***		-3.3712**	-2.5908*
	(6.11)	(-3.47)		(-2.31)	(-1.79)	(-3.47)		(-2.31)	(-1.79)
DEBT	-0.0003*	-0.0071		-0.0117	-0.0117	-0.0071		-0.0117	-0.0121
	(-1.84)	(-0.35)		(-0.56)	(-0.57)	(-0.35)		(-0.56)	(-0.59)
CDDummy		-26.223***		-26.858***	-27.835***	-26.221***		-26.857***	-27.821***
		(-8.88)		(-9.09)	(-9.38)	(-8.87)		(-9.08)	(-9.37)
ROE		-0.7515***		-0.8049***	-0.9926***	-0.7519***		-0.8050***	-0.9948***
		(-4.83)		(-5.00)	(-5.94)	(-4.81)		(-4.98)	(-5.94)
MVBV	0.1333***	-2.5199*		-2.2160	0.2503	-2.5161*		-2.2135	0.2945
	(5.36)	(-1.88)		(-1.45)	(0.16)	(-1.87)		(-1.43)	(0.18)
STDRET		-0.3968		-0.6556	-1.8625*	-0.3964		-0.6554	-1.8601*
		(-0.46)		(-0.76)	(-1.93)	(-0.46)		(-0.76)	(-1.93)
MANAHOLD	0.0365**		1.1601**	0.1988	0.2421		1.1661**	0.1994	0.2504
	(2.57)		(2.18)	(0.34)	(0.43)		(2.18)	(0.34)	(0.44)
INSTHOLD			-0.1206**	0.0026	-0.0209		-0.1215**	0.0026	-0.0215
			(-2.44)	(0.05)	(-0.39)		(-2.45)	(0.05)	(-0.40)
BOARD			0.1739	0.0929	0.1685		0.1748	0.0931	0.1720
			(0.40)	(0.22)	(0.39)		(0.40)	(0.22)	(0.40)
IDR			-0.0166	0.1181*	0.0452		-0.0168	0.1180*	0.0446
			(-0.27)	(1.90)	(0.67)		(-0.27)	(1.90)	(0.66)
OBS	-0.0065**								
	(-2.19)								
Yearly & Ind. Dummies		NO	NO	NO	YES	NO	NO	NO	YES
Chi-square		227.98	40.840	240.33	289.20	228.01	40.730	240.35	289.45
Num. of Obs.		1.689	1.691	1.689	1.689	1.689	1.691	1.689	1.689

Note: This table reports the Heckman's (1979) two-stage estimation results of the effects of DOLI on managerial pay ratio (*PayR*). The *t*-statistics are presented in parentheses. ***, ** and * denote significance at the 1%, 5% and 10%

5. Conclusion

Existing studies on investigating the effects of firm's purchasing DOLI on corporate governance and firm performance faced a challenge that the determinant process of demanding insurance is not a random process but is determined by other factors. Samples are self-selected into group of firm with DOLI and without DOLI constitutes sample selection problem on estimation. The estimated coefficient on DOLI with neglecting self-selection problem is likely to be biased. The main purpose of this research is to overcome this problem by employing sample matching technique. The main purpose of sample matching is to adjust two groups of samples (DOLI insured samples versus uninsured samples) to be similar (in terms of mean) for variables determining samples to be DOLI insured or uninsured. Successful sample matching tends to achieve equivalence for self-selection variables between two groups of samples. This research considers four matching methods, which are referred to as Nearest, Caplier, Mahala and Mahala-Caliper. The first two methods are based on propensity scoring method and the last two are based on method of MDs among self-selection variables. Regarding the matching efficiency, the best method is Mahala because self-selection variables in two groups are nearly the same at the conventional statistical level and the remaining number of matched samples is still large.

Based on data of 795 listed nonfinancial companies on Taiwan Stock Exchange during 2008~2010, empirical result shows that, before matching, firm with DOLI and greater coverage of DOLI is correlated with inferior profitability in terms of worse returns on equity. After sample matching, evidence of underperformance of firm with DOLI remains. Firm with DOLI tends to pay significantly higher level

relative to firm without DOLI. After controlling for sample's self-selection factors, empirical result tends to contradict positive view of DOLI, insured companies indeed have worsened corporate governance and firm performance. Different specifications and estimations of regression models and applying Heckman's (1979) two-stage estimation obtain similar results.

Future research could proceed in the following directions. First, this research finds that some matching methods provide better matching result but lose in sample size (lower estimation efficiency), such as Mahala Caliper. In contrast, some methods are just the opposite, they provide less satisfactory matching but retain more sample size, such as Nearest, Caliper and Mahala. Thus, using matching theory often reduce sample size, making the estimation less efficient. Extending data period or adjusting matching algorithm (1 to N matching) are necessary. Second, in sample matching, equivalent in means of self-selection variables is a check for matching effectiveness. Other checks such as equivalence in propensity score between two groups or F-test to test for simultaneously equivalent for all self-selection variables between two groups of matched samples could be examined. Third, nonlinearity effect of DOLI coverage on firm's financial and nonfinancial consequences could be considered.

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