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# The Role of Institutional Investors in the Sustainable CEO Compensation Structure

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**Abstract:** Chief executive officer (CEO) retirement pension plans are known as sustainable compensation because they induce managers to make more sustainable and long-term-oriented corporate decisions. We focused on the role of institutional investors in awarding CEO pension plans. Long-term and short-term institutional investors are expected to increase and decrease the CEO pension plan, respectively, wherein the former is aimed at persuading the manager to focus more on the firm's long-term performance and the latter is aimed at making the CEO assume more risk. We empirically tested our hypothesis and found significantly negative (positive) relationship between short-term (long-term) institutional ownership and CEO pension plans, which is consistent with our hypothesis. Our results suggest the institutional ownership horizon's differing impact on managers' sustainable compensation structure.

**Keywords:** CEO inside debt; CEO pension plans; institutional ownership; institutional investor; managerial compensation

## 1. Introduction

Chief executive officers' (CEOs) retirement pension plans, also called the CEO inside debt, compose the CEOs' compensation packages. CEO pension plans, including defined benefit (DB) CEO pensions and deferred compensation, have unsecured and unfunded debt-like features, in that a fixed amount is actually paid a long time after the payment agreement has been established. This time inconsistency between the decision and the payment induces the manager to make more conservative and long-term-oriented corporate decisions [1–4]. In addition, according to bankruptcy law, firms undergoing bankruptcy are severely limited in their ability to pay the CEO pension plans regardless of the plans' priority. Gilson and Vetsuypens [5] found empirical evidence supporting the law. They found that 14 out of 77 publicly traded firms that went bankrupt had terminated pension plans or capped pension plan benefits. Due to the unique characteristics of CEO pension plans, studies have found empirical evidence of lenders' preference for higher CEO pension plans, as shown by fewer bond covenants for firms with higher CEO pension plans [6] and a rise in bond prices and a fall in equity prices right after the disclosure of large managerial inside debt holdings [7]. The CEO pension plans appeal to debt holders by reducing the agency cost of debt between equity holders and debt holders with less risky and more conservative corporate policies [8,9]. By contrast, shareholders generally oppose an increase in CEO pension plans, as the CEOs manage firms more from the perspective of creditors than shareholders [9]. However, managerial compensation is primarily dependent on the firm size, firm performance, and shareholder wealth [10,11], and creditors have less influence on managerial compensation and the compensation committee except when the firm suffers from financial distress [5,12]. Why then are the CEO pension plans offered in spite of debt holders' low influence on

managerial compensation? What type of shareholders may have incentives to provide debt-based compensation for CEOs?

We focused on the role of institutional investors in determining CEOs' compensation structure and explored whether institutional investment is related with managers' pension plans. Many finance and accounting studies have examined the institutional investors' monitoring role in reducing agency costs between shareholders and managers [13–15]. Institutional investors have been found to influence managerial compensation for the shareholders' or their own benefits [16–18]. Specifically, institutional investors seek a lower level and higher sensitivity of managerial compensation to the firm's performance [14,19,20].

In particular, we examined how institutional investors' different investment horizons influence CEO pension plans, which is a component of managerial compensation. Prior literature suggests different incentives between short-term and long-term institutional investors, and the long-term institutional investors are generally considered more active and effective monitors [21–23]. Particularly, different types of institutional investors affect managers' compensation structure according to their differing incentives [19]. Thus, long-term institutional investors are expected to increase the CEO inside debt holdings, as they want managers to focus more on firms' long-term performance. In addition, long-term institutional investors can obtain benefits of inside debt holdings of managers. For example, long-term institutional investors can enjoy a firm's improved investment efficiency by giving CEOs pension plans, because more CEO inside debt holdings promote high financial reporting quality [24], which leads to high investment efficiency [25]. In addition, Mo et al. [26] found that CEO inside debt holdings are positively related to labor investment efficiency. On the other hand, short-term institutional investors focus more on firms' short-term performance and pursue higher risk to increase their expected profit from investment. As they want managers who favor risk more, they will likely reduce the managers' debt-based compensation, which increases the managers' conservatism. Therefore, our hypothesis predicts that the associations between CEO pension plans and short-term institutional ownership (SIO) or long-term institutional ownership (LIO) will be opposite in direction.

With 8315 US observations from 2006 to 2016, we obtained empirical results that are consistent with our hypothesis, both from ordinary least squares (OLS) regression and propensity-score-matching (PSM) analyses. We additionally documented the effect of default risk on our hypothesized association. We expected the default risk to strengthen the relationship between SIO or LIO and CEO pension plans, as the short-term investors will increase the managers' preference for the risk that they will take back their investments sooner, whereas the long-term investors will seek to increase the managers' conservatism for the firms' long-term survival. We obtained results that are consistent with our expectations and noted that all our empirical analyses support our hypothesis.

Our study contributes to the literature on CEO pension plans and institutional investors. Conventional finance and accounting studies have found the institutional investors' monitoring role in shareholders' benefits; however, more recent studies differentiate long-term institutions from short-term ones and suggest that long-term institutions are more active monitors and have more influence on managerial compensation [14,19–23]. Our paper adds an additional path through which institutional investors influence the CEO compensation structure. We find that the differing impacts of institutional investors on CEO inside debt holdings vary according to their investment horizons. Our results stress the importance of considering the type of institutional investor in examining the impact of institutional ownership (IO) on CEO compensation.

## 2. Literature Review and Hypothesis Development

### *2.1. CEO Pension Plans*

The compensation of CEOs consists of various components, including fixed salaries, performance-based bonuses, equity-based compensation, and debt-based compensation. A good example of CEOs' debt-based compensation is the DB pension, whose actual payment is implemented

long after the decision of the payment has been made. From the firm's perspective, the amount of pension recorded in the book is considered another type of liability [23]. Related literature has proposed that the firms' motives to offer executive pensions with long-term horizons lie in their intention to retain competent workers for a long time, keep the workers from terminating labor contracts before retirement, and control the workers' retirement schedules [1,26–29].

Compared with equity-based compensation, CEOs' debt-based compensation, or inside debt, affects managers and firms differently in various ways. According to several studies, CEOs' equity-based compensation increases managers' risk preference and aligns managers' incentives with the long-term perspective, unlike cash-based compensation [22,30–32]. However, the large gap between the decision of payment and the actual payment of the CEO inside debt allows the managers to focus more on long-term performance and survival, thereby increasing their risk averseness and conservatism. This theoretical prediction was empirically supported by various subsequent studies. Sundaram and Yermack [1] found that higher CEO inside debt holdings are negatively associated with the frequency of filing for bankruptcy. Wang et al. [4] found that managers with higher inside debt holdings adopt more conservative accounting policies, whereas Cassell et al. [2] found that these managers attempt to reduce firms' risk by seeking a higher degree of diversification and liquidity and by investing less in research and development. Moreover, Wei and Yermack [6] and Anantharaman, Fang, and Gong [33] showed a lower cost of debt for firms with higher CEO inside debt holdings. Lastly, Phan [3] demonstrated a negative relationship between CEO inside debt holdings and mergers and acquisition activities.

### *2.2. Institutional Investor and Managerial Compensation*

Much research on institutional investors has stressed their monitoring role, which small individual shareholders easily fail, for their fiduciary duty [13], the difficulty of exit arising from owning a large proportion of shares [34], the opportunities to gain economies of scale as the institutions invest in many firms [35], and their expertise [36]. With various means such as voting power, shareholder activism, and construction of the board of directors, institutional investors are known to reduce the agency problem between the principal (shareholders) and the agent (manager) [15] and play an active monitoring role for shareholders [15,21,37,38]. To this end, institutional investors try to interfere with managerial compensation and impede excessive executive compensation by privately influencing the management [18] or negotiating with the board or compensation committee [16,17]. As the institutional investors themselves are stockholders with a large number of shares, they seek to benefit the shareholders by lowering the level of managerial compensation, which tends to be excessive because of the agency problem, and by increasing the pay-for-performance sensitivity of executive compensation [14,19,20].

### *2.3. Hypothesis Development*

We examined whether the IO is related with the CEO inside debt holdings. Previous studies have determined that institutional investors have incentives, ability, and various mechanisms to affect managerial compensation. Although institutional investors, unlike debt holders who care about the downside risk of a firm in the long run, care a great deal about a firm's future prospects, institutions may also have incentives to influence the debt-based compensation to benefit themselves, depending on their investment horizon. In more detail, the incentive may vary between short-term and long-term institutional investors, in which long-term institutional investors are known to be more active and effective monitors [21–23]. In addition, long-term institutional investors can enjoy high investment efficiency by awarding CEOs pension plans, because high CEO inside debt holdings are positively related to high financial reporting quality, which leads to high investment efficiency [24,25]. In addition, they can face improved labor investment efficiency [26]. On the other hand, short-term institutions are expected to seek the firm's short-term performance and, therefore, prefer a higher risk to increase the possibility of a stock price increase. Therefore, we first expected that IO will be negatively related with CEO inside debt holdings. Further, we expected that short-term institutions will view the managers'

inside debt as non-beneficial for themselves and attempt to decrease the CEO inside debt holdings, thereby increasing the managers' risk preference to benefit the short-term shareholders. On the contrary, long-term investors are considered to show characteristics similar to debt holders, in that both of them are more conservative and more long-term-oriented. These characteristics of long-term institutions may be related with greater CEO inside debt holdings, as the inside debt induces the managers to be more conservative and focused on the long-term performance and survival.

We state our predictions in the following hypotheses:

**Hypothesis (H1).** *Institutional ownership is negatively related with CEO inside debt holdings.*

**Hypothesis (H2a).** *Long-term institutional ownership is positively related with CEO inside debt holdings.*

**Hypothesis (H2b).** *Short-term institutional ownership is negatively related with CEO inside debt holdings.*

## 3. Research Design

### 3.1. Specification of CEO Pension Plan

Following prior inside debt studies, we measure the CEO's debt-based compensation by taking the sum of the present value of the CEO's future pension payments and deferred compensation [7,39]. We scale the CEO's debt-based compensation by using the CEO's equity-based compensation. The CEO's equity-based compensation is calculated as the total value of the CEO's stock ownership and option holdings. Based on these two measures, we divide the CEO's debt-based compensation by the CEO's equity-based compensation to generate CEO Debt/Equity Compensation as follows:

$$CEO\ Debt/Equity\ \text{Compensation} = \frac{\text{CEO's debt-based compensation}}{\text{CEO's equity-based compensation}} \quad (1)$$

Alternately, we adopt two more proxies for CEO pension plans. That is, we divide this first measure, CEO Debt/Equity Compensation, by firm leverage (firm's debt-to-equity ratio) to generate our second measure, CEO-Firm Leverage. Our third measure, INSDEBT, is an indicator variable that is equal to 1 if our second measure, CEO-Firm Leverage, exceeds 1, and 0 otherwise. Although the results using alternative variables are not tabulated in this paper, the results are qualitatively the same as our main findings using CEO Debt/Equity Compensation.

### 3.2. Specification of Institutional Investors

To classify institutional investors as short-term and long-term investors, we follow Yan and Zhang [22] and classify the investment horizon based on the quarterly portfolio turnover, which is calculated as:

$$Turnover_{k,t} = \frac{\min\left(Buy_{k,t}, Sell_{k,t}\right)}{\sum_{i=1}^{N_k} \frac{S_{k,i,t}P_{i,t} + S_{k,i,t-1}P_{i,t-1}}{2}} \quad (2)$$

where $Buy_{k,t}$ and $Sell_{k,t}$ are the aggregate purchases and sales by investor $k$ for quarter $t$, respectively; $P_{i,t-1}$ and $P_{i,t}$ are the share prices for stock $i$ at the end of quarters $t-1$ and $t$, respectively; and $S_{k,i,t-1}$ and $S_{k,i,t}$ are the number of shares of stock $i$ held by investor $k$ at the end of quarters $t-1$ and $t$, respectively. Ownership by institutional investors with more frequent portfolio turnover is classified as *SIO*, and ownership by institutions with less frequent portfolio turnover is classified as *LIO*. In our sample, the average turnover ratios for short-term and long-term institutional investors during a quarter are 0.165 and 0.024, respectively. It implies that short-term (long-term) institutional investors hold a stock for approximately 6 (42) quarters. We include ownership by institutions that belong to the top tercile of quarterly portfolio turnover into *SIO* and ownership by institutions that belong to the bottom tercile into *LIO*.

### 3.3. Main Regression Model

We regressed *CEO Debt/Equity Compensation* on one of our three main independent variables, *IO*, *SIO*, and *LIO*, and control variables that are known or expected to affect CEO pensions. We followed Sundaram and Yermack [1] in specifying the firm and CEO characteristics that affect the CEO inside debt holdings. The controls include firm size (*FSIZE*), firm's leverage (*LEV*), market-to-book ratio (*MTB*), inventory turnover (*INT*), capital expenditure (*CAPEX*), Tobin's Q, CEO tenure, CEO's age, and CEO's gender. All the *IO* and control variables are values at fiscal year-end when the (debt-based and equity-based) compensation was given. We used *IO* and control variables' values at fiscal year-end prior to the year during which the compensation was given and obtained results qualitatively similar to the results presented here. Our main regression equation is as follows.

$$\begin{array}{l} \text{CEO } \frac{\text{Debt}}{\text{Equity}}\text{Compensation} \\ = \beta_0 + \beta_1 \text{Instutional Ownership} \\ +\beta_2 FSIZE + \beta_3 LEV + \beta_4 MTB \\ +\beta_5 INT + \beta_6 CAPEX + \beta_7 TobinQ \\ +\beta_8 CEOTenure + \beta_9 CEOAGE \\ +\beta_{10} CEOGENDER \\ + \sum \text{Industry fixed effects} \\ + \sum \text{Year fixed effects} + \varepsilon \end{array} \quad (3)$$

All continuous variables were winsorized at the 1% level, and all the regression analyses contain industry and year fixed effects. In this equation, the coefficients of *IO*, *SIO*, and *LIO* ($\beta_1$) are of our main interest. Specifically, we expected a significantly negative $\beta_1$ for *SIO* but a significantly positive $\beta_1$ for *LIO*, following our hypothesized relationship.

### 3.4. Sample

Our sample consists of 8315 US firm-year observations from 2006 to 2016. We used Compustat, Center for Research in Security Prices, ExecuComp, and Thomson Reuters' CDA/Spectrum databases to obtain the variables necessary for our research. Out of 286,016 observations from 2006 to 2016, we were left with 18,607 observations after excluding observations without the information about CEO pension plans. Approximately 75% of the sample firms do not have CEO pension plans. By further trimming the sample with missing values of our independent and control variables, we obtained our final sample with 8315 observations, which shows that about 75% of our sample firms do not provide CEO pension plans. Table 1 displays how our final sample was constructed. Furthermore, Tables 2 and 3 show the distribution of our final sample by year and Fama−French industry. We observe a well-dispersed distribution of our final sample.

**Table 1.** Sample selection process.

| | No. of Firm-Year Observations | | Percent (%) of Firm-Year Observations |
|---|---|---|---|
| All firm-year observations in Compustat for 2006–2016 | 286,016 | | |
| Less: Missing firm-year information to obtain our dependent variable (*CEO Debt/Equity Compensation*) | (267,409) | | |
| | 18,607 | | |
| Without CEO pension plans | | 13,932 | 74.88 |
| With CEO pension plans | | 4,675 | 25.12 |
| Less: Missing firm-year information on Thomson Reuters to calculate IO-related variables (*IO*, *SIO*, and *LIO*) | (5825) | | |
| Less: Missing information to calculate control variables (*FSIZE*, *LEV*, *MTB*, *INT*, *CAPEX*, *Tobin's Q*, *CEOTenure*, *CEOAGE*, and *CEOGENDER*) | (4467) | | |
| Final sample | 8315 | | |
| Without CEO pension plans | | 5999 | 72.15 |
| With CEO pension plans | | 2316 | 27.85 |

**Table 2.** Sample distribution by year.

| Year | *INSDEBT* = 0 | *INSDEBT* = 1 | Total |
|---|---|---|---|
| 2006 | 388 | 146 | 534 |
| 2007 | 602 | 232 | 834 |
| 2008 | 575 | 245 | 820 |
| 2009 | 571 | 238 | 809 |
| 2010 | 565 | 236 | 801 |
| 2011 | 562 | 233 | 795 |
| 2012 | 579 | 217 | 796 |
| 2013 | 597 | 213 | 810 |
| 2014 | 599 | 207 | 806 |
| 2015 | 571 | 205 | 776 |
| 2016 | 390 | 144 | 534 |
| Total | 5999 | 2316 | 8315 |

**Table 3.** Sample distribution by industry.

| Code | Fama–French 12 Industry Classification | No. of Observations |
|---|---|---|
| 1 | Consumer non-durables: food, tobacco, textiles, apparel, leather, toys | 402 |
| 2 | Consumer durables: cars, TVs, furniture, household appliances | 369 |
| 3 | Manufacturing: machinery, trucks, planes, office furniture, paper | 1442 |
| 4 | Oil, gas, and coal extraction and products | 135 |
| 5 | Chemicals and allied products | 463 |
| 6 | Business equipment: computers, software, and electronic equipment | 2508 |
| 7 | Telephone and television transmission | 48 |
| 9 | Wholesale, retail, and some services (laundries, repair shops) | 1298 |
| 10 | Healthcare, medical equipment, and drugs | 1296 |
| 12 | Other: mines, construction, transportation, hotels, bus service, entertainment | 354 |
| | Total | 8315 |

## 4. Results

### *4.1. Descriptive Statistics and Correlation Analysis*

Table 4 displays summary statistics of the variables in our final sample of 8315 observations. Our CEO inside debt holding variable, CEO Debt/Equity Compensation, shows a great difference between the mean (0.3314) and median values (0.0132). On average, a CEO in our sample has debt-based compensation that is 33% of equity-based compensation. The great difference between its mean and median values indicates that a majority of firms offer a small amount of debt-based compensation to their managers, whereas a minority of firms provide a great amount of CEO inside debt.

**Table 4.** Descriptive statistics.

| Variables | Mean | Median | SD | Q1 | Q3 |
|---|---|---|---|---|---|
| *CEO Debt/Equity Compensation* | 0.3314 | 0.0132 | 1.3924 | 0.0000 | 0.2556 |
| *IO* | 0.8696 | 0.9406 | 0.1795 | 0.8005 | 1.0000 |
| *SIO* | 0.2948 | 0.2726 | 0.1490 | 0.1852 | 0.3813 |
| *LIO* | 0.2530 | 0.2510 | 0.1005 | 0.1860 | 0.3137 |
| *FSIZE* | 7.3442 | 7.2036 | 1.7086 | 6.1091 | 8.4136 |
| *LEV* | 1.9195 | 1.1032 | 2.3866 | 0.5905 | 2.2660 |
| *MTB* | 3.3991 | 2.5101 | 32.3592 | 1.6170 | 3.9691 |
| *INT* | 1.4032 | 1.1089 | 3.6398 | 0.7423 | 1.5580 |
| *CAPEX* | 0.0413 | 0.0306 | 0.0365 | 0.0179 | 0.0523 |
| *Tobin's Q* | 1.6847 | 1.2954 | 1.8266 | 0.8048 | 2.0865 |
| *CEOTenure* | 7.1001 | 5.0000 | 7.1522 | 2.0000 | 10.0000 |
| *CEOAGE* | 55.7927 | 56.0000 | 7.1915 | 51.0000 | 60.0000 |
| *CEOGENDER* | 0.0310 | 0.0000 | 0.1734 | 0.0000 | 0.0000 |

*Note:* This table reports the descriptive statistics of the dependent and independent variables in the final sample of 8315 firm-year observations. The mean, median, standard deviation, 25th percentile, and 75th percentile values are presented.

Our main independent variable, *IO*, shows high mean (0.8696) and median (0.9406) values, which implies that our sample consisted of observations with a high percentage of share ownership by institutional investors. Out of the total IO, approximately 29% and 25%, on average, represent *SIO* and *LIO*, respectively.

Table 5 presents Pearson (upper-right triangle) and Spearman (lower-left triangle) correlation coefficients among our dependent and explanatory variables. In both correlation calculation methods, we observe significantly strong and positive univariate coefficients among the CEO inside debt holding variable. The total *IO* has mixed significance in correlation with the CEO inside debt measure. Pearson coefficients generate insignificantly negative values, whereas rank-dependent Spearman coefficients have significantly negative values. Furthermore, the *SIO* is significantly and negatively correlated with our CEO inside debt holding measure, whereas the *LIO* is significantly and positively correlated with the CEO inside debt variable. This univariate result supports our hypothesis.

**Table 5.** Pearson (upper-right triangle) and Spearman (lower-left triangle) correlation matrix.

| No. | Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *CEO Debt/Equity Compensation* | 1.00 | −0.01 | −0.05 | 0.06 | 0.12 | −0.07 | 0.00 | −0.02 | −0.01 | −0.07 | −0.04 | 0.06 | 0.00 |
| | | | (0.33) | (0.00) | (0.00) | (0.00) | (0.00) | (0.87) | (0.13) | (0.20) | (0.00) | (0.00) | (0.00) | (0.88) |
| 2 | *IO* | −0.04 | 1.00 | 0.56 | 0.44 | 0.07 | −0.02 | 0.03 | −0.03 | 0.04 | 0.04 | −0.05 | −0.03 | 0.00 |
| | | (0.00) | | (0.00) | (0.00) | (0.00) | (0.03) | (0.00) | (0.02) | (0.00) | (0.00) | (0.00) | (0.00) | (0.85) |
| 3 | *SIO* | −0.15 | 0.65 | 1.00 | −0.10 | −0.18 | 0.01 | 0.01 | 0.03 | 0.10 | 0.03 | −0.05 | −0.08 | 0.01 |
| | | (0.00) | (0.00) | | (0.00) | (0.00) | (0.26) | (0.29) | (0.01) | (0.00) | (0.01) | (0.00) | (0.00) | (0.23) |
| 4 | *LIO* | 0.19 | 0.29 | −0.12 | 1.00 | 0.26 | −0.08 | 0.02 | −0.06 | −0.03 | −0.03 | −0.03 | 0.09 | 0.03 |
| | | (0.00) | (0.00) | (0.00) | | (0.00) | (0.00) | (0.04) | (0.00) | (0.02) | (0.01) | (0.00) | (0.00) | (0.00) |
| 5 | *FSIZE* | 0.49 | −0.01 | −0.15 | 0.28 | 1.00 | −0.37 | 0.03 | −0.03 | 0.01 | −0.19 | −0.11 | 0.09 | 0.02 |
| | | (0.00) | (0.18) | (0.00) | (0.00) | | (0.00) | (0.00) | (0.00) | (0.47) | (0.00) | (0.00) | (0.00) | (0.16) |
| 6 | *LEV* | −0.37 | 0.03 | 0.04 | −0.09 | −0.48 | 1.00 | −0.01 | 0.11 | −0.06 | 0.17 | 0.12 | −0.05 | 0.00 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | (0.30) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.75) |
| 7 | *MTB* | −0.01 | 0.01 | −0.01 | 0.03 | 0.12 | −0.12 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | −0.02 | 0.02 |
| | | (0.23) | (0.19) | (0.49) | (0.01) | (0.00) | (0.00) | | (0.86) | (0.90) | (0.34) | (0.85) | (0.14) | (0.08) |
| 8 | *INT* | −0.15 | 0.00 | −0.02 | −0.01 | 0.09 | 0.20 | 0.00 | 1.00 | −0.07 | 0.03 | 0.01 | −0.02 | −0.01 |
| | | (0.00) | (0.74) | (0.05) | (0.42) | (0.00) | (0.00) | (0.96) | | (0.00) | (0.00) | (0.32) | (0.04) | (0.18) |
| 9 | *CAPEX* | 0.10 | 0.02 | 0.05 | 0.01 | 0.07 | −0.05 | 0.09 | −0.38 | 1.00 | 0.08 | 0.00 | 0.03 | 0.08 |
| | | (0.00) | (0.04) | (0.00) | (0.29) | (0.00) | (0.00) | (0.00) | (0.00) | | (0.00) | (0.84) | (0.02) | (0.00) |
| 10 | *Tobin's Q* | −0.24 | 0.04 | 0.01 | −0.03 | −0.18 | 0.38 | 0.72 | 0.09 | 0.06 | 1.00 | 0.05 | −0.07 | 0.00 |
| | | (0.00) | (0.00) | (0.38) | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | (0.00) | (0.00) | (0.84) |
| 11 | *CEOTenure* | −0.04 | −0.03 | −0.04 | −0.02 | −0.09 | 0.13 | 0.04 | 0.06 | −0.02 | 0.12 | 1.00 | 0.38 | −0.07 |
| | | (0.00) | (0.00) | (0.00) | (0.16) | (0.00) | (0.00) | (0.00) | (0.00) | (0.04) | (0.00) | | (0.00) | (0.00) |
| 12 | *CEOAGE* | 0.17 | −0.05 | −0.10 | 0.10 | 0.11 | −0.07 | −0.07 | −0.04 | 0.05 | −0.09 | 0.31 | 1.00 | −0.04 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | (0.00) |
| 13 | *CEOGENDER* | 0.01 | 0.01 | 0.00 | 0.03 | 0.00 | −0.01 | 0.03 | −0.05 | 0.08 | 0.01 | −0.07 | −0.03 | 1.00 |
| | | (0.20) | (0.21) | (0.92) | (0.00) | (0.96) | (0.28) | (0.00) | (0.00) | (0.00) | (0.65) | (0.00) | (0.00) | |

*Note:* This table reports the Pearson (upper-triangle) and Spearman (lower-left triangle) correlation coefficients among the dependent and independent variables. The numbers in parentheses represent *p*-values. Main regression results.

Table 6 shows our main regression results of Equation (1), using *CEO Debt/Equity Compensation* as the dependent variable. Column (1) shows the regression results for the relationship between *IO* and CEO inside debt holdings, which is our first hypothesis. We can see that the *IO* does not show a significant relationship with our CEO inside debt holding variable. Thus, we do not find evidence supporting the significant association between IO and inside debt holdings, and our first hypothesis is not supported. However, when we focus on column (2), which shows the relationship between SIO and CEO inside debt holdings, we find significantly negative coefficients for our CEO inside debt holding measure. Interestingly, column (3) shows opposite results. We observe a significantly positive coefficient of *LIO* for our CEO inside debt holding measure. Therefore, as we stated in the second hypothesis, we find empirical evidence for the negative relationship between SIO and CEO inside debt holdings and for the positive relationship between LIO and CEO inside debt holdings. We also attribute the lack of a significant association between the unclassified *IO* and the CEO inside debt

holdings to the *IO* variable's inclusion of these two contradicting subgroups (*SIO* and *LIO*) that have varying relationships with the dependent variables.

**Table 6.** Effect of IO on CEO pension compensation.

| Independent Variables | Dependent Variable: *CEO Debt/Equity Compensation* (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| *IO* | −0.11 | | | | | |
| | (−1.28) | | | | | |
| *SIO* | | | −0.36 | *** | | |
| | | | (−3.25) | | | |
| *LIO* | | | | | 0.56 | *** |
| | | | | | (3.14) | |
| *FSIZE* | 0.07 | *** | 0.07 | *** | 0.07 | *** |
| | (7.25) | | (6.71) | | (6.35) | |
| *LEV* | −0.01 | | −0.01 | * | −0.01 | * |
| | (−1.61) | | (−1.76) | | (−1.70) | |
| *MTB* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.27) | | (−0.24) | | (−0.33) | |
| *INT* | 0.00 | | 0.00 | | 0.00 | |
| | (−0.82) | | (−0.67) | | (−0.68) | |
| *CAPEX* | −0.79 | | −0.76 | | −0.79 | |
| | (−1.62) | | (−1.55) | | (−1.63) | |
| *Tobin's Q* | −0.02 | ** | −0.02 | ** | −0.02 | ** |
| | (−2.07) | | (−2.15) | | (−2.14) | |
| *CEOTenure* | −0.01 | *** | −0.01 | *** | −0.01 | *** |
| | (−2.80) | | (−2.90) | | (−2.59) | |
| *CEOAGE* | 0.01 | *** | 0.01 | *** | 0.01 | *** |
| | (5.22) | | (5.17) | | (5.09) | |
| *CEOGENDER* | 0.10 | | 0.09 | | 0.08 | |
| | (1.08) | | (1.08) | | (0.96) | |
| *Intercept* | 0.37 | | 0.39 | | 0.22 | |
| | (1.21) | | (1.30) | | (0.72) | |
| Year fixed effects | Yes | | Yes | | Yes | |
| Industry fixed effects | Yes | | Yes | | Yes | |
| {F-value} | {8.07} | *** | {8.21} | *** | {8.20} | *** |
| Adj. R2 | 0.0547 | | 0.0557 | | 0.0556 | |
| N | 8315 | | 8315 | | 8315 | |

*Note:* This table reports the regression results of the association between IO and CEO inside debt holdings. The *t*-statistics are reported in parentheses, and the *F*-values are in square brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

### 4.2. Robustness Test 1 – PSM Approach

Table 6 shows that the OLS regression results support our hypothesis regarding short-term and long-term institutional investors' differing incentives and impacts on CEO inside debt holdings. However, well-known econometric studies have noted that OLS regression analyses may suffer from uncontrolled systematic differences that may affect our hypothesized relationship [40,41]. To alleviate this endogeneity concern, we also applied Rosenbaum and Rubin's [42] PSM methodology to our empirical analysis. We see the probable existence of systematic differences based on both the CEO inside debt holdings and the IO, and we attempt to reduce these systematic differences to some extent.

Tables 7–12 display the PSM results. Our attempt to decrease the systematic differences induced by the existence of CEO pension plans is well explained in Tables 7–9. We regress whether CEO pension or *CEO Debt/Equity Compensation* has a zero or positive value on a set of control variables known to affect CEO inside debt holdings [1,2]. Table 7 shows the first regression results, and we find that most of the controls are significantly related with the CEO pension dummy.

**Table 7.** PSM approach1: First-stage results.

| **Independent Variables** | **Dependent Variable: *CEO Debt/Equity Compensation* > 0 or = 0** | | |
|---|---|---|---|
| *Intercept* | −4.93 | {26.60} | *** |
| *FSIZE* | 0.83 | {1023.06} | *** |
| *LEV* | −0.16 | {79.74} | *** |
| *MTB* | 0.00 | {0.50} | |
| *INT* | −0.85 | {225.35} | *** |
| *CAPEX* | −1.65 | {3.10} | * |
| *Tobin's Q* | −0.09 | {13.63} | *** |
| *CEOAGE* | 0.00 | {0.39} | |
| *CEOTENURE* | 0.02 | {20.53} | *** |
| *CEOGENDER* | 0.31 | {3.44} | * |
| *Year fixed effects* | Yes | | |
| *Industry fixed effects* | Yes | | |
| {$\chi^2$-value} | {3107.40} *** | | |
| Adj. $R^2$ | 0.493 | | |
| *N* | 8315 | | |

*Note:* This table reports first-stage PSM regression results, focusing on the potential systematic differences caused by the existence of CEO pensions. The *t*-statistics are reported in parentheses, and the *F*-values are in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

With the propensity score computed in the first regression, we match each observation with positive CEO pension to the observation with zero CEO pension that has the closest propensity score, within a maximum difference of 0.03. Table 8 shows each variable's mean difference analysis for unmatched and propensity-score-matched samples. In the unmatched sample, 4586 observations (approximately 55.15%) have positive CEO pension values. We observe that for all the variables except for the CEO's gender, significant mean differences exist in the unmatched sample; however, most of this significance in the mean difference disappears in the propensity-score-matched sample, except for the variables of IO, SIO, and FSIZE. Following He [43], we perform a covariate balance check after PSM and find that the covariates are not generally statistically different between treatment and control groups. That is, all standardized biases of control variables are less than 10% for all covariates. With this result, we expect our propensity-score-matched sample to suffer less from endogeneity concerns.

We ran the main regression analysis for this propensity-score-matched sample, the results of which are shown in Table 9. In the second-stage regression, we find mixed results for the coefficient of IO but still observe significantly negative and positive coefficients of SIO and LIO, respectively. Thus, our first PSM analysis shows results that are consistent with our hypothesis and the main regression result.

Similarly, we conducted the PSM analysis for IO. First, we computed the propensity score, or the probability of high IO, by regression of the dummy variable of high IO on related control variables, the results of which are shown in Table 10. High IO is defined as above-median IO, and low IO is defined as below-median IO. Similarly, to Tables 7–9, we constructed the propensity-score-matched sample, wherein Table 11 compares the mean difference analysis between the unmatched and propensity-score-matched samples. The mean difference analysis for the unmatched sample shows significant mean differences for variables including FSIZE, CAPEX, Tobin's Q, CEO's tenure, and CEO's age; however, this significance disappears for every variable. In addition, all standardized biases of control variables are less than 10% for all covariates, implying that our sample is well matched.

Table 12 displays the main regression results performed on the propensity-score-matched sample, and we observe results consistent with our hypothesis and the previous results. Coefficients of IO show mixed results, whereas those of SIO and LIO have consistently negative and positive values, respectively. Overall, the PSM method, which is used to alleviate the endogeneity concerns that may be caused by the systematic differences related with our dependent (CEO Debt/Equity Compensation) and independent (IO) variables, also provides empirical results supporting our hypothesis.

**Table 8.** Differences in characteristics between firms *with* and *without* CEO pension plans.

| | **Unmatched Sample** | | | | | | **Propensity-Score-Matched Sample** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *CEO Debt/Equity Compensation* > 1 | | *CEO Debt/Equity Compensation* = 0 | | *Mean difference* | | *CEO Debt/Equity Compensation* > 1 | | *CEO Debt/Equity Compensation* = 0 | | *Mean difference* | | *Standardized bias* |
| Variables | N | Mean | N | Mean | *P*-value | | N | Mean | N | Mean | *P*-value | | (%) |
| IO | 4586 | 0.882 | 3729 | 0.854 | 0.000 | *** | 1773 | 0.907 | 1773 | 0.882 | 0.000 | *** | −15.917 |
| SIO | 4586 | 0.277 | 3729 | 0.316 | 0.000 | *** | 1773 | 0.316 | 1773 | 0.325 | 0.097 | * | 5.639 |
| LIO | 4586 | 0.268 | 3729 | 0.235 | 0.000 | *** | 1773 | 0.247 | 1773 | 0.246 | 0.771 | | −0.900 |
| FSIZE | 4586 | 8.083 | 3729 | 6.435 | 0.000 | *** | 1773 | 6.943 | 1773 | 7.102 | 0.000 | *** | 11.739 |
| LEV | 4586 | 1.219 | 3729 | 2.781 | 0.000 | *** | 1773 | 1.907 | 1773 | 1.829 | 0.219 | | −4.131 |
| MTB | 4586 | 3.994 | 3729 | 2.668 | 0.000 | *** | 1773 | 2.410 | 1773 | 2.769 | 0.572 | | 1.647 |
| INT | 4586 | 1.140 | 3729 | 1.727 | 0.000 | *** | 1773 | 1.169 | 1773 | 1.187 | 0.417 | | 2.710 |
| CAPEX | 4586 | 0.043 | 3729 | 0.039 | 0.000 | *** | 1773 | 0.045 | 1773 | 0.043 | 0.136 | | −5.101 |
| Tobin's Q | 4586 | 1.424 | 3729 | 2.006 | 0.000 | *** | 1773 | 1.621 | 1773 | 1.635 | 0.847 | | 0.875 |
| CEOTENURE | 4586 | 6.571 | 3729 | 7.751 | 0.000 | *** | 1773 | 6.913 | 1773 | 7.045 | 0.604 | | 1.749 |
| CEOAGE | 4586 | 56.557 | 3729 | 54.852 | 0.000 | *** | 1773 | 55.793 | 1773 | 55.833 | 0.871 | | 0.540 |
| CEOGENDER | 4586 | 0.032 | 3729 | 0.030 | 0.638 | | 1773 | 0.031 | 1773 | 0.033 | 0.703 | | 1.345 |

*Note:* This table shows mean difference test results for unmatched and propensity-score-matched samples. Each observation with a positive inside debt value was matched with an observation with a zero inside debt value that has the closest propensity score within a maximum difference of 0.03. The *t*-statistics are reported in parentheses, and the *F*-values are in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 9.** PSM approach 1: Second-stage results.

| Independent Variables | Dependent Variable: CEO Debt/Equity Compensation (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| *IO* | −0.27 | * | | | | |
| | (−1.84) | | | | | |
| *SIO* | | | −0.45 | *** | | |
| | | | (−2.77) | | | |
| *LIO* | | | | | 0.15 | |
| | | | | | (0.53) | |
| *FSIZE* | 0.01 | | −0.01 | | −0.01 | |
| | (0.11) | | (−0.29) | | (−0.13) | |
| *LEV* | 0.03 | ** | 0.03 | ** | 0.03 | ** |
| | (2.39) | | (2.11) | | (2.29) | |
| *MTB* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.85) | | (−0.86) | | (−0.96) | |
| *INT* | −0.02 | | −0.01 | | −0.02 | |
| | (−0.34) | | (−0.10) | | (−0.45) | |
| *CAPEX* | −1.54 | ** | −1.44 | ** | −1.59 | ** |
| | (−2.17) | | (−2.03) | | (−2.24) | |
| *Tobin's Q* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.51) | | (−0.62) | | (−0.58) | |
| *CEOTenure* | −0.01 | * | −0.01 | ** | −0.01 | * |
| | (−1.93) | | (−1.99) | | (−1.87) | |
| *CEOAGE* | 0.01 | ** | 0.01 | ** | 0.01 | ** |
| | (2.07) | | (2.10) | | (2.11) | |
| *CEOGENDER* | 0.18 | | 0.19 | | 0.17 | |
| | (1.40) | | (1.46) | | (1.32) | |
| *Intercept* | 1.78 | | 1.64 | | 1.47 | |
| | (1.30) | | (1.20) | | (1.07) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| *{F-value}* | *{1.95}* | *** | *{2.02}* | *** | *{1.90}* | *** |
| *Adj. R2* | 0.0164 | | 0.0176 | | 0.0155 | |
| *N* | 3546 | | 3546 | | 3546 | |

*Note:* This table reports second-stage PSM regression results, focusing on the potential systematic differences caused by the existence of CEO pensions. The *t*-statistics are reported in parentheses, and the *F*-values are in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 10.** PSM approach 2: First-stage results.

| Independent Variables | Dependent Variable: *High IO or not* | | |
|---|---|---|---|
| *Intercept* | −2.82 | {7.20} | *** |
| *FSIZE* | −0.07 | {20.12} | *** |
| *LEV* | −0.04 | {10.69} | *** |
| *MTB* | 0.00 | {2.12} | |
| *INT* | 0.02 | {4.14} | ** |
| *CAPEX* | 0.58 | {0.59} | |
| *Tobin's Q* | 0.04 | {5.49} | ** |
| *CEOTENURE* | −0.02 | {22.30} | *** |
| *CEOAGE* | 0.00 | {0.22} | |
| *CEOGENDER* | 0.17 | {1.59} | |
| *Year fixed effects* | Yes | | |
| *Industry fixed effects* | Yes | | |
| {$\chi^2$-value} | {661.96} *** | | |
| Adj. $R^2$ | 0.102 | | |
| *N* | 8315 | | |

*Note:* This table reports first-stage PSM regression results, focusing on the potential impact from high (above median) IO. The *t*-statistics are reported in parentheses, and the *F*-values are in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 11.** Differences in characteristics between firms *with* and *without* high IO.

| | Unmatched Sample | | | | | | Propensity-Score-Matched Sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | High *IO* | | Low *IO* | | Mean Difference | | High *IO* | | Low *IO* | | Mean Difference | Standardized Bias |
| **Variables** | **N** | **Mean** | **N** | **Mean** | ***p*-Value** | | **N** | **Mean** | **N** | **Mean** | ***p*-Value** | **(%)** |
| *FSIZE* | 4196 | 7.196 | 4119 | 7.495 | 0.000 | *** | 3324 | 7.216 | 3,324 | 7.231 | 0.697 | −1.029 |
| *LEV* | 4196 | 1.920 | 4119 | 1.920 | 1.000 | | 3324 | 2.027 | 3,324 | 2.000 | 0.656 | 1.083 |
| *MTB* | 4196 | 3.794 | 4119 | 2.997 | 0.261 | | 3324 | 3.174 | 3,324 | 3.190 | 0.981 | −0.054 |
| *INT* | 4196 | 1.430 | 4119 | 1.376 | 0.495 | | 3324 | 1.408 | 3,324 | 1.370 | 0.548 | 0.929 |
| *CAPEX* | 4196 | 0.042 | 4119 | 0.040 | 0.014 | ** | 3324 | 0.041 | 3,324 | 0.040 | 0.283 | 2.736 |
| *Tobin's Q* | 4196 | 1.752 | 4119 | 1.616 | 0.001 | *** | 3324 | 1.708 | 3,324 | 1.655 | 0.124 | 2.727 |
| *CEOTENURE* | 4196 | 6.813 | 4119 | 7.393 | 0.000 | *** | 3324 | 7.143 | 3,324 | 7.161 | 0.917 | −0.251 |
| *CEOAGE* | 4196 | 55.529 | 4119 | 56.062 | 0.001 | *** | 3324 | 55.525 | 3,324 | 55.688 | 0.352 | −2.216 |
| *CEOGENDER* | 4196 | 0.033 | 4119 | 0.029 | 0.265 | | 3324 | 0.030 | 3,324 | 0.028 | 0.770 | 0.750 |

*Note:* This table reports the mean difference test results for unmatched and propensity-score-matched samples, focusing on the potential impact from high (above median) IO. The *t*-statistics are reported in parentheses, and the *F*-values are in square brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 12.** PSM approach 2: Second-stage results.

| **Independent Variables** | **Dependent Variable: *CEO Debt/Equity Compensation*** | | | | | |
|---|---|---|---|---|---|---|
| | **(1)** | | **(2)** | | **(3)** | |
| *IO* | −0.14 | * | | | | |
| | (−1.78) | | | | | |
| *SIO* | | | −0.33 | *** | | |
| | | | (−3.22) | | | |
| *LIO* | | | | | 0.44 | ** |
| | | | | | (2.46) | |
| *FSIZE* | 0.08 | *** | 0.08 | *** | 0.07 | *** |
| | (8.12) | | (7.66) | | (7.04) | |
| *LEV* | 0.00 | | 0.00 | | 0.00 | |
| | (−0.13) | | (−0.30) | | (−0.35) | |
| *MTB* | 0.00 | | 0.00 | | 0.00 | |
| | (−0.50) | | (−0.48) | | (−0.59) | |
| *INT* | −0.01 | | −0.01 | | −0.01 | |
| | (−1.15) | | (−1.01) | | (−0.95) | |
| *CAPEX* | −0.65 | | −0.63 | | −0.66 | |
| | (−1.41) | | (−1.36) | | (−1.44) | |
| *Tobin's Q* | −0.05 | *** | −0.05 | *** | −0.05 | *** |
| | (−4.64) | | (−4.69) | | (−4.65) | |
| *CEOTenure* | −0.01 | ** | −0.01 | *** | −0.01 | ** |
| | (−2.54) | | (−2.61) | | (−2.51) | |
| *CEOAGE* | 0.01 | *** | 0.01 | *** | 0.01 | *** |
| | (5.19) | | (5.12) | | (5.14) | |
| *CEOGENDER* | 0.08 | | 0.08 | | 0.08 | |
| | (0.93) | | (0.95) | | (0.88) | |
| *Intercept* | 0.10 | | 0.09 | | −0.07 | |
| | (0.12) | | (0.10) | | (−0.09) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| *{F-value}* | *{7.86}* | *** | *{7.99}* | *** | *{7.91}* | *** |
| *Adj. R2* | 0.0602 | | 0.0612 | | 0.0606 | |
| *N* | 6648 | | 6648 | | 6648 | |

This table reports second-stage PSM regression results, focusing on the potential impact from high (above median) IO. The *t*-statistics are reported in parentheses, and the *F*-values are in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

### *4.3. Robustness Test 2 – Two-Stage Instrumental Variable Approach and Difference-in-Difference Test*

We also performed the two-stage instrumental variable approach and difference-in-difference test to alleviate the concerns over the causality problem. A causality problem might exist in which more inside debt holdings in the form of more pensions will lead institutional investors to hold a longer investment horizon. Therefore, reverse causality arises and would likely contaminate our main results. Furthermore, institutional investors' investment horizons are far more subject to changes from year to year than pension benefit plans. Thus, we employed a two-stage instrumental variable approach and difference-in-difference test to mitigate such a concern.

Tables 13 and 14 show the results from the two-stage instrumental approach. We adopted Analyst coverage as the instrumental variable because many prior studies have found a significant link between analyst coverage and IO [44,45] but there is no evidence that analyst coverage is related to CEO pension holdings yet. Also, we find that the Pearson correlation coefficient between analyst coverage and CEO inside debt is not statistically significant, which supports the validity of analyst coverage as the instrumental variable. Table 13 shows that IO is generally positively related with analyst coverage, while long-term institutional investors' ownership is negatively related with analyst coverage, implying that long-term institutional investors' interest is not consistent with analysts' interest.

**Table 13.** Two-stage instrumental approach: First-stage regression with Analyst coverage as the instrumental variable.

| | **Dependent Variable:** | | | | | |
|---|---|---|---|---|---|---|
| | ***IO*** | | ***SIO*** | | ***LIO*** | |
| ***Independent Variables*** | **(1)** | | **(2)** | | **(3)** | |
| *FSIZE* | −0.01 | | −0.03 | *** | 0.02 | *** |
| | (−1.53) | | (−20.66) | | (19.15) | |
| *LEV* | −0.01 | ** | −0.01 | *** | 0.01 | *** |
| | (−2.14) | | (−7.19) | | (3.28) | |
| *MTB* | 0.01 | * | 0.01 | | 0.01 | |
| | (1.91) | | (1.42) | | (0.23) | |
| *INT* | −0.01 | | 0.01 | *** | −0.01 | *** |
| | (−0.48) | | (3.71) | | (−3.15) | |
| *CAPEX* | 0.05 | | 0.04 | | −0.01 | |
| | (0.91) | | (0.73) | | (−0.12) | |
| *Tobin's Q* | −0.01 | | −0.01 | *** | 0.01 | * |
| | (−0.22) | | (−6.40) | | (1.74) | |
| *Analyst coverage* | 0.01 | *** | 0.01 | *** | −0.01 | *** |
| | (6.26) | | (14.33) | | (−10.70) | |
| *Intercept* | 0.62 | *** | 0.33 | *** | 0.17 | *** |
| | (18.27) | | (11.81) | | (9.68) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| {F-value} | {11.15} | *** | {33.43} | *** | {60.07} | *** |
| *Adj. R2* | 0.0746 | | 0.2048 | | 0.3194 | |
| *N* | 8183 | | 8183 | | 8183 | |

*Note:* This table shows the first-stage regression results, where the analyst coverage (*Analyst coverage*) is used as the instrumental variable. The *t*-statistics are reported in parentheses, and the *F*-values are in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 14.** Two-stage instrumental approach: Second-stage regression.

| | **Dependent Variable:** ***CEO Debt/Equity Compensation*** | | | | | |
|---|---|---|---|---|---|---|
| ***Independent Variables*** | **(1)** | | **(2)** | | **(3)** | |
| *residual (IO)* | −0.10 | | | | | |
| | (−1.02) | | | | | |
| *residual (SIO)* | | | −0.30 | *** | | |
| | | | (−2.62) | | | |
| *residual (LIO)* | | | | | 0.48 | ** |
| | | | | | (2.55) | |
| *FSIZE* | 0.07 | *** | 0.07 | *** | 0.07 | *** |
| | (6.80) | | (6.80) | | (6.83) | |
| *LEV* | −0.01 | | −0.01 | | −0.01 | |
| | (−1.60) | | (−1.59) | | (−1.61) | |
| *MTB* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.13) | | (−0.13) | | (−0.13) | |
| *INT* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.77) | | (−0.78) | | (−0.78) | |
| *CAPEX* | −0.84 | * | −0.84 | * | −0.84 | * |
| | (−1.70) | | (−1.69) | | (−1.70) | |
| *Tobin's Q* | −0.02 | ** | −0.02 | ** | −0.02 | ** |
| | (−2.15) | | (−2.15) | | (−2.16) | |
| *CEOTenure* | −0.01 | *** | −0.01 | *** | −0.01 | *** |
| | (−2.82) | | (−2.94) | | (−2.63) | |
| *CEOAGE* | 0.01 | *** | 0.01 | *** | 0.01 | *** |
| | (5.25) | | (5.24) | | (5.15) | |
| *CEOGENDER* | 0.10 | | 0.10 | | 0.09 | |
| | (1.15) | | (1.16) | | (1.05) | |
| *Intercept* | 0.32 | | 0.32 | | 0.32 | |
| | (1.03) | | (1.04) | | (1.05) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| *{F-value]* | {8.00} | *** | {8.09} | *** | {8.09} | *** |
| *Adj. R2* | 0.055 | | 0.0557 | | 0.0556 | |
| *N* | 8183 | | 8183 | | 8183 | |

*Note:* This table reports second stage regression results. with the residual variables from the first-stage regression as the main independent variables. The *t*-statistics are reported in parentheses, and the *F*-values are in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Then, we used the residual values from the first-stage regression model as the main independent variables of the second-stage regression model. Table 14 is qualitatively the same as our main findings in Table 6, that is, short-term (long-term) institutional investors' ownership is negatively (positively) related with CEO pension plans.

Additionally, to alleviate the causality concerns, we performed the difference-in-difference test. We created a one-year change variable for this test and then performed the difference-in-difference test as shown in Table 15. It reveals that all one-year ahead change in long-term institutional investors' ownership is marginally positively related with one-year change in CEO pension plans, implying that the increases in long-term institutional investors' ownership are preceding the increases in CEO pension plans. Overall, our two robustness tests alleviate the concerns over causality.

**Table 15.** Difference-in-difference test.

| **Independent Variables** | **Dependent Variable: Δ*CEO Debt/Equity Compensation*** | | | | | |
|---|---|---|---|---|---|---|
| | **(1)** | | **(2)** | | **(3)** | |
| Δ*IO* | 1.13 | | | | | |
| | (0.28) | | | | | |
| Δ*SIO* | | | −0.01 | | | |
| | | | (−0.01) | | | |
| Δ*LIO* | | | | | 1.45 | * |
| | | | | | (1.68) | |
| Δ*FSIZE* | 5.67 | | 6.37 | | 6.52 | |
| | (0.61) | | (0.71) | | (0.73) | |
| Δ*LEV* | 2.48 | * | 2.51 | ** | 2.40 | * |
| | (1.96) | | (2.00) | | (1.93) | |
| Δ*MTB* | 3.10 | | 3.09 | | 2.80 | |
| | (1.65) | | (1.65) | | (1.51) | |
| Δ*INT* | −3.91 | *** | −3.86 | *** | −3.97 | *** |
| | (−3.02) | | (−3.01) | | (−3.13) | |
| Δ*CAPEX* | 0.01 | | 0.01 | | 0.07 | |
| | (0.01) | | (0.02) | | (0.17) | |
| Δ*Tobin's Q* | −3.06 | | −3.06 | | −2.70 | |
| | (−1.60) | | (−1.59) | | (−1.42) | |
| Δ*CEOTenure* | 1.19 | ** | 1.20 | ** | 1.11 | ** |
| | (2.27) | | (2.28) | | (2.13) | |
| Δ*CEOAGE* | −5.85 | | −5.88 | | −5.98 | |
| | (−0.72) | | (−0.72) | | (−0.75) | |
| Δ*CEOGENDER* | −0.84 | | −0.84 | | −0.60 | |
| | (−0.68) | | (−0.68) | | (−0.49) | |
| *Intercept* | 0.65 | | 0.66 | | 0.76 | |
| | (0.85) | | (0.87) | | (1.01) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| *{F-value}* | {3.12} | *** | {3.11} | *** | {3.27} | *** |
| *Adj. R2* | 0.3735 | | 0.3729 | | 0.3899 | |
| *N* | 8204 | | 8204 | | 8204 | |

*Note:* This table reports the results of the difference-in-difference test. We created one-year change variables for all dependent and independent variables and then used them in the main regression model. The *t*-statistics are reported in parentheses, and the *F*-values are in square brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

### *4.4. Additional Test 1 – The Effect of Default Risk*

We additionally examined the influence of the firm's default risk on our hypothesized relationship between IO and CEO inside debt holdings. A long-term institutional investor who invests in a firm with a high default risk will be more eager to increase the manager's conservatism and risk averseness, thereby increasing the possibility of the firm's long-term survival and better long-term performance. By contrast, short-term institutional investors will seek to increase the manager's risk preference to take back their investments and reap potential profits from the investments. This reverse relationship between investment horizon and riskiness in managers' compensation structure predicts that the default risk strengthens the negative (positive) association between the LIO (SIO) and the CEO inside debt holdings.

We used two default risk measures following the previous studies. Our first default risk measure ($AZ$) is computed from Altman's [46] equation of the possibility of bankruptcy. To compute $AZ$, we first calculate Altman's $Z$-score (AZ) based on the following formula:

$$\begin{aligned} Z = 1.2 \times (\text{Working} \quad & \tfrac{\text{capital}}{\text{Total}}\text{assets}\Big) + 1.4 \times \Big(\text{Retained}\tfrac{\text{earnings}}{\text{Total}}\text{assets}\Big) \\ & +3.3 \times \Big(\tfrac{\text{EBIT}}{\text{Total}}\text{assets}\Big) + 0.6 \times \text{Book} - \text{to} - \text{market} \\ & +1 \times \Big(\tfrac{\text{Sales}}{\text{Total}}\text{assets}\Big) \end{aligned} \tag{4}$$

We construct a variable $AZ$ as the negative value of the $Z$-score so that a higher $AZ$ value indicates a higher default risk: $AZ = (-1) \times Z\text{−score}$.

Our second measure for default risk is based on the Ohlson's $O$-score (OS) formula [47] as follows:

$$\begin{aligned} O - \text{score} = \quad & 1.32 - 0.407 \times \text{Log}(\text{Total assets}) \\ & +6.03 \times (\text{Total liabilities}/\text{Total assets} \\ & -1.43 \times (\text{Working capital}/\text{Total assets}) \\ & +0.076 \times (\text{Current liabilities}/\text{Current assets}) \\ & -1.72 \times (1 \text{ if total liabilities} \\ & > \textit{total assets}, \ 0 \ \textit{otherwise}) \\ & -0.521 \times \left\{\tfrac{\textit{Net income}_t - \textit{Net income}_{t-1}}{|\textit{Net income}_t| + |\textit{Net income}_t|}\right\} \end{aligned} \tag{5}$$

We then insert the default risk variable and its interactions with (short-term or long-term) IO into our main regression equation (1). As we expected that default risk strengthens the associations between the SIO (LIO) and the CEO inside debt holdings, we predicted significantly negative coefficients for both $SIO$ and its interaction with default risk ($SIO \times AZ$ or $SIO \times OS$) but significantly positive coefficients for both $LIO$ and its interaction with default risk ($LIO \times AZ$ or $LIO \times OS$).

Tables 16 and 17 demonstrates the results of our analysis on the impact of default risk on our hypothesized relationship. Tables 17 and 18 show empirical results using $AZ$ (negative value of AZ) and $OS$ as default risk measures, respectively. Both tables' results support our predictions. For both measures of default risk, the default risk alone does not significantly affect the manager's inside debt holdings, but we witness significantly negative coefficients of $SIO$ and $SIO \times Default\_risk$ but significantly positive coefficients of $LIO$ and $LIO \times Default\_risk$ for our CEO inside debt holding measure. Thus, we empirically show that default risk reinforces our hypothesized relationship.

**Table 16.** Effect of default risk (AZ) on our hypothesized relationship.

| *Independent Variables* | **Dependent Variable:** ***CEO Debt/Equity Compensation*** | | | | | |
|---|---|---|---|---|---|---|
| | **(1)** | | **(2)** | | **(3)** | |
| *IO* | −0.04 | | | | | |
| | (−0.43) | | | | | |
| *IO*AZ* | 0.01 | *** | | | | |
| | (2.75) | | | | | |
| *SIO* | | | −0.24 | ** | | |
| | | | (−2.11) | | | |
| *SIO*AZ* | | | −0.02 | * | | |
| | | | (−1.86) | | | |
| *LIO* | | | | | 0.78 | *** |
| | | | | | (4.25) | |
| *LIO*AZ* | | | | | 0.05 | *** |
| | | | | | (3.63) | |
| *AZ* | 0.01 | | 0.01 | | 0.01 | |
| | (0.13) | | (0.17) | | (0.16) | |
| *FSIZE* | 0.07 | *** | 0.06 | *** | 0.06 | *** |
| | (7.05) | | (6.51) | | (6.09) | |
| *LEV* | −0.01 | | −0.01 | | 0.01 | |
| | (−0.17) | | (−0.94) | | (0.13) | |
| *MTB* | 0.00 | | 0.00 | | 0.00 | |
| | (−0.23) | | (−0.22) | | (−0.26) | |
| *INT* | −0.01 | | −0.01 | | −0.01 | |
| | (−1.04) | | (−0.74) | | (−0.99) | |

**Table 16.** *Cont.*

| *Independent Variables* | Dependent Variable: *CEO Debt/Equity Compensation* (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| *CAPEX* | −0.61 | | −0.62 | | −0.59 | |
| | (−1.31) | | (−1.34) | | (−1.27) | |
| *Tobin's Q* | −0.01 | | −0.01 | | −0.01 | |
| | (−1.03) | | (−1.50) | | (−0.85) | |
| *CEOTenure* | −0.01 | *** | −0.01 | *** | −0.01 | ** |
| | (−2.59) | | (−2.74) | | (−2.42) | |
| *CEOAGE* | 0.01 | *** | 0.01 | *** | 0.01 | *** |
| | (5.10) | | (5.04) | | (5.05) | |
| *CEOGENDER* | 0.10 | | 0.10 | | 0.09 | |
| | (1.17) | | (1.18) | | (1.06) | |
| *Intercept* | 0.95 | *** | 1.00 | *** | 0.78 | ** |
| | (2.82) | | (2.99) | | (2.33) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| *{F-value]* | {7.95} | *** | {8.02} | *** | {8.17} | *** |
| *Adj. R2* | 0.0552 | | 0.0557 | | 0.0568 | |
| *N* | 8219 | | 8219 | | 8219 | |

*Note:* This table reports the regression results of the impact of default risk on the relationship between IO and CEO inside debt holdings. The *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 17.** Effect of default risk (OS) on our hypothesized relationship.

| **Independent Variables** | Dependent Variable: *CEO Debt/Equity Compensation* (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| *IO* | 0.09 | | | | | |
| | (1.08) | | | | | |
| *IO*OS* | 0.11 | | | | | |
| | (1.06) | | | | | |
| *SIO* | | | 0.05 | | | |
| | | | (0.42) | | | |
| *SIO*OS* | | | −0.23 | *** | | |
| | | | (−5.91) | | | |
| *LIO* | | | | | 1.01 | *** |
| | | | | | (5.52) | |
| *LIO*OS* | | | | | 0.32 | *** |
| | | | | | (7.08) | |
| *OS* | 0.01 | | 0.01 | | 0.01 | |
| | (0.35) | | (0.43) | | (0.44) | |
| *FSIZE* | 0.08 | *** | 0.07 | *** | 0.08 | *** |
| | (8.43) | | (7.39) | | (7.49) | |
| *LEV* | 0.02 | ** | 0.01 | | 0.02 | ** |
| | (2.46) | | (1.29) | | (1.96) | |
| *MTB* | 0.00 | | 0.00 | | 0.00 | |
| | (−0.43) | | (−0.36) | | (−0.50) | |
| *INT* | 0.00 | | 0.00 | | 0.00 | |
| | (−1.19) | | (−0.83) | | (−0.97) | |
| *CAPEX* | −0.59 | | −0.63 | | −0.58 | |
| | (−1.27) | | (−1.36) | | (−1.25) | |
| *Tobin's Q* | −0.01 | | −0.01 | * | −0.01 | * |
| | (−1.47) | | (−1.66) | | (−1.73) | |
| *CEOTenure* | 0.00 | ** | −0.01 | ** | 0.00 | ** |
| | (−2.10) | | (−2.43) | | (−2.01) | |
| *CEOAGE* | 0.01 | *** | 0.01 | *** | 0.01 | *** |
| | (4.95) | | (4.83) | | (4.99) | |
| *CEOGENDER* | 0.10 | | 0.11 | | 0.09 | |
| | (1.22) | | (1.28) | | (1.05) | |
| *Intercept* | 0.77 | ** | 0.90 | *** | 0.64 | * |
| | (2.28) | | (2.70) | | (1.90) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| *{F-value}* | {8.61} | *** | {8.51} | *** | {8.75} | *** |
| *Adj. R2* | 0.0601 | | 0.0593 | | 0.0611 | |
| *N* | 8219 | | 8219 | | 8219 | |

*Note:* This table reports the regression results of the impact of default risk on the relationship between IO and CEO inside debt holdings. The *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 18.** Effect of FC on our hypothesized relationship.

| Independent Variables | Dependent Variable: *CEO Debt/Equity Compensation* (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| *IO* | 0.35 | | | | | |
| | (0.83) | | | | | |
| *IO*FC* | 0.12 | | | | | |
| | (1.12) | | | | | |
| *SIO* | | | −0.71 | | | |
| | | | (−1.23) | | | |
| *SIO*FC* | | | −0.11 | | | |
| | | | (−0.77) | | | |
| *LIO* | | | | | 0.58 | *** |
| | | | | | (2.75) | |
| *LIO*FC* | | | | | 0.24 | ** |
| | | | | | (2.31) | |
| *FC* | −0.26 | *** | −0.11 | ** | −0.08 | |
| | (−2.62) | | (−2.31) | | (−1.37) | |
| *FSIZE* | 0.04 | *** | 0.04 | *** | 0.04 | *** |
| | (2.90) | | (3.13) | | (3.07) | |
| *LEV* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.99) | | (−1.07) | | (−1.02) | |
| *MTB* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.21) | | (−0.21) | | (−0.31) | |
| *INT* | −0.01 | | −0.01 | | −0.01 | |
| | (−0.53) | | (−0.48) | | (−0.54) | |
| *CAPEX* | −0.68 | | −0.64 | | −0.69 | |
| | (−1.40) | | (−1.32) | | (−1.42) | |
| *Tobin's Q* | −0.02 | * | −0.02 | * | −0.02 | * |
| | (−1.86) | | (−1.78) | | (−1.85) | |
| *CEOTenure* | −0.01 | ** | −0.01 | ** | −0.01 | ** |
| | (−2.45) | | (−2.54) | | (−2.28) | |
| *CEOAGE* | 0.01 | *** | 0.01 | *** | 0.01 | *** |
| | (4.60) | | (4.59) | | (4.62) | |
| *CEOGENDER* | 0.09 | | 0.10 | | 0.09 | |
| | (1.05) | | (1.13) | | (1.02) | |
| *Intercept* | −0.32 | | 0.20 | | 0.16 | |
| | (−0.70) | | (0.58) | | (0.47) | |
| *Year fixed effects* | Yes | | Yes | | Yes | |
| *Industry fixed effects* | Yes | | Yes | | Yes | |
| *{F-value]* | {8.35} | *** | {8.41} | *** | {8.41} | *** |
| *Adj. R2* | 0.0583 | | 0.0587 | | 0.0587 | |
| *N* | 8315 | | 8315 | | 8315 | |

*Note:* This table reports the regression results of the impact of FC on the relationship between IO and CEO inside debt holdings. The *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

### *4.5. Additional Test 2 – The Effect of Financial Constraint (FC)*

In addition, we examined the effect of FC on our hypothesized relationship. Because institutional investors, regardless of whether they have a short- or long-term investment horizon, would have very little interest in firms with high default risk, we might have tested a small sample, which leads to sample selection bias. Thereby, an additional test seems to be necessary to strengthen the relationship between institutional investors' ownership and CEO pension plans. Therefore, we considered FC as another moderating variable. Since FC is known to exacerbate the agency conflict between shareholders and debt holders [48], we hypothesized that institutional investors are more likely to award CEO pension plans to prevent default in the future. We followed Hadlock and Pierce [49] as follows: $FC = -0.737 * FSIZE + 0.043 * FSIZE^{\wedge}2 - 0.040 * Firm\ age$, where *Firm age* is the number of years a firm has been listed in the Compustat database. Then, we interacted FC with our main independent variables. Table 18 shows the regression results. It shows that long-term institutional investors are more likely to award CEO pension plans to highly financially constrained firms.

## 5. Conclusion

Our study examined the correlation between IO and CEO inside debt holdings. We expected short-term institutions to decrease CEO inside debt holdings for them to reap their investment benefits sooner by inducing CEOs' risky decisions. Moreover, we expected long-term institutions to increase CEO inside debt holdings to seek firms' long-term survival and focus on their long-term performance by making the CEOs more conservative and long-term-oriented. We used OLS and PSM analyses to obtain empirical results supporting our predictions. All our empirical analyses including additional tests concerning default risk were consistent with our hypothesis. Our study contributes to the literature on CEO inside debt and institutional investors by documenting the differing impacts of short-term and long-term institutional investors on CEOs' debt-based compensation.

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