REIT Executive Compensation and Firm Risks*

Zifeng Feng
Department of Finance
College of Business Administration
Florida International University
Miami, FL 33199
zfeng@fiu.edu

William Hardin III
Hollo School of Real Estate
College of Business Administration
Florida International University
1101 Brickell Ave., Miami, FL 33131
wuz@fiu.edu

Zhonghua Wu
Hollo School of Real Estate
College of Business Administration
Florida International University
1101 Brickell Ave., Miami, FL 33131
wuz@fiu.edu

This version: December 28, 2017

* *We are grateful for helpful comments from the seminar participants at the 2017 ARES annual meeting in San Diego. All errors remain those of the authors.*

REIT Executive Compensation and Firm Risks

Abstract

This paper examines the relationship between REIT executive compensation and firm risks in the cross-section. Using a sample of U.S. equity REITs from 2001 to 2016, we find that total compensation of REIT top executives is positively correlated with the lagged firm risk measures, even after controlling for managerial entrenchment proxies. These results are consistent with principal-agent theory and suggest that exogenous firm risk is an important determinant of REIT executive compensation in the cross-section. Additional analysis based on the correlation between compensation components and firm risks show that, REITs tend to compensate their executives for risk mainly through cash compensation, instead of equity-based compensation. The latter finding supports the notion that REIT top executives, who are often required with specific real estate knowledge and experience, demand higher short-term compensation for bearing extra risk. Taken together, this paper sheds light on the recent REIT executive compensation reform and provides new evidence on the debate about the pay and risk relationship in the literature.

Key Words: Real Estate Investment Trusts, Executive Compensation, Risk

1. Introduction

Executive compensation of Real Estate Investment Trusts (REITs) has increased significantly over the past decade (see Figure 1). The escalation in executive compensation has raised concerns over REIT compensation practices due to managerial entrenchment. As a result, many REITs have been under pressure from shareholder advocates to revamp their compensation structures in recent years.[1] Indeed, effective executive compensation plans are crucial for REITs to stay in market competition, since REITs heavily rely on the external capital markets for funding due to the 90% dividend payout rule. If investors lose confidence in REIT executive compensation practices and governance, REITs would have trouble to raise external capital for investment and growth.

The recent executive compensation reform of REITs has largely focused on linking executive compensation closely to the firm's long-term financial performance and increasing the say of shareholders in approving executive compensation plans. While it is important to emphasize the tie between executive pay and REIT long-term performance and increase monitoring from shareholders in response to the say-on-pay provisions, one can argue that role of exogenous firm risks, another important dimension of executive compensation contract design, cannot be ignored in REIT executive compensation reform. In fact, along with the rapid industry growth, [2] risks of REITs have significantly changed, especially after 2001 when S&P stock market indices started to include REITs. The changing risks of REITs could have a potential impact on REIT executive compensation.

There is a growing finance literature on the relationship between executive compensation and firm risks. Some researchers argue that misaligned compensation packages cause top executives to take excessive risks due to managerial entrenchment (e.g., Hagendorff and Vallascas 2011), while others

[1] See an article from Wall Street Journal in 2015, titled "Under Fire from Advocates, REITs Overhaul pay for Executives."
[2] In 2016, the equity market capitalization of REITs broke the $1 trillion mark and a new Real Estate sector under the Global Industry Classification Standard (GICS) was created by S&P Dow Jones Indices and MSCI Inc.

demonstrate that, consistent with principal-agent theory, riskier firms offer higher pay to compensate risk-averse managers for the extra risks they take (see Cheng, Hong, and Scheinkman 2015). As suggested in Cheng, Hong, and Scheinkman 2015), understanding the pay and risk relationship has important policy implications for executive compensation reform. If exogenous firm risks are indeed an important determinant for executive compensation in the cross-section, stakeholders should also pay closer attention to the role of firm risks in optimal executive compensation contract design.

Despite its importance and the growing finance literature, little research has been done about the pay and risk relationship within the REIT industry. There are a few papers in the literature tangibly studying how firm risks are related to CEO compensation (e.g., Feng et al. 2010, Griffith, Najand and Weeks 2011, Price, Salas and Sirmans 2015). However, the impact of exogenous firm risks on REIT executive pay is not the focus of these studies and the existing REIT literature are largely based on relatively short-term data prior to the financial crisis and the empirical results are mixed.[3] Moreover, most of the research is not motivated based on principal-agent theory. According to principal-agent theory, exogenous firm risks are naturally related to executive compensation, since risk-averse managers at riskier firms face greater wealth uncertainty and must be compensated for the extra risks they take. Thus, it is interesting to study whether and how exogenous firm risks influence REIT executive compensation in accordance with principal-agent theory.

Given the importance of the issue to the REIT industry and lack of systematic research on the pay and risk relationship in the new era, [4] this paper examines the impact of exogenous firm risks on REIT executive compensation using a comprehensive REIT sample from 2001 to 2016.[5] To understand

[3] Please see the literature review for more details on the mixed evidence on the impact of firm risks on executive pay.
[4] Many considered 2001 is the beginning of the new REIT era, when REITs started to join S&P stock market indices.
[5] In addition, REITs have several unique characteristics which make it interesting to study the pay and risk relationship. First, many REITs are internally advised/managed, but others are still externally advised/managed (e.g., Hardin et al. 2009, Deng, Hu and Srinivasan 2017). Second, about 80 REITs are included in S&P stock market indices while the others stay outside the indices. Third, REITs are a capital intensive industry and credit risk is an important type of risks for them.

the specific channel of the impact, we also investigate how firm risks of REITs influence two major compensation components (cash and equity compensation). Besides, additional analysis is conducted to show the robustness of the results, which includes using credit risk as an alternative risk measure, examining the effect of managerial entrenchment proxies, and comparing the impact between S&P index REITs and non-index REITs.

It is worth noting that, due to unique operating environment of REITs, it is not obvious whether exogenous firm risks or managerial entrenchment plays a dominating role in REIT executive compensation in the cross-section. For example, principal agent theory suggests that riskier firms should pay more than less risky firms in order to provide the same incentives to risk-averse managers. Thus, as risks of REITs significantly changed during the past decade, it is likely that exogenous firm risk becomes a major determinant of REIT executive compensation. On the other hand, while some believe that REITs are more transparent and face less information asymmetry than other public firms (e.g., Hardin et al. 2009; Zhu, Ong and Yeo 2010), others argue that agency problems are still relevant to REITs (e.g., Han 2006; Feng et al. 2007). Hence, managerial entrenchment could be a potentially important factor to influence REIT executive compensation as well. Ultimately, it is an empirical question to examine which factor is the first order determinant of REIT executive compensation.

Using a comprehensive sample of U.S. equity REITs obtained from ExecuComp and SNL database, we find that residual compensation of REITs, defined as the average of total pay of top five executives controlling for firm size, is shown to be persistent over time, as the lagged residual compensation is strongly correlated with the previous year residual compensation. Similarly, the residual firm risks of REITs are also highly persistent after controlling for firm size. These finding suggest that there is a permanent firm effect in REIT residual compensation and residual risk measures.

More important, based on both stock price risk measures (return volatility and market beta) and credit risk measures (interest coverage ratio and EBITDA-to-debt ratio), our regression results show that the residual compensation of REIT executives (based on the average compensation of top five executives) is positively correlated with long lags of the three risk measures, controlling for firm size and property type effect, which suggests that REITs with higher exogenous firm risks indeed pay more to compensate their executives for the extra risk. When a nonparametric analysis for the pay and risk relationship is conducted, we find that the residual compensation almost monotonically increases over quintiles based on the lagged firm risk measures. To account for the influence of agency-related issues on REIT executive compensation, we add several entrenchment proxies in the regression. The results show that the effect of exogenous firm risks on REIT executive compensation still holds, suggesting that managerial entrenchment does not significantly change the impact. In short, these findings are consistent with principal-agent theory, indicating that exogenous firm risks are the first order determinant of REITs in the cross-section.

Moreover, we examine the extent to which compensation components are correlated with the lagged risk measures. The results show that REIT executives are largely compensated for risks via cash compensation (including salary, bonus, and non-equity incentive plans), but not via equity compensation (stock awards and option grants). These findings are consistent with the notion that cash compensation offers short-term certainty and is better to be used to compensate risk-averse managers. Finally, we find a strong impact of exogenous firm risks on executive compensation for REITs joining the S&P indices, but there is little effect for REITs outside of the indices. This is likely due to the fact that REITs joining the S&P indices have better analyst coverage, and greater stock liquidity level, higher institutional ownership, which make those REITs more sensitive to compensate for risks.

This paper contributes to the literature in the following ways. First, it demonstrates a strong positive correlation between total executive pay and the lagged firm risk measures of REITs, suggesting that firm risks play an important role in determining REIT executive compensation. These results shed light on the recent REIT executive compensation reform. That is, while linking REIT executive pay closely to the firm's long-term performance is important, it is also indispensable to take into account the role of firm risks. Essentially, to improve REIT executive compensation practices, stakeholders have to pay attention to the two important dimensions of executive compensation contract design: pay-for-performance and compensate-for-risk.

Second, this study shows that REIT executives are mainly compensated for risks through cash compensation, which helps us better understand how REITs compensate their executives for risks and improve REIT compensation structures. This finding is largely different from those based on financial firms (see Cheng, Hong, Scheinkman 2015), which examines the relationship between the fractions of compensation components over total pay and firm risks. They find that firms with higher stock price risk pay lower salaries as a fraction of total pay. The results based on REIT data is likely to due to the fact REIT executives are required with real estate specific knowledge and expertise, and they may be more risk-averse and demand a higher fixed compensation for bearing additional risks. Nevertheless, it appears that there exists some heterogeneity in terms of how firm executives are compensated for risks under different contracting environments.

Finally, the paper offers new evidence on the debate about the relationship between executive pay and firm risks, given the mixed evidence in the literature. Based on an alternative sample (REITs) covering both pre- and post-crisis period, this study presents findings that are consistent with principal-agent theory. Also, both stock price risk measures and credit risk measures are used in the analysis and

the results are robust. These findings suggest that the causal relationship between executive pay and exogenous firm risks can be generalized to other industries (i.e., beyond high-risk financial firms).

The rest of this paper is organized as follows. Section 2 provides a literature review. The data sources, summary statistics and research methodology are described in Section 3. Section 4 presents the empirical results. Section 5 concludes.

2. Related Literature

In the finance literature, there are different theoretical views on the relationship between executive pay and firm risk. A traditional view based on moral hazard is that executive compensation packages do not effectively align the interests of managers with those shareholders, and thus pay causes excessive risk-taking by managers. For example, Bechat, Bolton, and Roell (2003) argue that US pay practices do not provide "right" incentives to align interests of managers and shareholders, and executives have power and opportunities to set their own pay at the expense of shareholders. This supports the managerial entrenchment view.

Several recent papers in the literature provide evidence to support the managerial entrenchment view. Hagendorff and Vallascas (2011) examine the relationship between CEO pay incentives and risk-taking, using a sample of bank mergers and acquisitions. They find that CEOs with higher pay-risk sensitivity are more likely to engage in risk-inducing mergers, suggesting CEO compensation structure causes more risk-taking in the banking industry. Armstrong and Vashishtha (2012) find that CEOs are given incentives to increase firm systematic risks but not idiosyncratic risk. In another recent paper, Shue and Townsend (2017b) examine how stock option grants affect CEO risk-taking. They exploit institutional features of multi-year compensation plans and focus on the period when large increases in

new at-the-money options are granted. Their results suggest that an increase in new options granted results in a significant increase in equity volatility.

Meanwhile, others contend that firm risk plays an important role in executive compensation. Edmans and Gabaix (2011) presents a market equilibrium model, which considers CEO assignment, pay and incentives under risk aversion and moral hazard. In the model, risk aversion is introduced into a CEO market equilibrium and it shows that firms with higher exogenous risk tend to pay more in the cross-section if incentives are independent of risk and risk aversion. However, economy-wide increases in risk do not affect pay. Moreover, the paper argues, if CEOs can affect firm risk, incentives will increase in risk and risk aversion. In short, they suggest that cross-sectional changes in risks increase pay in a CEO market equilibrium, but if value-enhancing actions by CEO increase firm risk, incentives will have a positive relationship with risk and risk aversion.

In Aggarwal and Samwick (1999), the role of risk is examined in the context of pay-performance sensitivity. They contend that one should focus on the heterogeneity in pay-performance sensitives, instead of the average level of pay-performance. Based on a classical principal-agent model, they show that an executive's pay-performance sensitivity decreases in the riskiness of the firm's performance and their empirical analysis support their argument.

A recent paper by Cheng, Hong and Scheinkman (2015) examines the relationship between executive pay and firm risk both theoretically and empirically. They present a principal-agent model and argue that even in a model with exogenous firm risk and *without* managerial entrenchment, pay and risk may still be correlated in equilibrium. In other words, even if managers always make the optimal efforts to maximize shareholder value, firms with high exogenous risks may have to offer higher total compensation in the cross-section to compensate risk-averse executives for the higher risks they take. Otherwise, executives in riskier firms will face greater wealth uncertainty. Using long lags of stock price

based risk measures from financial firms, they provide evidence to support their argument. They conclude that exogenous firm risk, not managerial entrenchment, is a first-order determinant in the cross-section of executive pay. Overall, there is mixed evidence on the relationship between executive pay and firm risk in the finance literature.

There is a growing literature in REIT executive compensation. A large portion of the early studies focus on examining the determinants of REIT CEO compensation and in particular how firm performance influences executive compensation (e.g., Chopin, Dickens, and Shelor 1995, Hardin 1998, Pennathur and Shelor 2002, Griffith, Najand, and Weeks 2011). For instance, Chopin, Dickens, and Shelor (1995) examine the determinants of cash compensation of REIT executives by focusing on frim revenue and unexpected profits. They find that revenue is positively correlated with the level of executive compensation. However, unexpected profit is generally insignificantly related to executive compensation.

Hardin (1998) is the first to argue that industry-specific performance measures should be used to examine executive compensation of REITs. In his study, dividends received by executives, stock ownership, firm size, number of years since REIT IPO are found to affect REIT executive compensation. Using compensation data from 1993 to 1999, Pennathur and Shelor (2002) examine what influence REIT CEO compensation, and their emphasis is on the impacts of industry specific financial performance and stock returns. Their results show that stock returns, real estate investment and changes of FFO are positively related to total pay raise of CEOs, while there is a negative relation between the compensation raise and CEO age.

Other studies in the REIT literature examine how corporate governance, board structure, and institutional monitoring influence REIT CEO compensation (see Ghosh and Sirmans 2005, and Feng et al. 2010). For instance, Ghosh and Sirmans (2005) argue that, because of agency problems, REIT CEOs

are allowed to manipulate boards so that they obtain benefits at the expense of shareholder wealth. Specifically, they document that CEO pay is higher for firms with weaker boards, e.g., those larger boards or boards dominated by older directors. Another paper by Feng et al. (2010) study the relationship between REIT institutional ownership and CEO compensation structure. Their results show that high institution ownership lead to greater emphasis on incentive-based CEO pay and more cash and total compensation for the CEOs, suggesting that large institutions have the power to influence CEO compensation.

A recent paper by Hallman, Hartzell and Parsons (2011) analyze two managerial compensation incentive devices (the threat of termination and pay for performance) and examine how they are related to CEO compensation of real estate firms. Using data from REITs and real estate limited partnerships (RELPs), they find that the two devices are substitutes in terms of providing incentives to real estate mangaers. Specifically, pay-for-performance sensitivity is higher for general partners of RELPs, as the termination threat in the organizations is less credible. Similarly, for certain property type REITs where managers are more difficult to be replaced, pay-for-performance incentives are stronger. Their paper suggests that executive compensation structures may depend on different contract environments, e.g., due to different firm characteristics, organization forms, or stakeholder relationships.

Most of the earlier studies discussed above focus on the impact of *firm performance* on REIT CEO compensation. Only a few papers in the REIT literature tangibly examine how firm risks are related to CEO compensation. For instance, Griffith, Najand, and Weeks (2011) investigate the determinants of *changes* of REIT CEO compensation, using data from 2000 to 2006. In their study, firm risk, measured as the standard deviation of stock return in year t, is considered as one of the determinants. Overall, their results show that CEO tenure, title, ownership and age affect change in CEO salary, but firm performance and firm size do not matter. Also, firm performance affects bonuses and stock option

awards. Regarding the effect of firm risk, change in CEO salary is found to be positively associated with the firm risk measure, while CEO bonus, change in total CEO compensation, and option awards are not significantly affected by the risk measure.

Pennathur, Gilley, and Shelor (2005) examine the determinants of stock-based compensation of REIT CEOs, based on data from 1997 to 2000. Using a Tobit method, they show that REIT CEOs receive more option awards when return volatility of REITs is higher, suggesting that a larger amount of options are awarded to REIT CEOs who take more risky projects. This finding is inconsistent with Griffith, Najand, and Weeks (2011), which documents that firm risk is not correlated with option awards and argues that CEOs are not granted with option awards for investing in high-risk projects. In another related paper, Feng et al. (2010) contend that institutional investors act as monitors in REITs, which can influence corporate governance of REITs through CEO compensation. Using a REIT sample between 1998 and 2007, they find evidence that institutional investors are willing to pay higher cash compensation to encourage CEOs to take riskier projects.

There are also papers that examine the relationship between REIT CEO compensation and other types of risk. For instance, Ertugrul, Sezer, and Sirmans (2008) examine the determinants of REIT hedging activities based on a sample from 1999 to 2001. They find that the ratio of cash compensation to the total CEO pay is negatively correlated with the hedging activities. Also, a negative relation exists between the sensitivity of CEO's wealth to return volatility and the hedging activities. Price, Salas and Sirmans (2015) study the relationship between governance mechanisms, conference call voluntary disclosures, and CEO compensation, using data from 2004 to 2007. They show that REIT executives do not receive higher pay for bearing risks associated with additional voluntary conference calls.

To sum up, research about the relationship between REIT executive compensation and firm risk is limited. The focus of the literature is on REIT CEO compensation, rather than average executive

compensation of top executives. More important, the previous studies on the relationship are not motivated by a theory such as principal-agent theory, and no systematic analysis on how exogenous firm risks affect REIT executive compensation is conducted. Instead, firm risk is just considered as one of the determinants in the REIT CEO compensation. In addition, the results on the relationship between CEO compensation components with firm risk are mixed. As explained in Griffith, Najand and Weeks (2011), the mixed results are likely to due to the different sample periods used in the analyses. Finally, almost all the REIT compensation studies are based on data that predate the financial crisis. Given that REIT executive compensation has risen significantly and their compensation structure has evolved during the past decade, it is interesting to investigate how REIT executive compensation and its components are related to exogenous firm risk.

In theory, the relationship between executive pay and firm risk for REITs is ambiguous due to their unique operating environment and firm characteristics. According to principal agent theory, riskier firms should pay more in order to provide the same incentives to risk-averse managers. Thus, as risks of REITs increased significantly over the past decade, one can argue that exogenous firm risk could become a dominating factor in REIT executive compensation. Moreover, since REITs have to pay a high level of dividends to shareholders, they rely on the external capital market to raise funds (Hardin et al. 2009). With the monitoring from the external capital market, many believe that REITs are more transparent than other public firms (e.g., Danielsen et al. 2009), which suggests that managerial entrenchment is less likely to cause REIT executives to take excessive risks.

However, others contend that agency problems are still relevant to REITs. For instance, Han (2006) argues that it is challenging to determine market value of heterogamous property transactions and REITs are often involved in new development and form joint ventures with other entities that do not fully disclose information. Also, some REITs are externally managed and use a UPREIT structure, which

create additional agency conflicts. Feng et al. (2007) contend that the five or fewer rule (the five largest investors cannot own more than 50% of total shares) makes it difficult for blockholders to pose a takeover threat on REITs and for shareholders to effectively monitor REIT managers. Hence, managerial entrenchment could be a potentially important factor to influence REIT executive compensation as well. Ultimately, the executive pay and firm risk relationship is an empirical question for REITs.

Another interest aspect in REIT operating environment is that REIT executives are typically required to have real estate specific experience and local market knowledge such as regional economic trends, local property market conditions and competition, and financing strategies for property investments (Han 2006). Relatively speaking, REIT executives need to invest a lot of time to acquire this kind of knowledge and experience. Moreover, arguably it is difficult to transfer these specific knowledge and experience to other industries, and REIT executives may face more uncertainty when choosing to work at REITs with higher risks than other public firms. Thus, one would expect that risk-averse executives of REITs would demand a higher fixed amount of their compensation (i.e., cash compensation) for bearing additional uncertainty at high-risk firms. By examining the relationships between the compensation components (i.e., cash compensation and equity compensation) and firm risks, we can understand which compensation component drives the relationship, which in turn can help improve REIT executive compensation structures.

3. Data and Research Methodology

3.1. Data and Summary Statistics

The REIT executive compensation data for the main empirical analysis are obtained from S&P's Execucomp database. This compensation data set includes annual information about total executive compensation for top executives, as well as detailed information on major compensation components

(e.g., salary, bonus, non-equity incentive plan, stock awards, and option grants). Another data source often used in the REIT executive compensation literature is SNL Financial (now S&P Global Market Intelligence). When comparing compensation data from Execucomp and SNL, we find that the information on stock awards and options grants in the SNL database is often missing, especially before 2006. Based on our conversation with staff members from SNL, our understanding is that only the total compensation, salary and bonus data are reliable in the SNL database before 2006. This is probably related to the changes in accounting rules, imposed by the Financial Accounting Standards Board (FASB), and expanded compensation disclosure requirements, imposed by the Securities and Exchanges Commission (SEC) in 2006 (see details about the regulation changes in Coles, Naveen, and Naveen 2014).[6] To make sure accurate information on total compensation and major components is used, we decide to use Execucomp data as the main sample for the empirical analysis in the paper.

Our sample from Execucomp includes 114 REITs, which is largely consistent with number of REITs covered in typical industry reports.[7] Since S&P's Execucomp database mainly covers large firms and firms in the S&P 500, S&P 400 mid-cap, and S&P 600 small-cap indices, we recognize the potential sample selection issue. To mitigate the concern, REIT compensation data are also collected from SNL Financial and merged with Execucomp compensation data to conduct a robust check.

Following Cheng, Hong and Scheinkman (2015), the average of the total compensation of top five executives of each REIT in the database in each year is calculated, and we define it as Executive Compensation (ExComp). If a firm has less than five executives reported in the database, the average of all the executives reported is taken. Similarly, the average of each five major compensation component

[6] According to the regulation changes, all companies on Execucomp report compensation information based on the old reporting format from 1992 to 2005. After 2007, the new format is used to report information. For 2006, only a small portion of the firm (16%) use the old format.

[7] For example, see a report from FTI Consulting, 2016 Executive Compensation Report: Real Estate Industry Long-Term Incentive Practices, which includes 125 publicly traded REITs.

is calculated.[8] The executive compensation data at a REIT IPO year are excluded since the data often consist of a large amount of one-time start-up grant.

As less than 20 REITs are included in the Execucomp database each year prior to 2001 and we are mainly interested in examining REIT executive compensation in the new REIT era, our sample period starts in 2001. Again, since our sample period is from 2001 to 2016, we recognize a common data issue in the executive compensation research due to the changes in compensation reporting rules by FAS 123R and new SEC disclosure requirements implemented in 2006. More discussion about the data issue is added in the empirical result section.

The financial data for equity REIT are from SNL Financial. Specifically, the following annual firm characteristics are obtained: implied market capitalization, total assets, total equity, earnings before interest, tax, depreciation and amortization (EBITDA), share prices, dividends, total debt, interest expenses, real estate investment growth, funds from operations, IPO date, year REIT status established and real estate property type.[9] To calculate stock price risk measures, we collect data on daily stock returns of REITs and the value-weighted market return from the Center for Research in Security Prices (CRSP). Data on risk free rate are from Kenneth French's website. Furthermore, institutional ownership data is from Thomson Reuters' 13F database. Independent director data is from Institutional Shareholder Services (ISS, formerly Risk Metrics) and analyst coverage data from Thomson Reuters' I/B/E/S. REITs included in S&P indices are identified based on NAREIT website.[10]

Following Cheng, Hong, and Scheinkman (2015), the stock price risk for REITs is measured by (i) the annualized return volatility of a REIT's stock (Return Volatility), which is the annualized standard

[8] We do not include long-term incentive pay (LTIP) in our analysis since it is not reported after 2006 and there are only 32 annual observations in our sample. Also, we do not include other form of compensation in the analysis as this is a very small fraction of the total compensation. See Figure 1 for more details.

[9] If a REIT's accounting information is missing in year t, it is replaced by estimates from this formula: $Info_{i,t}^{x} = \left(Info_{i,t+1}^{x} + Info_{i,t-1}^{x}\right)/2$, where $Info_{i,t}^{x}$ is the information of x (TA, TE, etc.) of REIT i in year t.

[10] https://www.reit.com/investing/investor-resources/reit-directory/reits-sp-indexes.

deviation of daily stock return, and (ii) the annual market beta of a REIT's stock (Market Beta), estimated based on the standard CAPM model. To ensure our measures reliable, at least 60 days of return are required for the calculation of Return Volatility and Market Beta.

In addition to the stock price risk measures, we include REIT-specific risk measure - credit risk measures, as REIT are capital intensive firms and credit risk is considered one of the most important risks by REIT investors. Specifically, two credit risk measures are used. One is interest coverage ratio, calculated as EBITDA divided by interest expense. Another is EBITDA to Debt ratio (EBITDA/Debt), calculated as EBITDA divided by total debt.[11] The interest coverage ratio (ICR) represents credit quality of a REIT and is often used by lenders and investors to evaluate a REIT' credit risk (Ooi, Wong and Ong 2012). REITs with a lower interest coverage ratio are more likely to face challenges to access the debt markets (Hartzell, Sun, and Titman 2006), while those with high interest coverage ratios might exhibit an enhanced debt capacity since they have relatively low bankruptcy costs (Harrison, Panasian, and Seiler 2011). Similarly, the lower EBITDA/Debt ratio a REIT has, the higher probability the firm will default on its loan payments.

Following the executive compensation literature, other control variables included in the analysis are: CEO turnover (a binary variable that takes a value of one for a firm if it reports a new CEO joining the company in year *t*), stock return, leverage ratio (defined as the ratio of total book assets to total book equity, following Adrian and Shin (2010)), firm age (the log of the number of years since IPO or year REIT status established), real estate investment growth, geographic diversification (the negative of the Herfindahl Index of REITs, calculated using their assets invested in different MSA location, based on book values, as in Hartzell, Sun, and Titman (2014)), property type diversification (the negative of the

[11] To ensure that outliers do not drive the results, 14 interest coverage ratio observations that are greater than 100 or less than 0 are replaced with missing value, while 7 EBITDA/Debt observations that are greater than 10 or less than 0 are also replaced with missing value.

Herfindahl Index of REIT, calculated using their assets invested in different real estate property type, based on book values, as in Hartzell, Sun, and Titman (2014)), independent director ratio, CEO age, CEO duration, the number of analyst coverage and institutional ownership percentage. All the variables are defined in Table A1 of the Appendix. Because several lagged variables are used in the regression, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility and market capitalization information. The numeric variables are winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations. The main sample consists of about 1,162 firm-year observations of 114 REITs from 2001 to 2016.

Table 1 reports summary statistics for the primary variables used in the analysis. The mean (median) market capitalization is $4.88 billion ($2.66 billion), while the mean (median) total compensation for top five executives is $2.17 million ($1.72 million). For the major components of the executive compensation,[12] the mean cash-based compensation (salary, bonus, and non-equity incentive plan) is about $0.97 million, which is smaller than the mean value of the equity-based compensation (stock awards and options grants, $1.31 million). For the risk measures, the mean stock return volatility is 0.32 and the average market beta is 1.03. Finally, the mean interest coverage ratio is 4.46 and the mean EBITDA/Debt ratio is 0.23. These credit risk measures are consistent with industry reports. For instance, based on NAREIT, the interest coverage ratio for equity REIT as of Q3 of 2016 is 4.6.[13]

[Insert Table 1 here]

[12] There are five major compensation elements (salary, bonus, non-equity incentive plans, stock awards and option grants). We calculate the average of each element for top five executives at each firm in each year. Specifically, Salary is the average of salary (salary in ExecuComp) of top five executives at each firm. Bonus is the average of bonus (bonus in ExecuComp). Non-Equity Incentive Plan is the average of non-equity incentive plans (noneq_incent in ExecuComp). Stock Awards is the average of stock grants (rstkgrnt in ExecuComp in pre-2006, stock_awards_fv in ExecuComp in post-2006). Option Grants is the average of option grants (option_awards_blk_value in pre-2006 and option_awards_fv in post-2006 in ExecuComp).

[13] See https://www.reit.com/data-research/data/industry-snapshot.

3.2. Research Methodology

Previous literature has shown that firm size is one of the most important determinants of executive compensation (see Gabaix, Xavier, and Lander 2008, Edmans and Gabaix 2011). In the REIT literature, it is also well-established that firm size matters in REIT executive compensation (e.g., Hardin 1998, Pennathur and Shelor 2002, Feng et al. 2010). Thus, following Cheng, Hong, and Scheinkman (2015), we calculate residual executive compensation of REITs, defined as the average compensation of top five executives controlling for firm size. Specifically, REIT residual compensation is obtained by regressing the total executive compensation on firm size (measured by log of market capitalization) in the cross-section:

$$LnExecuComp_{i,t} = \beta_0 + \beta_1 Size_{i,t} + \varepsilon_t \quad (1)$$

where $LnExecuComp_{i,t}$ is the natural logarithm of Executive Compensation (ExComp) of REIT i at year t. $Size_{i,t}$ is the natural logarithm of market capitalization of REIT i at year t. The cross-sectional regression of the executive compensation based on four sample years (2004, 2008, 2012, and 2016) and a pooled panel regression with REIT property type effects and year effects are also reported. Similarly, residual compensation components are estimated by replacing the dependent variable of equation (1) to the two major components of Executive Compensation (cash-based compensation and equity-based compensation). Finally, to control for firm size effect on risk, we also estimate the residual risk by using the two stock price based risk measures (Return Volatility and Market Beta) as the dependent variable in equation (1).

To test the persistence of the residual compensation, we regress the residual compensation of REITs in year *t* on the residual compensation in year *t-1*. CEO Turnover (a lagged binary variable, indicating whether the CEO changes in year t-1) is added in the regression as a control variable to see whether change of CEOs affects the persistence of the residual compensation. Similarly, the residual risk

measures are regressed on the lagged residual risk measures based on the same regression to evaluate the persistence of firm risk of REIT. In addition, we examine the correlation of residual compensation and residual risk of REIT in year *t* and that in year *t-1*.

After establishing persistence of the residual compensation, we examine the relationship between residual executive compensation and residual risk measures using equation (2), with heteroscedasticity-robust standard errors clustered at the firm level:

$$ResExComp_{i,t} = \beta_0 + \beta_1 ResRisk_{i,t-k} + \beta_2 PropType + \beta_3 Year + \varepsilon_{i,t} \quad (2)$$

The dependent variable is the residual executive compensation, $ResRisk_{i,t-k}$ is the residual stock price or credit risk measures of REIT *i* in year *t-k* (stock volatility, market beta, interest coverage ratio, and EBITDA to Debt ratio), where *k = 1, 2, 3*.

In a robust check, additional control variables are added in the regression, see equation (3).

$$ResExComp_{i,t} = \beta_0 + \beta_1 ResRisk_{i,t-k} + \beta_2 REGrowth_{i,t-1} + \beta_3 Lev_{i,t-1} + \beta_4 Age_{i,t-1} + \beta_5 GeoDiv_{i,t-1} + \beta_6 PropDiv_{i,t-1} + \beta_7 PropType + \beta_8 Year + \varepsilon_{i,t} \quad (3)$$

Besides the regression analysis, a nonparametric analysis is conducted by sorting REIT residual compensation in year *t+1* into quintiles based on the residual risk of a REIT in year *t*. In other words, we compute the average of the residual compensation at each quintile sorted by their previous-year residual risk measures and examine whether the residual compensation is mean-zero in each quintile. *T*-statistics from a two-sample *T*-test of the equality of the extreme quintiles (i.e., quintile 1 and quantile 5) are reported.

As discussed in the introduction section, we argue not only the total executive pay is important, it is also interesting to examine the relationships between the major components of executive compensation and firm risk. Hence, a similar regression is used to examine the relationship. We consider

two types of the compensation: case-based compensation (including salary, bonus, non-equity incentive plan) and equity-based compensation (stock awards and option grants).[14] This analysis provides insights about how REIT executives are compensated for higher risks based on different types of compensation.

4. Empirical Results

4.1 Growth in Executive Compensation of REITs

Following the methodology in Murphy (2013), we plot total executive compensation of REITs and its major components in Figure 1. Specifically, each bar in the figure represents the median level of average total compensation for top five executives of REITs in each year.[15] Also, each bar is decomposed into the three types of executive compensation (cash compensation, equity compensation and other compensation). All the values are adjusted for inflation (using 2016 dollar). Figure B1 in the Appendix shows the number of REITs included in the Execucomp database by compensation components.

As shown in Figure 1, the total executive compensation of REITs experienced a rapid growth during the period. In 2001, the median level of REIT total executive compensation was $1.2 million. It increased to $2.0 million in 2006 and then declined to $1.5 million in 2009 due to the financial crisis. Since then, it continued to rise and became $2.4 million in 2016. Compared with the level in 2001, the total compensation of REIT executives in 2016 increased by 100%. This trend shows that REIT executive compensation significantly increased in the new REIT era. These results are consistent with the dramatic industry growth of REITs during the period.

[14] In the executive compensation literature, the major components of executive compensation are Salary, Bonus, Stock Awards and Option Grants.

[15] We recognize that the changes in reporting rules may complicate the comparison of total executive compensation between pre-2006 and post-2006 period. Coles, Daniel and Naveen (2014) investigate this issue in detail and their empirical results based on the adjusted values and the reported values of total executive compensation over their sample period are quite similar. Thus, we decide to use the reported values. Shue and Townsend (2017a) use the Black-Scholes value computed by ExecuComp prior to 2006 and the fair value of option compensation in and after 2006. Finally, since these changes affect all the REITs in our sample systematically, it is less likely that the regression results are driven by the data changes.

[Insert Figure 1 here]

4.2 Executive Compensation and Firm Risks of REITs

In this subsection, the correlation between REIT executive compensation and their stock price based risks is examined. As described in the methodology section, we first compute the residual compensation and residual risks of REITs using equation (1), and then examine persistence of executive compensation and risks of REITs. Columns (1) - (4) of Panel A in Table 2 report the cross-sectional regression results on firm size (measured as Log Market Capitalization) for four years: 2004, 2008, 2012 and 2016. The coefficients of firm size are consistent in each of the cross-section regressions: 0.602 in 2004, 0.394 in 2008, 0.425 in 2012, and 0.524 in 2016. All the coefficients are statistically significant at the 1% level. The adjusted R-squared ranges from 0.204 to 0.423. Columns (5) in Panel A reports the results based on a pooled regression from 2001 to 2016. Similarly, the coefficient is 0.480 and statistically significant at the 1% level. Based on the regression results, we compute residual compensation to exclude the effect of firm size on executive compensation. Using the same method, residual risk measures are calculated to adjust the firm size effect.

Panel B of Table 2 shows the results on the persistence tests of compensation and risks of REITs. The residual compensation and residual risks (Return Volatility and Market Beta) in year *t* are strongly correlated with the residual compensation and residual risks in year *t-1*. Specifically, in the baseline model (Column (1)), the coefficient for the residual compensation is 0.802 and statistically significant at the 1% level, with adjusted R-squared being 0.675. In the augmented model (Column (2)), the result on the residual compensation is similar. In Column (3) and (5), the coefficients of the residual return volatility and residual market beta are 0.592 and 0.675, respectively, both being statistically significant. In the augmented models with CEO Turnover as a control variable (Column (4) and (6)), the results are

similar. Overall, these results indicate REIT executive compensation and stock price risks are highly persistent over time.

Panel C of Table 2 presents the results on the correlations of residual compensation and residual risks of REITs. The residual compensation in year t is strongly correlated with the residual compensation in year *t-1*, with the correlation being 0.822. Similarly, the correlation of residual return volatility (market beta) in year t with residual return volatility (market beta) in year t-1 is 0.594 (0.663). Hence, these findings suggest that there exists a permanent firm effect in executive compensation and firm risk. Moreover, residual compensation is correlated with residual risks in the previous year. The correlation is 0.158 for residual return volatility and 0.137 for residual market beta.

[Insert Table 2 here]

After documenting persistence of REIT compensation and risks, we examine how residual compensation of REITs is correlated with the previous-year stock price based risks. In Table 3, Column (1), (2) and (3) of Panel A show that the coefficients of the lagged risk measures (Return Volatility) are positive (1.315, 0.994 and 0.956) and statistically significant at 1% and 5% level, respectively. Similarly, Column (4) - (6) report the coefficients for Market Beta, and the results are similar: the coefficients are positive and statistically significant at 5% or 10% level.

In Panel B, the results based on the quintile sorting between residual compensation and the lagged stock price risk measures are provided. REIT residual compensation in year t+1 is sorted into quantiles by the residual return volatility (Column (1)) and residual market beta (Column (2)) in year t. The differences between the first quintile (with the lowest risk) and the fifth quintile (with the highest risk) are 0.231 (sorted by residual volatility) and 0.150 (sorted by residual market beta), respectively, statistically significance at the 1% level. These results based on quintile sorting analysis provide

additional robustness on the relationship between executive compensation and stock price risk measures, suggesting that top managers of REITs are indeed compensated for the extra risks they take.

[Insert Table 3 here]

4.3 Executive Compensation and Firm Risks by Compensation Components

To gain a deep understanding on the executive pay and firm risk relationship, we investigate how two types of executive compensation are related to REIT stock price risks. Panel A of Table 4 presents the results based on cash-based executive components. From Column (1) to (6), the results show that cash compensation received by REIT executives are positively associated with the lagged risk measures (stock return volatility and market beta, respectively). For instance, the coefficients for the cash compensation are 0.831, 0.720 and 0.622 for the return volatility variable in year t-1, t-2 and t-3, respectively. All the coefficients are statistically significant at the 1% level. These results suggest that cash-based compensation are used to compensate exogenous firm risks for REIT executives, which is consistent with the notion that REIT executives prefer to be compensated for higher firm risks using compensation components with less uncertainty.

[Insert Table 4 here]

In Column (7) - (12) of Panel A in Table 4, the coefficients for equity-based compensation are reported. Interestingly, none of the coefficients for the equity compensation are statistically significant, as), suggesting that equity-based compensation is not used to compensate exogenous firm risks. We also examine the relationship between equity-based compensation and stock price risk using non-parametric quintile analysis and find consistent results (the results are not reported). Based on cash compensation, the results show that the differences between the first quintile (with the lowest risk) and the fifth quintile (with the highest risk) are 0.155 (sorted by residual volatility) and 0.175 (sorted by residual market beta),

respectively, statistically significance at the 1% level. However, based on equity compensation, the quintile analysis results show a less significant difference in residual equity compensation among the quintiles. Taken together, these findings suggest, REIT executives in riskier firms are unlikely to be compensated for risk through stock awards and option grants.

4.4 Executive Compensation and Credit Risk

As real estate is a capital-intensive industry and credit risk is one of the most significant risks for REIT, we extend the literature by investigating how executive compensation of REITs are related to credit risk. Two credit risk measures are used. One is interest coverage ratio (defined as the ratio of EBITDA over interest expenses). Another is EBITDA/Debt (defined as a ratio of EBITDA over total debt).

Table 5 reports the regression results on the correlation based on the two credit risk measures. In Panel A, executive compensation of REIT is negatively related to the lagged credit risk measures. The estimated coefficients of the lagged interest coverage ratio in year t-1, t-2, t-3 range from -0.026 and -0.028, and statistically significant at the 1% level. Meanwhile, the estimated coefficients of the lagged EBITDA/Debt ratio range from -0.287 and -0.331, and statistically significant at the 1% level. These results are consistent with our previous results on stock price risk measures. The negative correlation indicates that, when interest coverage ratio and EBITDA/Debt are lower (i.e., the credit risk of a REIT is higher), REIT executives tend to receive higher total compensation.

In Panel B of Table 5, the quintile sorting results between residual compensation and the lagged credit risk measures are provided. The average residual compensation sorted by the lagged residual interest coverage ratio and EBITDA/Debt ratio declines monotonically from first quintile (with the lowest risk) to the fifth quintile (with the highest risk). The difference between the two extreme quintiles is 0.475 and 0.440 for residual EBITDA/Debt ratio and Interest Coverage Ratio, respectively, with

statistically significance at the 1% level. These results based on quintile sorting portfolio analysis provides additional robustness on the relationship between executive compensation and credit risk measures and suggest that top managers of REIT are compensated for the extra credit risks.

[Insert Table 5 here]

4.5 Executive Compensation and Risk – S&P Index Effect

In this section, we examine whether the impacts of exogenous firm risks on REIT executive compensation differ between REITs joining S&P indices and those remained outside the indices. The REIT literature suggests that, after REITs join S&P indices, they face different market environments, for example, more analyst coverage, great stock liquidity, higher institutional ownerships, which may lead to changes in risk and return profile (e.g., see Pavlov, Steiner, and Wachter 2017).

Based on the two subsamples (the indexed REITs and non-indexed REITs), we find a strong impact of exogenous firm risks on executive compensation for REITs included in the S&P indices, but there is little effect for REITs outside of the indices. Specifically, in Panel A of Table 7, the coefficients for the lagged risk measures are all positive and statistically significant at the 1% level. For instance, the coefficient for Return Volatility in year t-1 is 2.142 (in Column (1)). However, the estimated coefficients in Panel B for non-index REITs are mostly statistically insignificant. Our interpretation is that, REITs included in the S&P indices receive more analyst coverage, and have greater stock liquidity level, higher institutional ownership, which make those REITs more sensitive to compensate for exogenous firm risks.

4.6 Robustness Checks

4.6.1 Controlling for Corporate Entrenchment, Monitoring and Transparency

Based on the managerial entrenchment view, managers can use their power to influence board structure to extract rents and set high executive pay at the expense of shareholders (e.g., Ghosh and Sirmans 2005). Also, as institutional owners can act as monitors in REITs and influence executive compensation contracts, institutional ownership may be related to executive compensation (e.g., Feng et al. 2010). Moreover, previous literature suggest that more analyst coverage provide greater transparency (Ooi, Newell and Sing 2006, Devos, Ong and Spieler 2007, Feng, Ghosh and Sirmans 2007), which may affect executive compensation. Thus, one can argue that the executive pay and firm risk relationship documented above may be driven by information asymmetry, misaligned interest between REIT executives and shareholders. In other words, without controlling for monitoring, transparency, entrenchment and governance variables, we may have an omitted variable problem when examining the impacts of exogenous firm risks on executive compensation. In this section, we attempt to address this empirical issue.

Following the literature, five variables are adopted to control for monitoring, transparency, entrenchment and governance: (1). independent director, a ratio of the number of independent directors to the total number of directors, (2). The age of CEO, (3). The duration of CEO, (4). analyst coverage, measured as the number of analysts that report an annual FFO or EPS forecast, and (5). institutional ownership, measured as the ratio of the number of shares owned by institutional owners to the total number of shares outstanding. To the extent that managerial entrenchment increases the power of executives, we would expect a positive correlation between the entrenchment proxies and residual compensation. Also, since analyst coverage improves transparency and independent director ratio (the board independence measure) and institutional owners help reduce entrenchment through monitoring,

we may see a negative correlation between the proxies and residual compensation. Also, if those variables are correlated with total pay and risk, it is likely that the executive pay and firm risk relationship is driven by omitted variable bias.

In Panel A of Table 7, we regress residual compensation on the five variables in the pervious-year. The results show that there is significant correlation between institutional ownership and executive compensation. However, the coefficient is positive, not negative. No other significant correlations exist between the other four variables and total compensation. We regress residual return volatility and residual market beta on the five variables in the previous-year (the results are not reported). The results show that there are significant correlations between the five variables and the stock price risk measures.

Panel B of Table 7 reports the results for the compensation regression with the control variables. Adding more control variables reduces the number of observations. However, the key results associated with the executive pay and firm risk relationship are consistent with those in Table 3. Specifically, the estimated coefficients of the risk variables (return volatility and market beta) are both positive and statistically significant at 5% level, indicating that the agency problems are not likely to affect the executive pay and firm risk relationship documented above. For the control variables, none of the five variables do not exhibit a significant relationship with the residual executive compensation.

[Insert Table 7 here]

4.6.2 Executive Compensation and Firm Fisk while Adding Control Variables

To address the concern that other firm characristics may change the impacts of exogenous firm risks on REIT compensation, we add other standard control variables in the regression. These variables include real estate investment growth, firm leverage, firm age, geographical diversification, and property type diversification. One may argue that diversification both on property location and property type also

play an important rule on the firm risks of REIT. For instance, low risk REIT might be regionally diversified, while high risk REITs could have a stronger focus on development, etc.

The results are reported in Table 8. Adding control variables such as previous-year property geographic diversification and property type diversification reduces the number of observations. However, the key results associated with the executive pay and firm risk relationship are consistent with those in Table 3. The estimated coefficients of previous-year return volatility are all positive (1.296, 1.132 and 1.076) and statistically significant at 1% level, as in Column (1), (2) and (3), while those of previous-year market beta are also positive (0.373, 0.372 and 0.299) and statistically significant at 5% or 10% level, as in Column (4), (5) and (6). The estimated coefficients of previous-year property geographic diversification and property type diversification are negative but statistically insignificant. These results imply that even after adding other control variables such as diversification on property locations and property types, the impacts of exogenous firm risks on REIT executive compensation still hold.

[Insert Table 8 here]

4.6.3 With Merged Compensation Data From Execucomp and SNL

One may concern that Execucomp only include large REITs and may not be representative for the REIT industry. This might result in a potential sample selection bias. In other words, the larger REITs are more prone to scrutiny by analysts and shareholders, which lead to a stronger relationship between pay and risk. To address the sample bias concern, we construct a complete sample on REIT executive compensation by merging the compensation data from Execucomp with data from SNL Financial. The final merged sample consists of about 1,674 firm-year observations from 2001 to 2016.

Table 9 reports the regression results in the enhanced sample. The estimated coefficients are 1.117, 0.722 and 0.584 for the lagged stock return volatility, and 0.287 and 0.232 for the lagged market

beta in year t-1, t-2 and t-3. They are quantitatively similar with those presented in the previous tables, with similar statistical significance. These results provide additional support to the results.

[Insert Table 9 here]

5. Conclusion

REIT executive compensation has significantly increased over the past decade and recently many REITs have been under fire from shareholder advocates to change their compensation structures. In this paper, we examine how REIT executive compensation is correlated with exogenous firm risks, using a sample of equity REITs from 2001 to 2016. Our results show that, consistent with principal-agent theory, there is a strong positive correlation between total executive compensation of REITs and their lagged risk measures. Moreover, the executive compensation and risk relationship is robust even controlling for monitoring, transparency, entrenchment and governance issues. These findings suggest that exogenous firm risks play an important role in optimal contract design of executive compensation as REIT executives must be compensated with higher pay for working at riskier firms. In other words, to improve REIT executive compensation packages, REIT stakeholders have to strike a balance between two dimensions of executive compensation: pay-for-performance and compensate-for-risk.

Moreover, we extend the literature by studying how two types of compensation of REIT executive compensation are related to firm risks. We find that REIT executives are mainly compensated for risks via cash compensation (including salary, bonus, and non-equity incentive plan), but not via equity-based compensation (including stock awards and option grants). This finding suggests that some heterogeneity exists in terms of how firm executives are compensated for risks across different types of firms. For REITs, it is important to recognize that REIT executives are likely to be more risk-averse and they prefer cash compensation, which brings less uncertainty compared with equity compensation, for bearing additional risks.

Furthermore, to the best of our knowledge, this paper is the first study to examine REIT executive compensation trends in the new REIT era and how REIT executive compensation is correlated with the past firm risk during the period. We document that REIT executive compensation increased significantly in the new REIT era.

Overall, our analysis provides new evidence to the debate on the executive pay and firm risk relationship. Improving corporate governance and increasing the say of shareholders are important directions to reform executive compensation practices of REITs. However, they do not solve all the issues related to executive compensation. Ultimately, compensation contracts should be structured in accordance with principal-agent theory, and stakeholders need to pay closer attention to the role of exogenous firm risks in the optimal contract design. In addition, this paper points out that a subtle difference may exist among different types of firms in terms of how executives are compensated for risks. More research about the impacts of different contracting environments on the executive pay and firm risk relationship could be fruitful.

References

Adrian, T., & Shin, H. S. (2010). Liquidity and leverage. *Journal of Financial Intermediation*, *19*(3), 418-437.

Aggarwal, R. K., & Samwick, A. A. (1999). The other side of the trade-off: The impact of risk on executive compensation. *Journal of Political Economy*, *107*(1), 65-105.

Ambrose, B. W., Lee, D. W., & Peek, J. (2007). Comovement after joining an index: spillovers of nonfundamental effects. *Real Estate Economics*, *35*(1), 57-90.

Ambrose, B., & Linneman, P. (2001). REIT organizational structure and operating characteristics. *Journal of Real Estate Research*, 21(3), 141-162.

An, H., Cook, D. O., & Zumpano, L. V. (2011). Corporate transparency and firm growth: evidence from real estate investment trusts. *Real Estate Economics*, *39*(3), 429-454.

Armstrong, C. S., & Vashishtha, R. (2012). Executive stock options, differential risk-taking incentives, and firm value. *Journal of Financial Economics*, *104*(1), 70-88.

Becht, M., Bolton, P., & Röell, A. (2003). Corporate governance and control. *Handbook of the Economics of Finance*, *1*, 1-109.

Brick, I. E., Palmon, O., & Wald, J. K. (2006). CEO compensation, director compensation, and firm performance: Evidence of cronyism?. *Journal of Corporate Finance*, 12(3), 403-423.

Capozza, D. R., & Seguin, P. J. (2000). Debt, agency, and management contracts in REITs: the external advisor puzzle. *The Journal of Real Estate Finance and Economics*, 20(2), 91-116.

Cheng, I. H., Hong, H., & Scheinkman, J. A. (2015). Yesterday's heroes: compensation and risk at financial firms. The *Journal of Finance*, *70*(2), 839-879.

Chopin, M., Dickens, R., & Shelor, R. (1995). An empirical examination of compensation of REIT managers. *Journal of Real Estate Research*, *10*(3), 263-277.

Coles, J. L., Daniel, N. D., & Naveen, L. (2014). Co-opted boards. *The Review of Financial Studies*, *27*(6), 1751-1796.

Core, J. E., Holthausen, R. W., & Larcker, D. F. (1999). Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics*, 51(3), 371-406.

Danielsen, B. R., Harrison, D. M., Van Ness, R. A., & Warr, R. S. (2009). REIT auditor fees and financial market transparency. *Real Estate Economics*, *37*(3), 515-557.

Deng, Y., Hu, M. R., & Srinivasan, A. (2017). Information Asymmetry and Organizational Structure: Evidence from REITs. *The Journal of Real Estate Finance and Economics*, 55(1), 32-64.

Devos, E., Ong, S. E., & Spieler, A. C. (2007). Analyst activity and firm value: evidence from the REIT sector. *The Journal of Real Estate Finance and Economics*, *35*(3), 333-356.

Edmans, A., & Gabaix, X. (2011). The effect of risk on the CEO market. *The Review of Financial Studies*, *24*(8), 2822-2863.

Eichholtz, P. M., Kok, N., & Otten, R. (2008). Executive compensation in UK property companies. *The Journal of Real Estate Finance and Economics*, *36*(4), 405-426.

Ertugrul, M., Sezer, Ö., & Sirmans, C. F. (2008). Financial leverage, CEO compensation, and corporate hedging: evidence from real estate investment trusts. *The Journal of Real Estate Finance and Economics*, *36*(1), 53-80.

Fahlenbrach, R. & Stulz, R. M. (2011) Bank CEO incentives and the credit crisis. *Journal of Financial Economics*, 99(1), 11-26.

Feng, Z., Ghosh, C., He, F., & Sirmans, C. F. (2010). Institutional monitoring and REIT CEO compensation. *The Journal of Real Estate Finance and Economics*, *40*(4), 446-479.

Feng, Z., Ghosh, C., & Sirmans, C. F. (2007). Director compensation and CEO bargaining power in REITs. *The Journal of Real Estate Finance and Economics*, *35*(3), 225-251.

Feng, Z., Ghosh, C., & Sirmans, C. F. (2007). On the capital structure of real estate investment trusts. *The Journal of Real Estate Finance and Economics*, 34(1), 81–105.

Gabaix, X., & Landier, A. (2008). Why has CEO pay increased so much? *The Quarterly Journal of Economics*, *123*(1), 49-100.

Ghosh, C., & Sirmans, C. F. (2005). On REIT CEO compensation: Does board structure matter? *The Journal of Real Estate Finance and Economics*, *30*(4), 397-428.

Ghosh, C., & Sun, L. (2014). Agency cost, dividend policy and growth: The special case of REIT. *The Journal of Real Estate Finance and Economics*, *48*(4), 660-708.

Griffith, J., Najand, M., & Weeks, H. S. (2011). What influences the changes in REIT CEO compensation? Evidence from panel data. *Journal of Real Estate Research*, *33*(2), 209-232.

Hagendorff, J., & Vallascas, F. (2011). CEO pay incentives and risk-taking: Evidence from bank acquisitions. *Journal of Corporate Finance*, *17*(4), 1078-1095.

Hallman, G., Hartzell, J. C., & Parsons, C. A. (2011). Incentive compensation and the likelihood of termination: theory and evidence from real estate organizations. *Real Estate Economics*, *39*(3), 507-546.

Han, B. (2006). Insider ownership and firm value: evidence from real estate investment trusts. *The Journal of Real Estate Finance and Economics*, 32(4), 471-493.

Hardin, W. (1998). Executive compensation in EREIT: EREIT size is but one determinant. *Journal of Real Estate Research*, *16*(3), 401-410.

Hardin, W. G., Highfield, M. J., Hill, M. D., & Kelly, G. W. (2009). The determinants of REIT cash holdings. *The Journal of Real Estate Finance and Economics*, 39(1), 39-57.

Harrison, D. M., Panasian, C. A., & Seiler, M. J. (2011). Further evidence on the capital structure of REITs. *Real Estate Economics*, 39(1), 133-166.

Hartzell, J. C., & Starks, L. T. (2003). Institutional investors and executive compensation. *The Journal of Finance*, *58*(6), 2351-2374.

Hartzell, J. C., Sun, L., & Titman, S. (2014). Institutional investors as monitors of corporate diversification decisions: Evidence from real estate investment trusts. *Journal of Corporate Finance*, 25, 61-72.

Hermalin, B. E., & Weisbach, M. S. (1998). Endogenously chosen boards of directors and their monitoring of the CEO. *American Economic Review*, 96-118.

Hoesli, M., & Reka, K. (2015). Contagion channels between real estate and financial markets. *Real Estate Economics*, *43*(1), 101-138.

Hölmstrom, B. (1979). Moral hazard and observability. *The Bell Journal of Economics*, 74-91.

Kaplan, S. N., & Rauh, J. (2009). Wall Street and Main Street: What contributes to the rise in the highest incomes?. *The Review of Financial Studies*, *23*(3), 1004-1050.

Murphy, K. J. (2013). Executive Compensation: Where We Are, and How We Got There. *Handbook of the Economics of Finance*, *2*, 211-356.

Ooi, J. T., Newell, G., & Sing, T.-F. (2006). The growth of REIT markets in Asia. *Journal of Real Estate Research, 14*(2), 203–222

Ooi, J. T., Wong, W. C., & Ong, S. E. (2012). Can bank lines of credit protect REIT against a credit crisis?. *Real Estate Economics*, *40*(2), 285-316.

Pavlov, A., Steiner, E., & Wachter, S. (2017). The consequences of REIT index membership for return patterns. *Real Estate Economics*. Forthcoming.

Pennathur, A. K., Gilley, O. W., & Shelor, R. M. (2005). An Analysis of REIT CEO Stock-Based Compensation. *Real Estate Economics*, *33*(1), 189-202.

Pennathur, A. K., & Shelor, R. M. (2002). The determinants of REIT CEO compensation. *The Journal of Real Estate Finance and Economics*, *25*(1), 99-113.

Price, S. M., Salas, J. M., & Sirmans, C. F. (2015). Governance, conference calls and CEO compensation. *The Journal of Real Estate Finance and Economics*, *50*(2), 181-206.

Shue, K., & Townsend, R. R. (2017a). Growth through rigidity: An explanation for the rise in CEO pay. *Journal of Financial Economics*, *123*(1), 1-21.

Shue, K., & Townsend, R. R. (2017b). How Do Quasi-Random Option Grants Affect CEO Risk-Taking? *The Journal of Finance.* Forthcoming.

Zhu, Y. W., Ong, S. E., & Yeo, W. Y. (2010). Do reits manipulate their financial results around seasoned equity offerings? evidence from us equity reits. *The Journal of Real Estate Finance and Economics*, 40(4), 412-445.

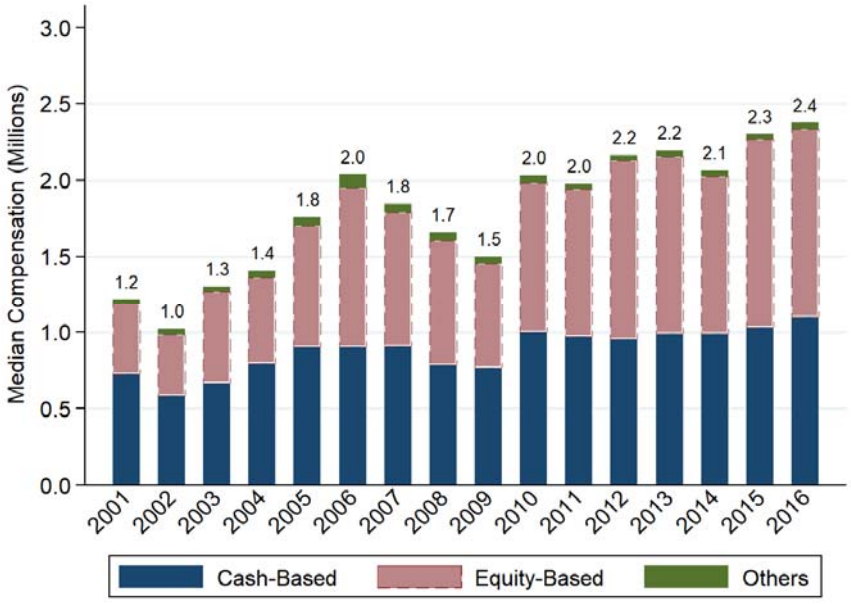

Figure 1: Executive Compensation of REIT Over Time

The figure shows executive compensation of REIT in our sample. Specifically, each bar represents the median of average total compensation for top five executives of each firm (adjusted based on 2016 dollar). Also, each bar is decomposed based on the cash-based and equity-based components of total executive compensation. Because our regression specification includes lagged variables, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility, and market capitalization information. Variables have been winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations.

Table 1: Summary Statistics

This table reports the summary statistics for the main variables used in the empirical analysis. The sample period is from 2001 to 2016. The variables are defined in Appendix A1. As several lagged variables are used in the regressions, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility and market capitalization information. Numeric variables are winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations.

Variable	Mean	Median	Std. Dev.	Min	Max	Yearly Obs.
Market Capitalization ($B)	4.88	2.66	6.25	0.21	35.14	1,182
Total Assets ($B)	5.45	3.37	5.74	0.37	27.68	1,182
Executive Compensation ($M)	2.17	1.72	1.68	0.07	8.23	1,182
Salary ($M)	0.42	0.41	0.13	0.18	0.87	1,134
Bonus ($M)	0.35	0.21	0.42	0.00	2.28	656
Non-Equity Incentive Plans ($M)	0.51	0.45	0.31	0.01	1.55	660
Stock Awards ($M)	1.17	0.80	1.17	0.01	5.66	1,010
Option Grants ($M)	0.44	0.27	0.52	0.01	3.07	388
Return Volatility	0.32	0.23	0.22	0.13	1.13	1,182
Market Beta	1.03	0.97	0.47	0.20	2.75	1,182
Interest Coverage Ratio	4.46	3.31	4.72	1.06	37.37	1,163
EBITDA/Debt Ratio	0.23	0.17	0.33	0.05	2.79	1,170
Stock Return (%)	12.38	13.23	25.99	-59.83	90.98	1,062
RE InvGrowth (%)	10.41	5.04	19.79	-18.93	110.89	1,159
Leverage	2.58	2.32	1.00	1.07	6.63	1,182
Firm Age	2.73	2.83	0.68	0.69	4.01	1,165
Independent Director Ratio (%)	73.78	72.73	10.94	50.00	91.67	736
CEO Age	55.48	55.00	8.17	39.00	80.00	1,112
CEO Duration	8.57	8.00	5.82	0.00	23.00	1,111
Analyst Coverage	10.17	10.08	5.10	1.00	22.25	1,046
Institutional Ownership (%)	78.35	81.39	19.96	3.46	99.00	1,182

Table 2: Persistence in REIT Executive Compensation and Firm Risks

Panel A reports regression estimates connecting firm size to REIT executive compensation to calculate residual compensation, based on Equation (1). The dependent variable is ExComp, which is the average of total executive compensation (*tdc1* in ExecuComp database) of top five executives in a firm. The independent variable is log of a firm's market capitalization as a proxy for firm size. Column (1)-(4) are based on four individual sample years and Column (5) is based on the pooled sample. REIT property type effects and year effects are included. T-statistics are reported in brackets. Standard errors are computed using HC3 robust standard errors, clustered at the firm level, for Columns (1) – (4). In Column (5), standard errors are heteroscedasticity-robust. Panel B reports cross-sectional regression results for persistence in REIT executive compensation and firm risks. The dependent variables are residual compensation and residual risk measures (return volatility and market beta) in year t and the independent variables are residual compensation and residual risk measures in year t-1 plus CEO turnover and stock return in year t-1. Panel C reports correlations of residual compensation and residual risk measures. Significance at the 1%, 5% or 10% levels are shown using 3, 2, or 1 asterisks, respectively. All other variables are defined in Appendix A1.

Panel A: Executive compensation and firm size

Variables	(1) 2004	(2) 2008	(3) 2012	(4) 2016	(5) Pooled
Log Market Capitalization	0.602	0.394	0.425	0.524	0.480
	[7.25]***	[4.74]***	[6.98]***	[8.46]***	[9.78]***
Constant	-4.629	-2.527	-2.795	-3.595	-3.508
	[-6.93]***	[-4.04]***	[-5.41]***	[-6.40]***	[-8.38]***
Observations	44	87	95	94	1,182
Adjusted R-squared	0.375	0.204	0.325	0.432	0.419
Property Type FE	N/A	N/A	N/A	N/A	YES
Year FE	N/A	N/A	N/A	N/A	YES

Panel B: persistence in compensation and risk

VARIABLES	(1) Residual Executive Compensation	(2) Residual Executive Compensation	(3) Residual Return Volatility	(4) Residual Return Volatility	(5) Residual Market Beta	(6) Residual Market Beta
Residual Excutive Compensation, *t-1*	0.802	0.803				
	[16.44]***	[16.43]***				
Residual Return Volatility, *t-1*			0.592	0.594		
			[20.83]***	[20.76]***		
Residual Market Beta, *t-1*					0.675	0.676
					[24.19]***	[24.24]***
CEO Turnover, *t-1*		-0.082		-0.008		-0.003
		[-2.05]**		[-1.06]		[-0.10]
Constant	-0.006	-0.001	-0.000	0.000	0.004	0.004
	[-0.49]	[-0.06]	[-0.03]	[0.20]	[0.56]	[0.56]
Observations	1,062	1,062	1,062	1,062	1,062	1,062
Adjusted R-squared	0.675	0.676	0.352	0.352	0.439	0.439

Panel C: Residual correlations

	Residual Compensation, *t*	Residual Compensation, *t-1*	Residual Return Volatility, *t*	Residual Return Volatility, *t-1*	Residual Market Beta, *t*	Residual Market Beta, *t-1*
Residual Compensation, *t*	1					
Residual Compensation, *t-1*	0.822**	1				
Residual Return Volatility, *t*	0.194**	0.190**	1			
Residual Return Volatility, *t-1*	0.1576**	0.198**	0.594**	1		
Residual Market Beta, *t*	0.178**	0.196**	0.796**	0.651**	1	
Residual Market Beta, *t-1*	0.137**	0.174**	0.459*	0.820**	0.663**	1

Table 3: Executive Compensation and Firm Risks

This table reports regression estimates connecting market risk measures to residual executive compensation. The dependent variable is residual executive compensation in year t. The independent variables include residual risk measures in year t-1 and other control variables (stock return, real estate investment growth, FFO growth, firm age, a dummy indicating whether a REIT is included in S&P index in year t-1). Real estate property type and year fixed effects are also included. Panel B reports average residual compensation in year t+1 based on a quintile sort of residual risk measures (residual market beta and residual return volatility) in year t. All variables are defined in Appendix A1. The *t*-statistics are reported in brackets. Standard errors are clustered at the firm level and are heteroscedasticity-robust. Significance at the 1%, 5% or 10% levels are shown with 3, 2, and 1 asterisks, respectively.

Panel A: regression results

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Return Volatility, *t-1*	1.315 [3.20]***					
Return Volatility, *t-2*		0.994 [2.42]**				
Return Volatility, *t-3*			0.956 [2.44]**			
Market Beta, *t-1*				0.362 [2.20]**		
Market Beta, *t-2*					0.324 [2.01]**	
Market Beta, *t-3*						0.270 [1.75]*
Constant	0.111 [0.50]	0.106 [0.43]	0.210 [0.85]	0.106 [0.46]	0.097 [0.39]	0.210 [0.82]
Observations	1,062	950	841	1,062	950	841
Adjusted R-squared	0.076	0.074	0.083	0.068	0.073	0.078
Size-*t* FE	YES	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Panel B: Quintile Sorting

Residual Risk Ranking, *t*	Residual Executive Compensation, *t+1*	
	Return Volatility	Market Beta
1	-0.142	-0.086
	[-3.027]***	[-1.830]*
2	0.009	-0.045
	[0.240]	[-1.051]
3	0.020	0.029
	[0.442]	[0.745]
4	0.019	0.031
	[0.466]	[0.739]
5	0.089	0.064
	[1.715]*	[1.231]
5-1 Spread	-0.231	-0.150
	[-3.311]***	[-2.145]**

Table 4: Cash-Based Executive Compensation and Firm Risks

This table reports regression estimates connecting risks to cash and equity components of REIT executive compensation. The dependent variables are residuals of cash compensation components (salary + bonus + non-equity incentive plan) and residual of equity compensation (stocks + options). The key independent variables are the risk measures in year t-1. Control variables include stock return, real estate investment growth, FFO growth, leverage, firm age, and a dummy indicating whether a REIT is included in S&P stock indices. Property type and year fixed effects are also added. All variables are defined in Appendix A1. The *t*-statistics are reported in brackets. Standard errors are clustered at the firm level and are heteroscedasticity-robust. Significance at the 1%, 5% or 10% levels are shown with 3, 2, or 1 asterisks, respectively.

Panel A: univariate regression results

	Cash-Based Compensation						Equity-Based Compensation					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Return Volatility, *t-1*	0.831						0.835					
	[3.14]***						[1.57]					
Return Volatility, *t-2*		0.720						0.448				
		[3.16]***						[0.90]				
Return Volatility, *t-3*			0.622						0.726			
			[3.17]***						[1.58]			
Market Beta, *t-1*				0.270						0.191		
				[3.09]***						[1.03]		
Market Beta, *t-2*					0.213						0.162	
					[2.83]***						[0.95]	
Market Beta, *t-3*						0.177						0.240
						[2.78]***						[1.40]
Constant	0.085	0.048	0.044	0.078	0.044	0.044	0.378	0.431	0.494	0.381	0.427	0.495
	[0.48]	[0.27]	[0.23]	[0.44]	[0.24]	[0.23]	[1.27]	[1.32]	[1.71]*	[1.25]	[1.31]	[1.72]*
Observations	1,020	913	808	1,020	913	808	969	875	780	969	875	780
Adjusted R-squared	0.105	0.097	0.094	0.102	0.090	0.087	0.021	0.017	0.020	0.018	0.018	0.020
Size-*t* FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B: quintile sorting

Residual Risk Ranking, *t*	Residual Cash Compensation, *t+1*		Residual Equity Compensation, *t+1*	
	Residual Return Volatility	Residual Market Beta	Residual Return Volatility	Residual Market Beta
1	-0.083	-0.062	-0.102	-0.030
	[-3.358] ***	[-2.500] **	[-1.705]*	[-0.520]
2	-0.045	-0.076	0.005	-0.005
	[-2.018] **	[-3.450] ***	[0.082]	[-0.073]
3	0.041	0.012	0.026	0.051
	[1.625]	[0.480]	[0.416]	[0.841]
4	0.016	0.016	-0.001	-0.023
	[0.726]	[0.682]	[-0.010]	[-0.414]
5	0.073	0.114	0.098	0.034
	[2.541] **	[4.181] ***	[1.522]	[0.537]
5-1 Spread	-0.155	-0.175	-0.200	-0.065
	[-4.128] ***	[-4.787]***	[-2.277]**	[-0.748]

Table 5: Executive Compensation and Credit Risks

This table reports the results from regressions of residual executive compensation as the dependent variable on residual credit risk at previous years, while controlling for the same year size, property type and year effects. All variables are defined in Appendix A1. The *t*-statistics are reported in brackets. Standard errors are clustered at the firm level and are heteroscedasticity-robust. Significance at the 1%, 5% or 10% levels are shown with 3, 2, or 1 asterisks, respectively. Because of the lagged variables, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility and market capitalization information. Variables have been winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations.

Panel A: regression results

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Interest Coverage Ratio, *t-1*	-0.026					
	[-2.94]***					
Interest Coverage Ratio, *t-2*		-0.028				
		[-3.05]***				
Interest Coverage Ratio, *t-3*			-0.028			
			[-2.73]***			
EBITDA/Debt Ratio, *t-1*				-0.298		
				[-2.79]***		
EBITDA/Debt Ratio, *t-2*					-0.331	
					[-3.18]***	
EBITDA/Debt Ratio, *t-3*						-0.287
						[-2.09]**
Constant	0.260	0.269	0.412	0.135	0.291	0.304
	[1.39]	[1.43]	[1.99]**	[0.66]	[1.56]	[1.36]
Observations	1,044	934	826	1,050	939	831
Adjusted R-squared	0.083	0.095	0.108	0.073	0.083	0.087
Size-*t* FE	YES	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Panel B: Quintile Sorting

Residual Risk Ranking, *t*	Residual Executive Compensation, *t+1*	
	Interest Coverage Ratio	EBITDA/Debt Ratio
1	0.163	0.209
	[4.773]***	[5.679]***
2	0.081	0.074
	[2.226]**	[1.943]*
3	0.028	0.011
	[0.747]	[0.277]
4	0.015	-0.068
	[0.316]	[-1.433]
5	-0.311	-0.232
	[-5.266]***	[-4.076]***
5-1 Spread	0.475	0.440
	[7.035]***	[6.571]***

Table 6: Robustness: Executive Compensation and Risk – the S&P Indices Effect

This table shows results from regressions of residual executive compensation on residual risk, measured as stock return volatility and market beta, at previous one- to three- years, while controlling for the same year size, real estate property type and year effects, for REIT in S&P indices sub-sample and REIT not in S&P indices sub-sample. The *t*-statistics are reported in brackets. Standard errors are clustered at the firm level and are heteroscedasticity-robust. The coefficients on variables of property type and years are suppressed from reporting. Significance at the 1%, 5% or 10% levels is shown with 3, 2, or 1 asterisks, respectively. All variables are defined in Appendix A1. Because our regression specification includes lagged variables, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility, and market capitalization information. Variables have been winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations.

Panel A: REIT in S&P indices

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Return Volatility, *t-1*	2.142					
	[3.65]***					
Return Volatility, *t-2*		1.685				
		[2.88]***				
Return Volatility, *t-3*			2.008			
			[3.64]***			
Market Beta, *t-1*				0.836		
				[3.14]***		
Market Beta, *t-2*					0.783	
					[2.93]***	
Market Beta, *t-3*						0.830
						[3.35]***
Constant	-0.555	-0.922	-0.876	-0.548	-0.916	-0.863
	[-0.64]	[-1.56]	[-1.59]	[-0.63]	[-1.54]	[-1.53]
Observations	531	461	392	531	461	392
Adjusted R-squared	0.136	0.136	0.179	0.150	0.164	0.202
Size-*t* FE	YES	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Panel B: REIT Not in S&P indices

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Return Volatility, *t-1*	0.759					
	[1.81]*					
Return Volatility, *t-2*		0.224				
		[0.72]				
Return Volatility, *t-3*			0.053			
			[0.18]			
Market Beta, *t-1*				0.141		
				[0.87]		
Market Beta, *t-2*					0.007	
					[0.06]	
Market Beta, *t-3*						-0.137
						[-1.24]
Constant	0.321	0.414	0.594	0.332	0.425	0.632
	[1.16]	[1.31]	[1.76]*	[1.16]	[1.32]	[1.80]*
Observations	466	376	306	466	376	306
Adjusted R-squared	0.183	0.220	0.246	0.175	0.219	0.250
Size-*t* FE	YES	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Table 7: Robustness: Executive Compensation and Risk while Controlling for Corporate Entrenchment, Monitoring and Transparency

Panel A report results from pooled regressions of executive compensation on independent director percentage, CEO age, CEO duality, analyst coverage and institutional ownership percentage at previous year, while controlling for year, firm size, real estate property type fixed effects. Panel B reports results from regressions where the residual executive compensation is the dependent variable and residual risk as well as corporate entrenchment, monitoring, transparency variables and other firm characteristics at previous year are independent variables, while controlling for year, firm size, real estate property type fixed effects. All variables are defined in Appendix A1. The *t*-statistics are reported in brackets. Standard errors are clustered at the firm level and are heteroscedasticity-robust. Significance at the 1%, 5% or 10% levels are shown with 3, 2, or 1 asterisks, respectively. Because our regression specification includes lagged variables, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility and market capitalization information. Variables have been winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations.

Panel A: compensation and corporate entrenchment, monitoring and transparency

VARIABLES	(1) Executive Compensation	(2) Executive Compensation	(3) Executive Compensation	(4) Executive Compensation	(5) Executive Compensation
Independent Director, *t-1*	1.270				
	[1.67]*				
Log CEO Age, *t-1*		-0.421			
		[-1.09]			
Log CEO Duration, *t-1*			-0.019		
			[-0.38]		
Log Analyst Coverage, *t-1*				0.105	
				[1.17]	
Institutional Ownership, *t-1*					0.949
					[3.04]***
Constant	-0.761	1.730	0.163	0.060	-0.404
	[-1.52]	[1.14]	[0.58]	[0.17]	[-1.22]
Observations	633	993	970	932	1,062
Adjusted R-squared	0.100	0.064	0.062	0.065	0.112
Size-*t* FE	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Panel B: compensation, risk, corporate entrenchment, monitoring and transparency

VARIABLES	(1)	(2)
Return Volatility, *t-1*	1.079	
	[2.78]***	
Market Beta, *t-1*		0.374
		[2.52]**
Independent Director, *t-1*	-0.050	-0.040
	[-0.14]	[-0.11]
Log CEO Age, *t-1*	-0.245	-0.247
	[-0.71]	[-0.72]
Log CEO Duration, *t-1*	0.029	0.026
	[0.67]	[0.61]
Log Analyst Coverage, *t-1*	0.085	0.091
	[0.97]	[1.04]
Institutional Ownership, *t-1*	0.340	0.351
	[1.17]	[1.24]
Constant	0.533	0.481
	[0.38]	[0.35]
Observations	579	579
Adjusted R-squared	0.152	0.150
Size-*t* FE	YES	YES
Property Type FE	YES	YES
Year FE	YES	YES

Table 8: Robustness: Executive Compensation and Risk, Controlling for REIT Characteristics

This table reports results from regressions of residual executive compensation on residual risk, measured as stock return volatility and market beta, at previous one- to three- years, while controlling for REIT characteristics as well as the same year size, real estate property type, and year effects. All variables are defined in Appendix A1. The *t*-statistics are reported in brackets. Standard errors are clustered at the firm level and are heteroscedasticity-robust. The coefficients on variables of property type and years are suppressed from reporting. Significance at the 1%, 5% or 10% levels is shown with 3, 2, or 1 asterisks, respectively. Because our regression specification includes lagged variables, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility, and market capitalization information. Variables have been winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Return Volatility, *t-1*	1.296					
	[2.99]***					
Return Volatility, *t-2*		1.132				
		[2.66]***				
Return Volatility, *t-3*			1.076			
			[2.90]***			
Market Beta, *t-1*				0.373		
				[2.12]**		
Market Beta, *t-2*					0.372	
					[2.23]**	
Market Beta, *t-3*						0.299
						[1.93]*
RE InvGrowth, *t-1*	0.002	0.003	0.003	0.003	0.003	0.003
	[1.53]	[1.78]*	[2.23]**	[1.72]*	[1.93]*	[2.07]**
Leverage, *t-1*	0.089	0.085	0.080	0.093	0.085	0.079
	[1.80]*	[1.78]*	[1.57]	[1.88]*	[1.77]*	[1.54]
Firm Age, *t-1*	-0.026	-0.024	-0.043	-0.036	-0.033	-0.051
	[-0.28]	[-0.23]	[-0.39]	[-0.38]	[-0.32]	[-0.46]
Geo Diversification, *t-1*	-0.111	-0.134	-0.149	-0.103	-0.131	-0.138
	[-0.40]	[-0.47]	[-0.52]	[-0.37]	[-0.46]	[-0.48]
Proptype Diversification, *t-1*	-0.290	-0.255	-0.232	-0.285	-0.255	-0.233
	[-1.40]	[-1.22]	[-1.10]	[-1.37]	[-1.21]	[-1.10]
Constant	-0.329	-0.332	-0.103	-0.331	-0.333	-0.093
	[-1.05]	[-0.96]	[-0.27]	[-1.05]	[-0.96]	[-0.24]
Observations	922	827	738	922	827	738
Adjusted R-squared	0.081	0.078	0.085	0.074	0.076	0.078
Size-*t* FE	YES	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Table 9: Robustness: Executive Compensation and Risk with ExecuComp and SNL Merged Compensation Data

This table reports the results from regressions of residual executive compensation on residual risk, measured as stock return volatility and market beta, at previous one- to three- years, while controlling for the same year size, real estate property type and year effects, on ExecuComp and S&P Global Market Intelligence (formally SNL Financial) merged compensation data sample. All variables are defined in Appendix A1. The *t*-statistics are reported in brackets. Standard errors are clustered at the firm level and are heteroscedasticity-robust. Significance at the 1%, 5% or 10% levels is shown with 3, 2, or 1 asterisks, respectively. Because our regression specification includes lagged variables, we exclude firms with fewer than two consecutive years of executive compensation, stock return volatility, and market capitalization information. Variables have been winsorized at the 1% and 99% tails of the distributions to avoid the influence of extreme observations.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Return Volatility, *t-1*	1.117					
	[3.14]***					
Return Volatility, *t-2*		0.722				
		[2.04]**				
Return Volatility, *t-3*			0.584			
			[1.74]*			
Market Beta, *t-1*				0.287		
				[2.65]***		
Market Beta, *t-2*					0.223	
					[2.15]**	
Market Beta, *t-3*						0.189
						[1.93]*
Constant	0.896	0.625	-0.165	0.923	0.628	-0.162
	[10.00]***	[8.19]***	[-1.15]	[10.12]***	[8.35]***	[-1.19]
Observations	1,674	1,495	1,335	1,674	1,495	1,335
Adjusted R-squared	0.036	0.028	0.026	0.029	0.027	0.026
Size-*t* FE	YES	YES	YES	YES	YES	YES
Property Type FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Appendix

Table A1: Definition of Variables

This table present the definition of variables used in the paper.

Variable	Abb.	Definition
Market Capitalization	MktCap (Size)	Market capitalization of common equity, assuming the conversion of all convertible subsidiary equity into common.
Executive Compensation	ExComp	The average of total compensation (*tdc1* in ExecuComp) of top five executives at each firm.
Return Volatility	Return Volatility	The standard deviation of daily stock return at each firm-year.
Market Beta	Market Beta	The annual beta of the stock of each firm based on CAPM at each firm year.
Interest Coverage Ratio	ICR	The ratio of EBITDA to interest expenses. The interest coverage ratio is replaced to missing if it is greater than 100.
EBITDA to Debt ratio	EBITDA/Debt	The ratio of EBITDA to total debt. EBITDA to Debt ratio is replaced to missing if it is greater than 10.
Residual	Res	Residuals obtained from the regression model: $Variable_{i,t} = \alpha + \beta_1 Size_{i,t} + \varepsilon_i$, where $Variable_{i,t}$ are log of executive compensation and firm risk measures.
CEO Turnover	CEO Turnover	A binary variable takes a value of 1 for a firm who reports a new CEO joining the company.
Stock Return	Return	The sum of stock price and dividend paid divided by lagged stock price, then minus one.
Leverage Ratio	Leverage	The ratio of total book assets to total book equity.
Firm Age	Firm Age	The natural logarithm of the number of years since IPO.
Real Estate Investment Growth	RE InvGrowth	The Real Estate Investment Growth (*reig* in SNL).
Geographic Diversification	Geo Diversification	The negative of the Herfindahl Index of REITs, calculated using their assets invested in different MSA location, based on book values. Data is from SNL database.
Property Type Diversification	Proptype Diversification	The negative of the Herfindahl Index of REITs, calculated using their assets invested in different real estate property type, based on book values. Data is from SNL database.
Independent Director Ratio	Independent Director	The percentage of directors that are outsiders (*independent* in ISS). Data is from ISS database.
CEO Age	CEO Age	The age (*age* in ExecuComp) of current CEO (*ceoann* is CEO in ExecuComp).
CEO Duration	CEO Duration	The difference current year and the initial year of CEO position (*becameceo* in ExecuComp).
Analyst Coverage	Analyst Coverage	The total number of analysts that report annual EPS of FFO forecast. Data is from I/B/E/S database.
Institutional Ownership Percentage	Institutional Ownership	The percentage of shares are owned by institutions. Data is from Thomson Reuters 13F database.
Real estate property type	Property Type	REIT's type of real estate property, which is determined by the tenant's uses of the property, as reported by SNL.