Local Peers and CEO Incentives [*]

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Abstract

We develop a geographic instrument to assess the impact of CEO compensation on corporate policies. We first document that a CEO's incentive ratio is positively associated with the average incentive ratio for CEOs of firms headquartered nearby. The incentive ratio for executives other than the CEO also exhibits a strong local peer effect. This peer effect is more pronounced for firms headquartered in small and medium-sized cities and for smaller firms, and remains significant after controlling for local economic conditions and other factors that affect compensation. Its economic magnitude is comparable to the effects of other firm characteristics on CEO incentives. These findings suggest that the labor market for top executives has a geographical component, and that geographic shocks, through local peer incentives, can impact CEO compensation. We use local peer incentives as a geographic instrument for CEO incentives and find that higher instrumented CEO incentives lead to subsequently higher R&D expenses, larger capital expenditures, more volatile stock returns, and higher firm value. Our geographic instrument for CEO compensation addresses endogeneity concerns that are pervasive in corporate governance research.

Keywords: CEO compensation, endogeneity, geography, labor market competition

JEL classification: G30, G34, J31, J33, R1

1. Introduction

Conventional wisdom suggests that the labor market for top executives of large U.S. corporations is free from geographical frictions. Drawing from a larger talent pool should outweigh the cost of a nationwide search, and relocation costs are small when compared to the size of executive pay packages. Yet emerging research challenges the notion of a national labor market for executive talent: Yonker (2012) finds that firms hire local CEOs five times more than they would if geography were irrelevant to the searching process. Ang, Nagel, and Yang (2012) document that social pressure of local CEOs and social elites impact CEO compensation, and Bouwman (2013) shows that CEO total pay is increasing in the average CEO pay in the area. Deng and Gao (2011) find that firms in unpleasant locations pay premiums to CEOs. These studies provide evidence that geography is a strong determinant of the *level* of executive compensation.

In contrast, this paper investigates whether the *composition* of managerial compensation has a geography pattern, and develops a geographic instrument to assess the impact of CEO compensation on corporate policies. Considering pay composition is important since it affects CEO risk-taking incentives. Following Mehran (1995), Francis, Hasan, John, and Waisman (2012), and Knyazeva, Knyazeva, and Masulis (2013), we measure CEO incentives as incentive pay scaled by total pay. We find that the incentive ratio for a particular CEO is positively associated with the average incentive ratio for CEOs of firms headquartered in local areas. This local peer effect is comparable to the effects of firm characteristics on CEO incentives and remains significant after controlling for local economic conditions and other factors that affect compensation. We show that the local peer effect is more pronounced for firms headquartered in small and medium-sized cities and firms that are not in the largest size quartile. The incentive

ratio for the top four non-CEO executives also exhibits a strong local peer effect. These findings are consistent with the hypothesis that the market for top executives is geographically segmented.

The dynamics in local labor markets provide shocks to an individual CEO's compensation. We develop a geographic instrument – the local peer incentives – for CEO incentive pay. The relevance condition for an instrument variable is satisfied by the strong correlation between CEO incentives and her local peer incentives. We test the exclusion condition by adding a host of economic factors known or expected to directly affect firm outcome variables and examine whether the inclusion of these factors cause the local peer effect to become statistically insignificant, and the local peer incentive continue to hold statistical and economic significance. After using the local peer instruments, we find that stronger CEO incentives lead to subsequently higher R&D expenses, larger capital expenditures, more volatile stock returns, and higher firm value. These findings are consistent with the agency theory that performance-based incentive pay motivates managers to take risk and increase firm value. The coefficients estimated from the instrumental regressions are significantly different from those from OLS regressions, suggesting that OLS regressions provide biased estimates due to endogeneity.

This paper contributes to the finance literature in three dimensions. First, we explore the geography of executive incentives and find a strong local peer effect on the ratio of incentive pay to total pay for managers. These findings focus on the composition rather than level of managerial compensation. Second, we show that the local peer effect concentrates in firms located in small and medium-sized cities and firms that are not in the largest quartile, implying that the local labor market competition matters more for executives that lack of visibility. Third, we test the validity of local peer incentive as an instrument and show that the dynamics in local

labor markets provides shocks to an individual CEO's compensation. The instrument variable approach using geography variations provides a new angle to mitigate the serious endogeneity issues commonly seen in the research of executive compensation.

The paper proceeds as follows. In section 2 we relate our study to the existing literature. In section 3 we develop our hypotheses. In section 4 we describe our data. In section 5 we discuss our findings. Section 6 concludes.

2. Relevant Literature

2.1 The geography in executive compensation

Emerging studies have started to explore geographic variations in executive compensation. Yonker (2012) finds that firms hire local CEOs five times more than they would if geography were irrelevant to the searching process. Using the birth origin data of CEOs in the S&P 1500 firms and comparing the CEOs' birth state with firms' headquarter locations, he shows that firms headquarter in less desirable areas are more likely to hire locally, and local CEOs have lower compensation and turnover than non-locals. Linking geography to social circles, Ang, Nagel, and Yang (2012) investigate the effects of social pressures on CEO compensation due to interactions with other CEOs and social elites in local areas. They define social premium as the proportion of CEO pay that is linked to the number of local social peers and that is not explained by other control variables, and they find that the social premium increases in the number of local social peers, but the positive association attenuates as the social circles become larger. Similarly, Bouwman (2013) also document strong geography patterns in executive compensation that CEO total pay is increasing with the average pay of CEOs in the

local area. Unlike Ang et al. (2012) who attribute the findings of social premium in managerial compensation to that social pressures influence executive pay, Bouwman (2013) proposes four possible explanations for her results: local hiring of similar CEOs; the effect of "leading firms" in the local area; local labor market competition for CEOs; envy among CEOs whose firms are close by. The envy hypothesis seems to be supported by her tests, where the salaries of top players in professional sports teams are positively associated with those of CEOs in nearby firms. From the perspective of the living environment around the corporate headquarters, Deng and Gao (2011) examine the impacts of nonmonetary benefits on executive compensation. Using a livability ranking database by states, they find that firms in unpleasant locations pay premiums to CEOs, and this premium in pay for quality of life is stronger when firms have less bargaining power and the CEO has short-term career concerns. They conclude that the desirability of living environment around firm headquarters effectively substitute for CEO monetary compensation. In addition to executive compensation, recent studies also investigate the impact of geography in other corporate finance settings (Dougal, Parsons, and Titman 2014; Parsons, Sulaeman, and Titman 2014).

2.2 CEO incentives and compensation composition

In the literature of executive compensation, the pay composition is a very important topic because how a CEO is paid with cash and equity has been shown to affect her risk-taking behaviors by numerous papers. Mehran (1995) examine the managerial compensation structure of randomly selected manufacturing firms, and show that the composition rather than the level of compensation is what motivates managers to increase firm value. Firm performance is positively

related to the percentage of managers' compensation that is equity-based. Knyazeva, Knyazeva, and Masulis (2013) use the ratio of incentive pay to total pay to measure CEO incentives and find that higher proportions of incentive pay are associated with more independent boards. Francis, Hasan, John, and Waisman (2012) also measure CEO incentives by the equity-based compensation as the percentage of total pay and show that CEOs of firms headquartered in urban areas are paid with higher incentives. Compared to the simple and straightforward way to use percentage of incentive pay to total pay as proxy for managerial incentives, more advanced techniques are adopted in other studies to capture distinct dimensions of compensation structures. Core and Guay (2002) use delta and vega to capture the essence of managerial contracts that incentivize managers to increase firm value and take risks. Delta is the change in the dollar value of the CEO's stock and option portfolio for a 1% change in stock price. Vega is the change in the dollar value of the CEO's stock and option portfolio for a 0.01 change in stock return volatility. Coles, Daniel, and Naveen (2006) find that higher vega is associated with riskier firm policies, such as higher R&D, less investment in PPE, more focus, and higher leverage. DeYoung, Peng and Yan (2013) find that from 1995 to 2006, CEOs' vega at the U.S. commercial banks significantly increases, and it is positively related to measures of bank risk, such as systematic risk, idiosyncratic risk and total risk. In sum, these studies document that the composition of executive pay affects managers' risk-taking behaviors and their choices of firm policies, which eventually lead to changes in firm performance and value.

2.3 The endogeneity issues in managerial compensation

The empirical evidence on the relation between managerial compensation and firm outcome variables has been confounded by endogeneity issues that arise in the negotiation of compensation contracts. Executives and the board internalize the information about the firm prospect and managerial talent and risk-bearing in the contracts. Thus executive compensation and firm outcome variables are often jointly determined by unobservable firm characteristics. There may also be reverse causality between pay and firm outcomes. Therefore, it is very difficult to test the causal effect of compensation on firm policies and performance. Some researchers search for natural or quasi-natural experiments to introduce exogenous shocks to compensation. Hayes, Lemmon, and Qiu (2012) investigate the changes in the accounting treatment of stock options following the adoption of FAS 123R in 2005, and they use the implementation of FAS 123R as an exogenous change in the accounting benefits of stock options that has no effect on the economic costs and benefits of options for providing managerial incentives. They find that firms reduce their usage of stock options, but the decline in option usage is not followed by adjustments in investments and financial policies. Others studies apply more advanced econometrics tools to address endogeneity. Coles et al. (2006) exploit the settings of simultaneous equations and use three-step-least-square technique to estimate the effect of delta and vega on firm policies. To sum up, if we do not mitigate the endogeneity concerns, we cannot argue for causal relation between compensation and firm outcomes.

The geographic variations in corporate variables are used as valid instruments in different settings of finance research. Becker, Cronqvist, and Fahlenbrach (2011) find that individual blockholders tend to hold blocks of shares in firms located near their residence. They use the density of wealthy individuals in the state where a firm is headquartered as an instrument and

show that this instrument is correlated with the presence of large shareholders but affect the firm outcome variables only through its effect on block ownership. In the framework of instrumental variable regressions, they find that the presence of large shareholders reduces a firm's investments, cash holdings, and CEO total pay, and increases payout ratios and firm performance. Knyazeva et al. (2013) find that proximity to large pool of local director talent is associated with more independent boards, and this association does not attenuate after controlling for local economic and demographic characteristics of a firm's regions that may directly affect firm performance. Using the number of firms nearby as an instrument for board independence, they show that board independence positively affect firm value and performance. The geographic variations in corporate variables are often attributed to cross-sectional distinctions in geography, which are beyond individual firms' unobservable characteristics and hence makes these geographic instruments valid in corporate finance research.

2.4 The peer effect in managerial compensation

The notion that one's happiness (or utility) at least in part depends on the income of one's reference group is well documented in the sociology and economics literature. Seidl, Traub, and Morone (2006) document the effect of relative income in experimental studies, and Hagerty (2000) and McBride (2001) find similar results in empirical studies. Hamermesh (1975) models the influence of relative wages on efforts and incentives. Veblen (1934) and Frank (2000) further show that a "consumption arms race" could occur if one must consume more to keep up with the consumption of one's comparison group. To retain or improving social standing, one seeks to receive pay higher than its peers in the reference group.

To examine the peer effect, it is critical to specify the reference group. Luttmer (2005) documents that one's neighbors are often one's reference group. In a happiness survey conducted on 9,200 households in rural China, Knight, Song, and Ramani (2009) show that 70 percent of individuals consider their village as the reference group. In addition, Melenberg (1992) find evidence that reference groups are often people of similar age and educational background. Similarly, CEOs use their peers in the same industry (Bizjak, Lemmon, and Naveen 2008) or in close proximity (Ang, Nagel, and Yang 2010; Bouwman 2013) as their reference group. In addition, CEOs interact with their alumni (Cohen, Frazzini, and Malloy 2008; Cohen, Malloy, and Frazzini 2010; Shue 2013) and with people who serve on the same boards of non-profit organizations (Fracassi 2012). Leary and Roberts (2010) find that industry peer firms affect capital structures and financial policies. In other words, reference groups based on industry, geography, or social network are important determinants of how CEOs perceive their compensation.

3. Hypotheses

Gabaix and Landier (2008) and Tervio (2008) propose competitive assignment models that CEOs match optimally to firms based in firm size and CEO talent. In their models the top quality CEOs are matched to the largest firms and receive the highest pay. If we expand the matching criterion to include other factors such as geographic preferences and search frictions, the local peer effect may exist in the framework of optimal matching between firms and CEOs. Both the cluster hypothesis and the friction hypothesis predict the local peer effect, but they

differ in the conditions where the effect is stronger. Later, we use empirical analysis to disentangle the two hypotheses.

3.1 Cluster

CEOs that have the similar geographic preference may choose to work in the same areas and cause firms appear to hire local CEOs. But in fact it is the geographic preference contributes to the clustering of homogeneous CEOs, and hence a firm can just rely on the local supply of talents without switching to other markets. If that is the case, the local peer effect is merely due to the clustering of homogeneous CEOs in local areas. Furthermore, we expect the local peer effect to be stronger among local firms that are in the same industry as the homogeneity of executives in these firms would be more pronounced than local firms in different industries.

If firms prefer to hire CEOs that are fit with their "culture" and there exists regional cultural differences, it would also induce local markets for CEOs. We expect the local peer effect to be stronger among local firms that are in the same industry as these firms are in the same industry and local area.

3.2 Friction

Searching for CEOs may be costly for firms and hence may induce local CEO labor markets. Bebchuk and Fried (2004) and Khurana (2002) investigate the role and prevalence of firms that specialize in executive search in the CEO hiring process. The fact that hiring firms do not internalize search for CEOs suggests that the associated costs could be substantial. Intuitively,

hiring local CEOs lower the search costs, and we expect that larger firms are more likely to engage a wider search as they are more resourceful.

Firm visibility may be another friction that causes firms to hire locally. Less visible firms are more likely to be constrained by the local supply of executives, while firms of large size and located in big cities are of high visibility and have the ability and resources to get access to a national executive market. Therefore, we expect the local peer effect to be more pronounced in firms that are of smaller size and that are located in smaller cities.

4. Data

We analyze a panel of S&P 1500 firms from 1992-2012. The sample includes Compustat/CRSP firms with available Execucomp data and 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. The final sample consists of 21,658 firm-year observations.

4.1 Executive variables

Following prior literature, we use the proportion of CEO incentive pay relative to total pay (CEO %Incentive Pay) as the main measure of CEO incentives. The incentive pay for a CEO includes restricted stocks, stock options, long term incentive payments, and other compensation that is not cash awards. According to Panel A of Table 1, the average CEO is paid with $5.9 million annually, and 57% of that total package is incentive-based. The four highest paid non-CEO executives in a firm typically receive a total pay of $8.5 million annually, 54% of which is

incentive-based. An average CEO in my sample is at the age of 55 and has tenure of 9 years, and 60% of them are also chairman of the board.

4.2 Local and industry peer variables

Local peer firms for a firm i refer to firms that are headquartered within the 100-mile radius of firm i's headquarter and that are not in the same industry as firm i. *Avg. CEO Local Peer % Incentive Pay* is the mean of CEO %Incentive Pay at local peer firms, while *Median CEO Local Peer % Incentive Pay* is the median of CEO %Incentive Pay at local peer firms. On average, *Avg. CEO Local Peer % Incentive Pay* is 55%, while *Median CEO Local Peer % Incentive Pay* is 61%. Notice that these two variables are the mean and median of a set of CEO %Incentive Pay that are in local areas, and thus comparing to firm i's CEO incentives, those of local peer firms have smaller variance. A firm on average has 93 local peer firms in a given year.

Industry peer firms for a firm i refer to firms that are in the same industry as firm i. *Avg. CEO Local Peer % Incentive Pay* is the mean of CEO %Incentive Pay at industry peer firms, while *Median CEO Local Peer % Incentive Pay* is the median of CEO %Incentive Pay at industry peer firms. On average, *Avg. CEO Local Peer % Incentive Pay* is 54%, while *Median CEO Local Peer % Incentive Pay* is 59%. Notice that these two variables are the mean and median of a set of CEO %Incentive Pay that are in the same industry, and thus comparing to firm i's CEO incentives, those of industry peer firms have smaller variance. A firm on average has 61 industry peer firms in a given year.

Local industry peer firms for a firm i refer to firms that are headquartered within the 100-mile radius of firm i's headquarter and that are in the same industry as firm i. *Avg. CEO Local Industry Peer % Incentive Pay* is the mean of CEO %Incentive Pay at local industry peer firms, while *Median CEO Local Industry Peer % Incentive Pay* is the median of CEO %Incentive Pay at local industry peer firms. On average, *Avg. CEO Local Industry Peer % Incentive Pay* is 56%, while *Median CEO Local Industry Peer % Incentive Pay* is 60%. Notice that these two variables are the mean and median of a set of CEO %Incentive Pay that are in local areas and that belong to the same industry, thus comparing to firm i's CEO incentives, those of local industry peer firms have smaller variance. A firm on average has 8 local industry peer firms in a given year.

4.3 Firm characteristics

Panel B of Table 1 reports the summary statistics of firm control variables. On average, a firm in the sample has assets of $7.1 billion, sales growth of 13%, cash-to-assets ratio of 0.09, capital expenditure intensity of 0.06, tangible assets of 0.28, R&D intensity of 0.03, book leverage of 0.21, institutional holdings of 72%, market-to-book ratio of 2.15, ROA of 14%, and excess stock returns of 0.71%. The standard deviation of excess stock returns is 0.11, while the standard deviation of ROA during five years is 0.05. The average of excess stock returns for local peer firms is 0.68%.

5. Results

5.1 Local peers and CEO incentives

Table 2 reports results from regressions of local peer incentives on CEO incentives. We find that the local peer incentives have strong effects on CEO incentives. Firms in geographic areas with stronger local peer incentives tend to have higher proportion of incentive pay to total pay, after controlling for firm and year fixed effects (Column 1). In Column 2, 3, and 4, the result remains strong after controlling for other firm and CEO characteristics (size, stock returns, ROA, firm risk, cash flow risk, institutional ownership, R&D intensity indicator, tangible asset intensity, CEO age, tenure, the CEO-Chairman duality) and local economic factors. The magnitude of the coefficient remains relatively the same. In terms of economic significance, one standard deviation increase of local peer incentives ($\delta = 0.12$) is associated with 6.04% increase by a standard deviation in CEO incentives. In Figure 1, compared to other primary determinants of CEO incentives, local peer incentives are only second to the effect of assets (23.86%) and are higher than excess stock returns (4.76%), ROA (3.59%), institutional ownership (4.21%), and CEO age (-1.83%). Consistent with prior work, larger firms have higher CEO incentives. Past stock and accounting performance are positively associated with CEO incentives. Firms with larger institutional ownership have stronger CEO incentives. CEOs of older age have lower incentives. There is weak evidence that firms with more fixed assets have lower CEO incentives. CEO-Chairman duality is also weakly associated with CEO incentives. Taken together, the local peer effect on CEO incentives continues to hold after the inclusion of baseline controls.

5.2 Local labor market and CEO incentives

We test the friction hypothesis by subsample analysis and report the results in Table 3. The friction hypothesis predicts that firms of low visibility have more frictions in the labor market matching process and thus are more constrained by local labor market. Table 3 provides strong support to the friction hypothesis: local peer effects continue to be significant after we restrict sample to exclude firms headquartered in the top 10 or top 20 cities. Moreover, the coefficient of local peer incentives is not significant in firms that are in the largest quartile of asset size, while the local peer effect is significant at the 1% level in firms that are not in the largest quartile of asset size. This finding is consistent with hypothesis that larger firms are less constrained by local CEO labor market. Moreover, S&P 500 firms do not exhibit significant local peer effect, while non S&P 500 firms do.

However, it is possible that firm size and city size proxy for other omitted geographic variables. For example, small firms or firms located in small cities may tend to be regional firms that cater to regional or local market. If that is the case, the association between local peer incentives and CEO incentives may merely reflect the commonality in regional product market. We address this concern in Table 4.

5.3 Alternative explanations of local peer effect

Table 4 reports robustness checks that examine alternative explanations. Column 1 controls for the industry peer effect by adding the average of CEO industry peer incentives. The magnitude and significance of the local peer effect remain almost unchanged. Column 2 controls for the local industry peer effect. Figure 2 compare the economic effects of various peer

incentives. By design, the local peer incentives and the local industry incentives are computed in mutually exclusive domains, but they do share the commonality of local labor market due to the fact that these peer firms are in the same local area. That may explain why the local peer effect in Column 2 loses some significance as the two variables may have multicollinarity issues. But the fact that the coefficient of the local peer effect is virtually unchanged and remains significant at 5% level in Column 2 provides counterargument for the clustering hypothesis. If due to geographic preference CEOs cluster to the extent that the clustering leads to local peer effect, we would expect the local industry peers to have stronger effects than local non-industry peers. There is one caveat though, the number of local peers (average = 93) far more exceed the number of local industry peers (average = 8), and hence the average of local industry peer incentives may be affected by outliers, which may explain the low t-statistics and coefficients. Instead Column 3 controls for the median of local industry peer incentives because the median is less affected by outliers. We do see evidence that the median of local industry peers have larger t-statistics and coefficient. However, the local peer effect is almost the same as in Column 2. Hence we do not find evidence to support the cluster hypothesis.

Column 4 addresses the concern that firms in local areas may face the same regional market either because they are in the vertical supply chain or because they serve the same local clientele. The average excess returns of local peer firms can be view as equally-weighted returns of the local portfolio that consists of local peer firms. The local peer effect continues to be significantly positive, implying that the regional market effect does not explain away the local peer effect. In Column 5 and 6, we controls for the average total pay of peer CEOs in local firms and the number of local firms, and the coefficients of the *Avg. CEO Local Peer %Incentive Pay* variable remain quantitatively similar.

In sum, we do not find evidence to support alternative explanations such as clustering hypothesis and regional market effect. We acknowledge that there are still many geographic factors that need to control for. For example, local business cycle, the desirability of local living environment, regional religiosity, and local convictions of political fraud are shown in prior studies to affect executive compensation and firm outcome variables. It is important to show that the local peer effect remains significant after control for these factors, and we plan to do that in the next version of the paper.

5.4 Local peers and management team incentives

CEOs are just a subset of top executives, and CFOs, COOs, and senior VPs are top managers that may also be constrained by the local labor market. Table 5 reports the local peer effects in management team. In short, the local peer effects in the setting of management team are significantly positive. All the previous findings in the CEO setting continue to hold. Interestingly, Column 2 and 3 of Panel B in Table 5 do show a significant local industry effect, but the coefficient is much smaller than the local peer effect.

5.5 Validity of the instrument

As discussed in section 1 and 2, it is difficult to estimate the causal effect of executive compensation on firm outcome variables as they are jointly determined. We circumvent this endogeneity issue by exploiting the dynamics of local labor markets for executives to introduce exogenous shocks to managerial compensation. Specifically, we develop a geographic

instrument – the local peer incentives – for CEO incentives, and estimate the effect of managerial compensation of firm outcome variables in instrument variable regressions.

The relevancy condition requires that local peer incentives are sufficiently correlated with CEO incentives, after controlling for other covariates. From the results in Table 2, 3, and 4, we find strong evidence to support the relevancy of local peer incentives in estimating CEO incentives. The local peer effects are mostly consistent with the friction hypothesis, where the effects are more pronounces in firms that are more likely to be constrained by local labor market for CEOs.

The exclusion condition requires that local peer incentives affect firm outcome variables only through their effect on endogenous CEO incentives. We use two ways to validate the exclusion condition. First, we check whether the local peer effects attenuate after adding other economic factors known or expected to affect firm outcome variables. If the coefficient of the local peer incentives becomes insignificant in presence of some plausible determinants of firm outcomes that vary by geography, then the instrument fails the exclusion condition. Table 4 provides elementary evidence to validate the exclusion condition, because the local peer effects continue to hold after control for other firm and local economic characteristics. Second, we use the diagnostic statistics such as Hansen J-statistics to examine the exclusion condition. While both methods support the validity of the local peer instrument, we caution that the exclusion condition remains challenging to fully validate.

5.6 CEO incentives and firm investment

Table 6 reports regression results of CEO incentives on firm investment. For comparison, OLS regression results are also provided in Column 1 and 3. Column 2 and 4 report second-stage results of instrumental variable regressions, where *CEO % Incentive Pay* is estimated by the average of CEO Local Peer %Incentive Pay, median CEO local peer cash pay, and second-stage controls. Various statistics are also provided to examine the validity of the instruments. The Kleibergen-Paap rk LM statistic and Anderson-Rubin Wald F-statistic are to test the null hypothesis of weak instruments, and both reject the null hypothesis at 5% level. First-stage Cragg-Donald F statistic is used to compare with the Stock-Yogo critical values for weak instrument tests, and they are larger than the largest critical values (usually smaller than 20), rejecting the null hypothesis of weak instruments. The Hansen J-statistic is not significant at all, not rejecting the null hypothesis of overidentification. In other words, the exclusion condition cannot be rejected. It is also important to check whether the CEO incentives are indeed endogenous. Based on the Hausman test, the null hypothesis of the exogeneity of *CEO % Incentive Pay* is rejected at 1% level. Taken together, all the test statistics support the relevancy and exclusion conditions. No surprisingly, the IV coefficients of CEO incentives differ a lot from those in the OLS specifications, because OLS estimates of endogenous variables are biased. In this case, OLS specifications with fixed effects underestimate the marginal effect of CEO incentives on firm investments. In terms of economic magnitude, Figure 3 and Figure 4 compare the economic effects of CEO incentives on R&D intensity in OLS and IV specifications. In the OLS setting, a one-standard-deviation increase in the *CEO %Incentive Pay* variable is associated with 0.064 units of a one-standard-deviation increase in R&D intensity, holding other determinants constant. In contrast, In the IV setting, a one-standard-deviation increase in the *CEO %Incentive Pay* variable is associated with 0.334 units of a one-standard-deviation increase

in R&D intensity. Similarly, Figure 5 and Figure 6 compare the economic effects of CEO incentives on CAPEX intensity in OLS and IV specifications. In response to a one-standard-deviation increase in the *CEO %Incentive Pay* variable, CAPEX intensity in the IV specification is predicted to increase by 0.138 units of a standard deviation, much larger than the 0.023 units of a one-standard-deviation increase predicted by the OLS specification. The finding that CEO incentives are positively associated with R&D intensity is consistent with that more performance-based pay incentivizes CEOs to increase risky investments in R&D projects. More importantly, by using geography instruments for CEO incentives, we mitigate the endogeneity concern and find that marginal effects of CEO incentives on firm investment estimated from the OLS specification are severely biased.

5.7 CEO incentives and firm value

Table 7 reports regression results of CEO incentives on firm value and risk. Column 1 and 3 report OLS regression results for comparison. Column 2 and 4 report second-stage results of instrumental variable regressions, where *CEO % Incentive Pay* is estimated by the average of CEO Local Peer %Incentive Pay, median CEO local peer cash pay, and second-stage controls. Various statistics to examine the validity of the instruments are also provided. We test the null hypothesis of weak instruments by the Kleibergen-Paap rk LM statistic and Anderson-Rubin Wald F-statistic, and the null hypothesis are rejected at 5% level. First-stage Cragg-Donald F statistic passes the maximum critical values of Stock-Yogo test statistics, rejecting the null hypothesis of weak instruments. The Hansen J-statistic cannot reject the exclusion condition. Based on the Hausman test, the null hypothesis of the exogeneity of CEO % Incentive Pay is

rejected at 5% level. In sum, all the test statistics support the relevancy and exclusion conditions. Similar to the results in Table 6, the IV coefficients of CEO incentives differ a lot from those in the OLS specifications, because OLS estimates of endogenous variables are biased. In this case, OLS specifications with fixed effects underestimate the marginal effect of CEO incentives on firm value and risk. In terms of economic magnitude, Figure 7 and Figure 8 compare the economic effects of CEO incentives on Market-to-Book in OLS and IV specifications. In the OLS setting, a one-standard-deviation increase in the *CEO %Incentive Pay* variable is associated with 0.049 units of a one-standard-deviation increase in Market-to-Book, holding other determinants constant. In contrast, In the IV setting, a one-standard-deviation increase in the *CEO %Incentive Pay* variable is associated with 0.203 units of a one-standard-deviation increase in Market-to-Book. Similarly, Figure 9 and Figure 10 compare the economic effects of CEO incentives on firm risk in OLS and IV specifications. In response to a one-standard-deviation increase in the *CEO %Incentive Pay* variable, firm risk in the IV specification is predicted to increase by 0.290 units of a standard deviation, much larger than the 0.056 units of a one-standard-deviation increase predicted by the OLS specification. Consistent with that more performance-based pay incentivizes CEOs to increase firm value, the CEO incentives are positively associated with future market-to-book ratio. Moreover, the increase in firm value comes at the price of more volatile stock returns as the CEO incentives are positively associated with future stock return standard deviation as well. Similar to the results in Table 6, by using geography instruments for CEO incentives, we mitigate the endogeneity concern and find that marginal effects of CEO incentives on Market-to-Book and firm risk estimated from the OLS specification are severely biased.

6. Conclusions

In contrast to recent studies that focus on the geography effect on the *level* of compensation, we examine empirically whether the *composition* of managerial compensation has geography patterns, and we explore the implications in firm policies and performance. Specifically, we investigate the role of geography on CEO incentives and find that the incentive ratio for a particular CEO is positively associated with the average incentive ratio for CEOs of firms headquartered in local areas. This local peer effect is only smaller than the size effect on CEO incentives and is comparable to primary determinants of CEO compensation.

We show that the local peer effect is more pronounced for firms headquartered in small and medium-sized cities and firms that are not in the largest size quartile. Moreover, the ratio of incentive pay to total pay for the top four executives other than the CEO also exhibit strong local peer effect. These findings are consistent with the friction hypothesis that the market for top executives has a geographical component. We also test alternative explanations of the local peer effect, and the positive association between CEOs and her local peers remain significant after controlling for additional economic factors.

The dynamics in local labor markets provide shocks to an individual CEO's compensation, which allows us to develop a geographic instrument – local peer incentives – for CEO incentives. Our instrumental variable specifications suggest that stronger CEO incentives lead to subsequently higher R&D expenses, larger capital expenditures, more volatile stock returns, and higher firm value. These findings are consistent with the view that more incentive-based compensation encourages managers to take more risk and increase firm value. Most

importantly, our geographic instrument for CEO compensation addresses endogeneity concerns that are pervasive in corporate governance research.

References

Ang, James, Gregory Nagel, and Jun Yang. 2010. The effect of social pressures on CEO compensation. Florida State University working paper.

Bebchuk, Lucian A., and Jesse M. Fried. 2004. Pay without performance. Vol. 278. Cambridge, MA: Harvard University Press.

Bizjak, John M., Michael L. Lemmon, and Lalitha Naveen. 2008. Does the use of peer groups contribute to higher pay and less efficient compensation? *Journal of Financial Economics* 90.2: 152-168.

Becker, Bo, Henrik Cronqvist, and Rüdiger Fahlenbrach. 2011. Estimating the effects of large shareholders using a geographic instrument. *Journal of Financial and Quantitative Analysis* 46.4: 907-942.

Bouwman, Christa. 2012. The geography of executive compensation. Working paper, Case Western Reserve University.

Cohen, Lauren, Andrea Frazzini, and Christopher Malloy. 2008. The small world of investing: Board connections and mutual fund returns. *Journal of Political Economy* 116.5: 951–979.

Cohen, Lauren, Andrea Frazzini, and Christopher Malloy. 2010. Sell-side school ties. *The Journal of Finance* 65.4: 1409-1437.

Coles, Jeffrey L., Naveen D. Daniel, and Lalitha Naveen. 2006. Managerial incentives and risk-taking. *Journal of Financial Economics* 79.2: 431-468.

Core, John, and Wayne Guay. 2002. Estimating the value of employee stock option portfolios and their sensitivities to price and volatility. *Journal of Accounting Research* 40.3: 613-630.

Deng, Xin, and Huasheng Gao. 2011. Nonmonetary benefits, quality of life, and executive compensation. *Journal of Financial and Quantitative Analysis* 48.1: 197-218.

DeYoung, Robert, Emma Y. Peng, and Meng Yan. 2013. Executive compensation and business policy choices at U.S. commercial banks. *Journal of Financial and Quantitative Analysis* 48.1: 165–196.

Dougal, Casey, Parsons, Christopher A. and Titman, Sheridan, Urban vibrancy and corporate growth (May 8, 2014). *Journal of Finance*, Forthcoming. Available at SSRN: http://ssrn.com/abstract=2023993.

Fracassi, Cesare. 2012. Corporate finance policies and social networks. AFA 2011 Denver Meetings Paper.

Francis, Bill and Hasan, Iftekhar and John, Kose and Waisman, Maya. 2012. Urban agglomeration and CEO compensation (April 19, 2012). Bank of Finland Research Discussion Paper No. 17/2012.

Frank, Robert H. 2000. Luxury fever: Money and happiness in an age of excess (Princeton University Press, Princeton).

Gabaix, Xavier, and Augustin Landier. 2008. Why has CEO pay increased so much? *The Quarterly Journal of Economics* 123.1: 49-100.

Hagerty, Michael R. 2000. Social comparisons of income in one's community: evidence from national surveys on income and happiness. *Journal of Personality and Social Psychology* 78.4: 764–771.

Hamermesh, Daniel S. 1975. Interdependence in the labour market. *Econometrica* 42.168: 420–429.

Hayes, Rachel M., Michael Lemmon, and Mingming Qiu. 2012. Stock options and managerial incentives for risk taking: Evidence from FAS 123R. *Journal of Financial Economics* 105.1: 174-190.

Kedia, Simi, and Shiva Rajgopal. 2009. Neighborhood matters: The impact of location on broad based stock option plans. *Journal of Financial Economics* 92.1: 109-127.

Khurana, Rakesh. 2002. Searching for a corporate savior: The irrational quest for charismatic CEOs. Princeton University Press.

Kini, Omesh, and Ryan Williams. 2012. Tournament incentives, firm risk, and corporate policies. *Journal of Financial Economics* 103.2: 350-376.

Knight, John, Lina Song, and Ramani Gunatilaka. 2009. Subjective well-being and its determinants in rural China. *China Economic Review* 20.4: 635–649.

Knyazeva, Anzhela, Diana Knyazeva, and Ronald W. Masulis. 2013. The supply of corporate directors and board independence. *Review of Financial Studies* 26.6: 1561-1605.

Leary, Mark, and Michael Roberts. 2010. Do peer firms affect corporate financial policy? Available at SSRN 1623379.

Luttmer, Erzo FP. 2005. Neighbor as negatives: Relative earnings and well-being. *Quarterly Journal of Economics* 120.3: 963–1002.

McBride, Michael. 2001. Relative income effects on subjective well-being in the cross section. *Journal of Human Behavior and Organization* 45.5: 251–278.

Mehran, Hamid. 1995. Executive compensation structure, ownership, and firm performance. *Journal of Financial Economics* 38.2: 163-184.

Melenberg, B. 1992. Micro-economic models of consumer behavior and welfare. PhD Thesis, Tilburg University.

Parsons, Christopher A., Johan Sulaeman, and Sheridan Titman. 2014. The geography of financial misconduct. No. w20347. National Bureau of Economic Research.

Seidl, Christian, Stefan Traub, and Andrea Morone. 2006. Relative deprivation, personal income satisfaction, and average well-being under different income distributions, in Mark McGillivray eds.: Inequality, Poverty and Well-Being (Palgrave Macmillan, Basingstoke): 66–90.

Shue, Kelly. 2013. Executive networks and firm policies: Evidence from the random assignment of MBA peers. *Review of Financial Studies* 26.6: 1401-1442.

Tervio, Marko. 2008. The difference that CEOs make: An assignment model approach. *The American Economic Review* 98.3: 642-668.

Veblen, Thorstein. 1934. The Theory of the Leisure Class (Modern Library, New York).

Yonker, Scott E. 2012. Geography and the market for CEOs. Working paper, Indiana University.

Appendix A

Variable Definitions

Compensation Variables

CEO Total Pay: CEO's total compensation.

CEO Incentive Pay: Options + Restricted Stock + Long Term Incentive Plan Payouts + Other performance-based pay.

CEO %Incentive Pay: CEO Incentive Pay / CEO Total Pay.

Avg. CEO Local Peer % Incentive Pay: The mean of CEO %Incentive Pay at firms headquartered within a 100-mile radius, excluding CEO's own compensation and those at in the same industry within the radius.

Median CEO Local Peer % Incentive Pay: The median of CEO %Incentive Pay at firms headquartered within a 100-mile radius, excluding CEO's own compensation and those at in the same industry within the radius.

Avg. CEO Local Industry Peer % Incentive Pay: The mean of CEO %Incentive Pay at firms headquartered within a 100-mile radius and that belong to the same industry, excluding CEO's own compensation.

Management Team (Mgmt. Team) Incentive Pay: (Options + Restricted Stock + Long Term Incentive Plan Payouts + Other performance-based pay) of the top 5 executives.

Mgmt. Team %Incentive Pay: Mgmt. Team Incentive Pay / Mgmt. Team Total Pay.

Avg. Mgmt. Team Local Peer % Incentive Pay: The mean of Mgmt. Team %Incentive Pay at firms headquartered within a 100-mile radius, excluding Mgmt. Team's own compensation and those at in the same industry within the radius.

Avg. Mgmt. Team Local Industry Peer % Incentive Pay: The mean of Mgmt. Team %Incentive Pay at firms headquartered within a 100-mile radius and that belong to the same industry, excluding Mgmt. Team's own compensation.

Control Variables

CEO Age: CEO's age.

CEO Tenure: The length of years the executives has been served as CEO

CEO-Chairman Indicator: equals 1 if the CEO is also chairman of the board.

Assets: Firm's total assets.

Sale Growth: $(Sales_t - Sales_{t-1})/ Sales_{t-1}$.

Cash-to-assets: Cash / Assets.

CAPEX Intensity: CAPEX/Assets.

Tangible Asset Intensity: PP&E / Assets.

R&D Intensity: R&D expenditure / Assets.

R&D Intensity Indicator: Equals one if R&D Intensity is positive.

Book Leverage: Debts / Assets.

Institutional Ownership: Percentage of institutional ownership.

Market-to-Book: Ratio of market value of assets to book value of assets.

ROA: Return of operating income before depreciation scaled by assets.

Excess Stock Return: Average of monthly stock returns in excess of market returns in a fiscal year.

Excess Stock Return (%) of Local Peer Firms: Average of monthly stock returns in excess of market returns in a fiscal year for firms headquartered within a 100-mile radius, excluding CEO's own firm and those at in the same industry within the radius.

Firm Risk: Standard deviation of monthly excess returns in a fiscal year.

Cash Flow Risk: Standard deviation of annual ROA in prior five years.

Per Capita Income: Annual personal income per capita for a MSA, adjusted to the 2012 USD.

State Income Tax: The maximum marginal state income tax rate for individuals.

Figure 1

The economic effects of local peer incentives and other determinants of CEO incentives

The economic effects of one-standard-deviation increase in the x variable on *CEO %Incentive Pay* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *CEO %Incentive Pay* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 2, Column 4, and standard deviations of firm characteristics reported in Table 1, Panel B.

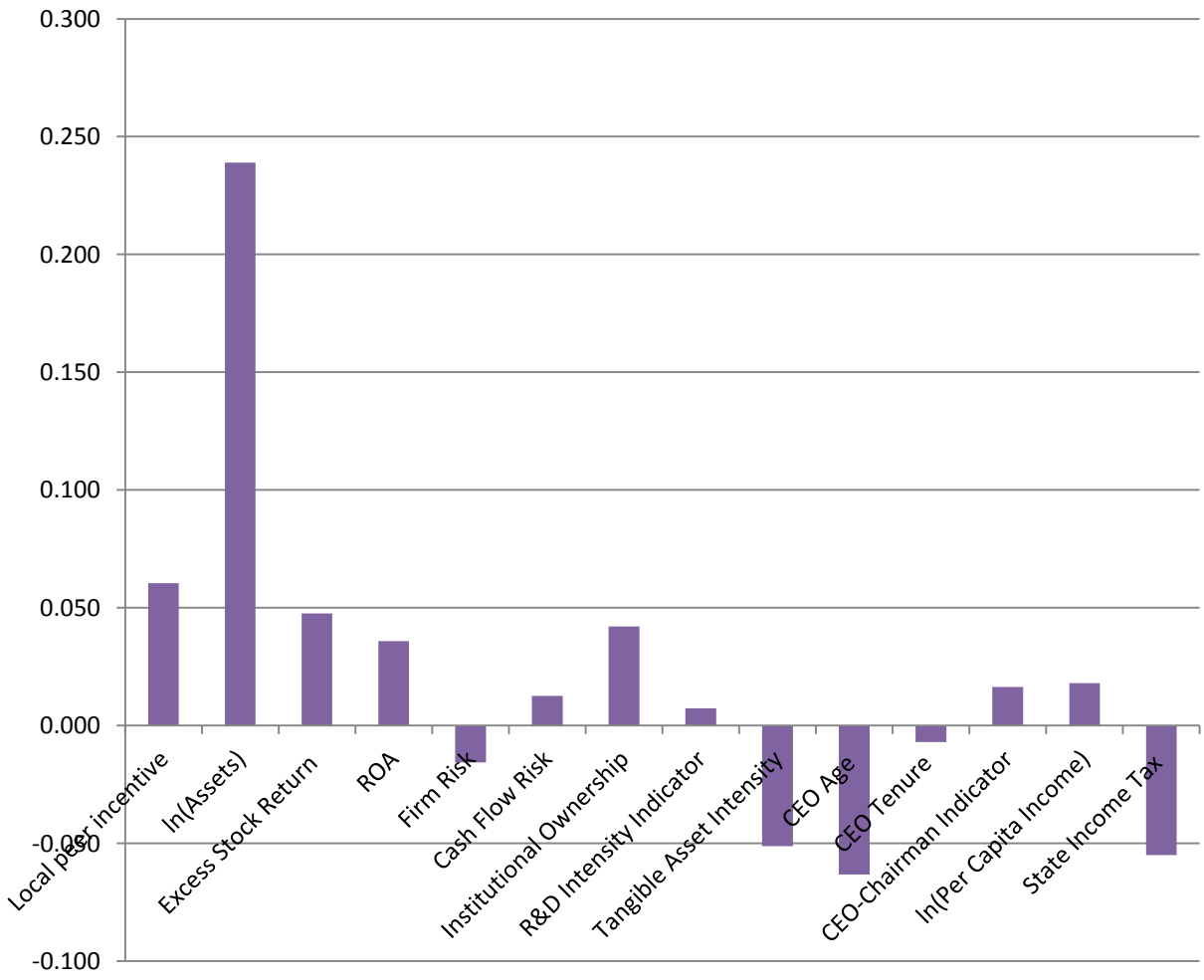

Figure 2

The economic effects of various peer incentives

The economic effects of one-standard-deviation increase in the x variable on *CEO %Incentive Pay* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *CEO %Incentive Pay* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 2, Column 4, Table 4, Column 1 and Column 2, and standard deviations of executive variables reported in Table 1, Panel A.

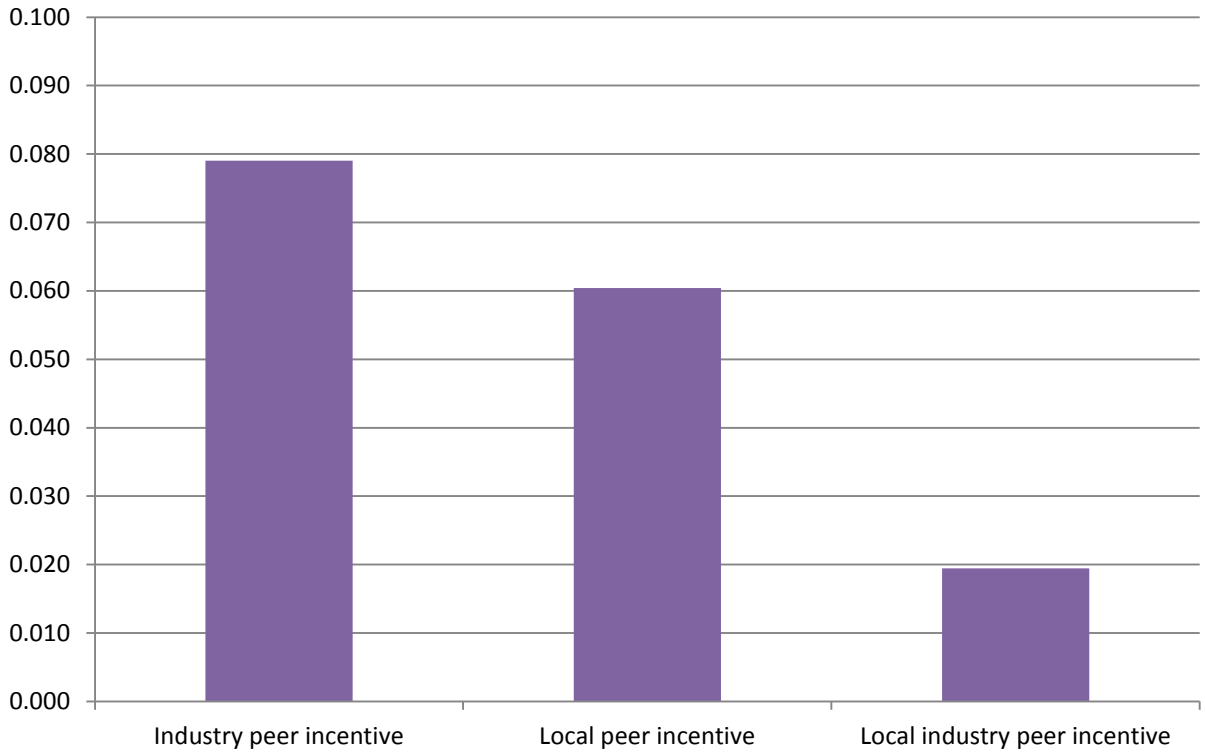

Figure 3

The economic effect of CEO incentives on R&D intensity: OLS

The economic effects of one-standard-deviation increase in the x variable on *R&D intensity* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *R&D intensity* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 6, Column 1, and standard deviations of executive variables and firm characteristics reported in Table 1.

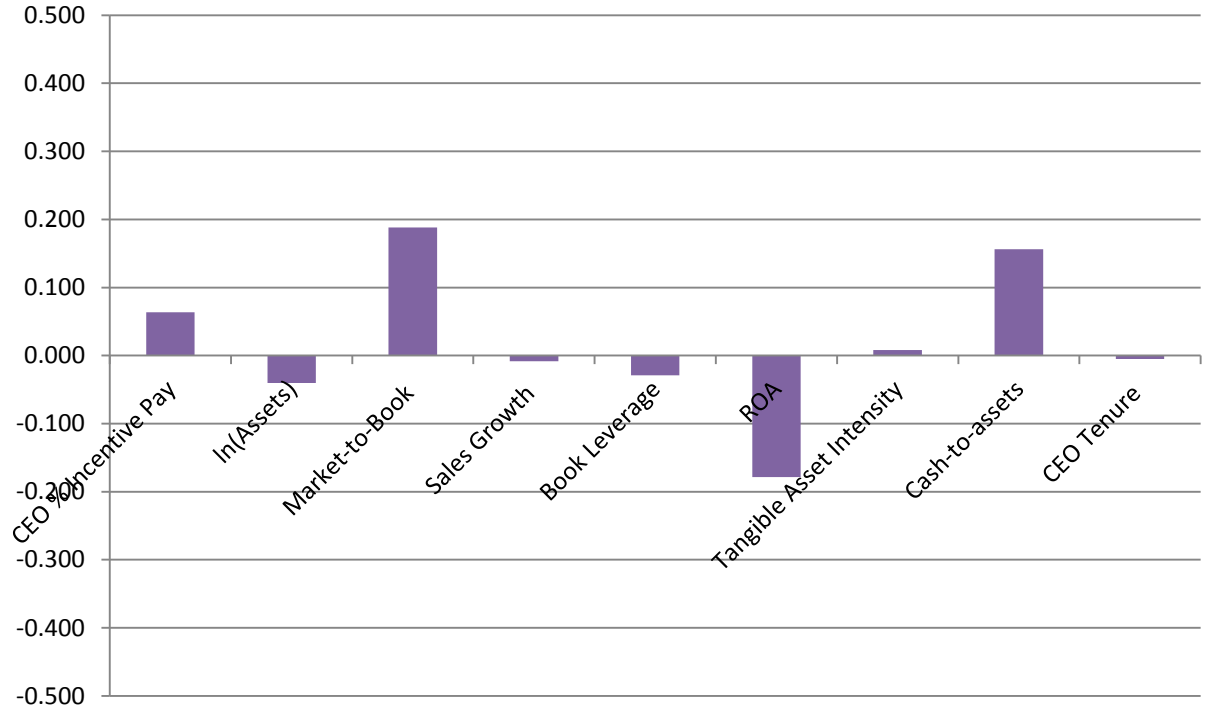

Figure 4

The economic effect of CEO incentives on R&D intensity: IV

The economic effects of one-standard-deviation increase in the x variable on *R&D intensity* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *R&D intensity* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 6, Column 2, and standard deviations of executive variables and firm characteristics reported in Table 1.

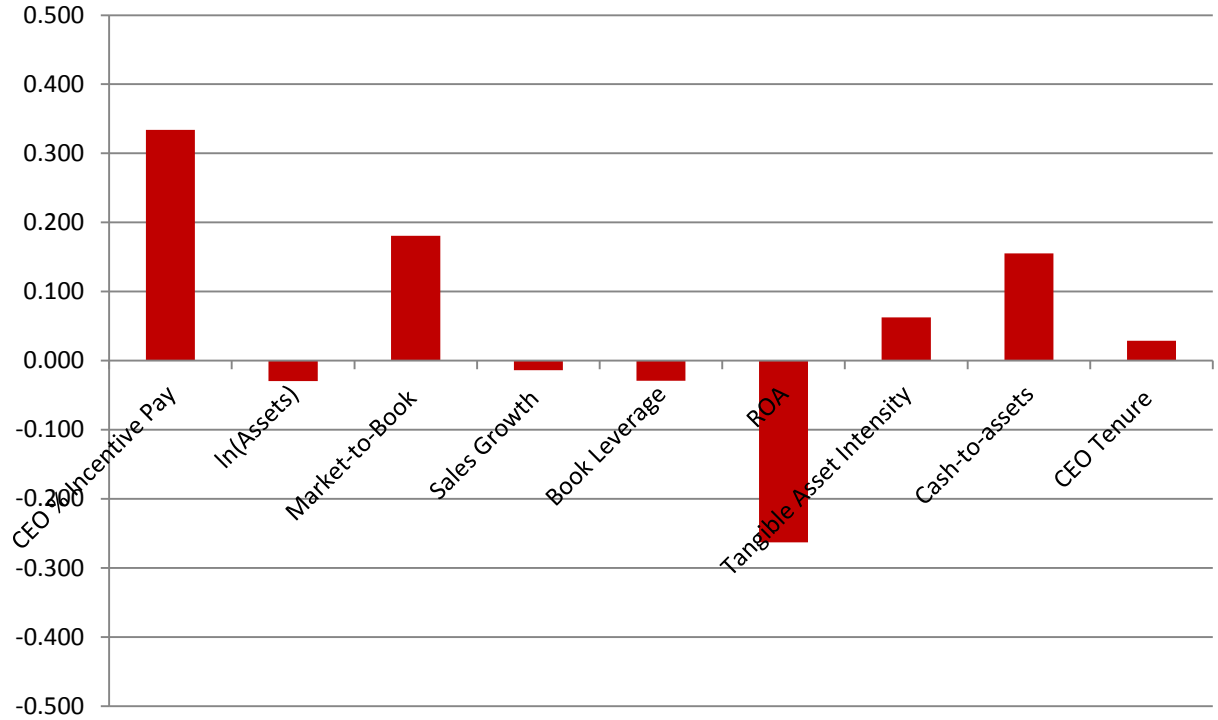

Figure 5

The economic effect of CEO incentives on CAPEX intensity: OLS

The economic effects of one-standard-deviation increase in the x variable on *CAPEX intensity* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *CAPEX intensity* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 6, Column 3, and standard deviations of executive variables and firm characteristics reported in Table 1.

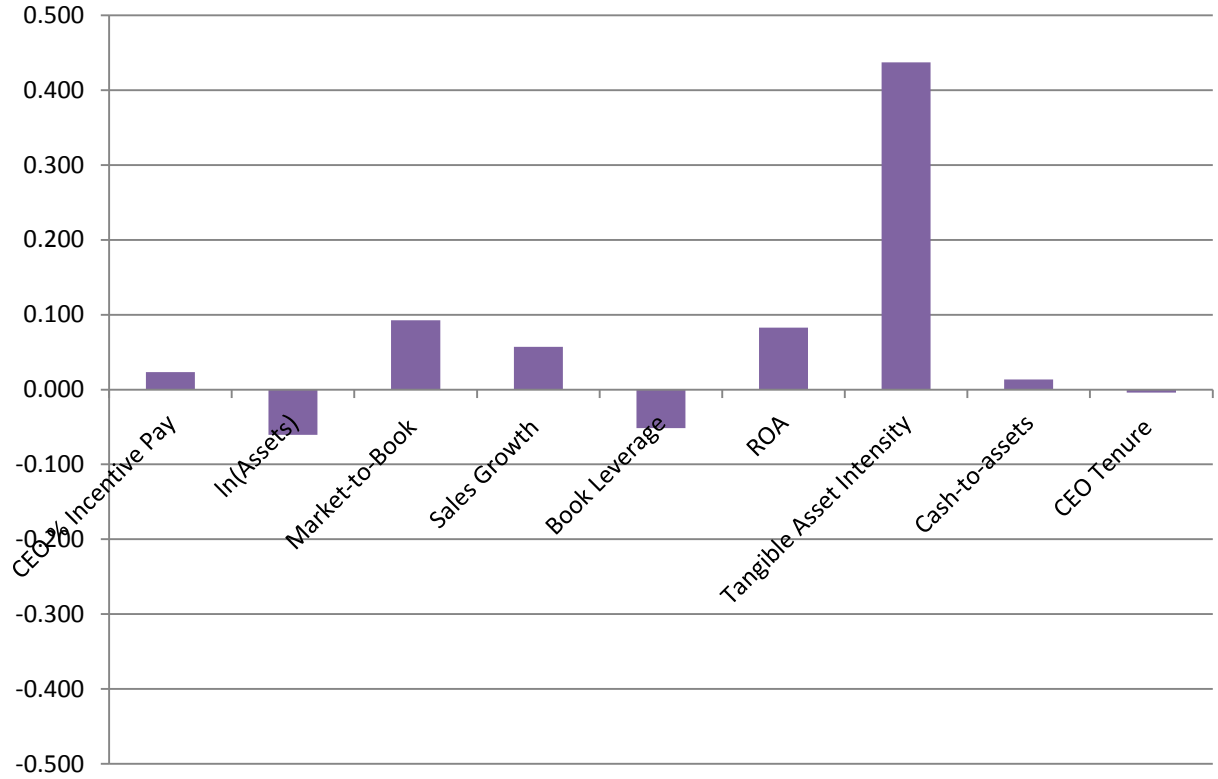

Figure 6

The economic effect of CEO incentives on CAPEX intensity: IV

The economic effects of one-standard-deviation increase in the x variable on *CAPEX intensity* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *CAPEX intensity* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 6, Column 4, and standard deviations of executive variables and firm characteristics reported in Table 1.

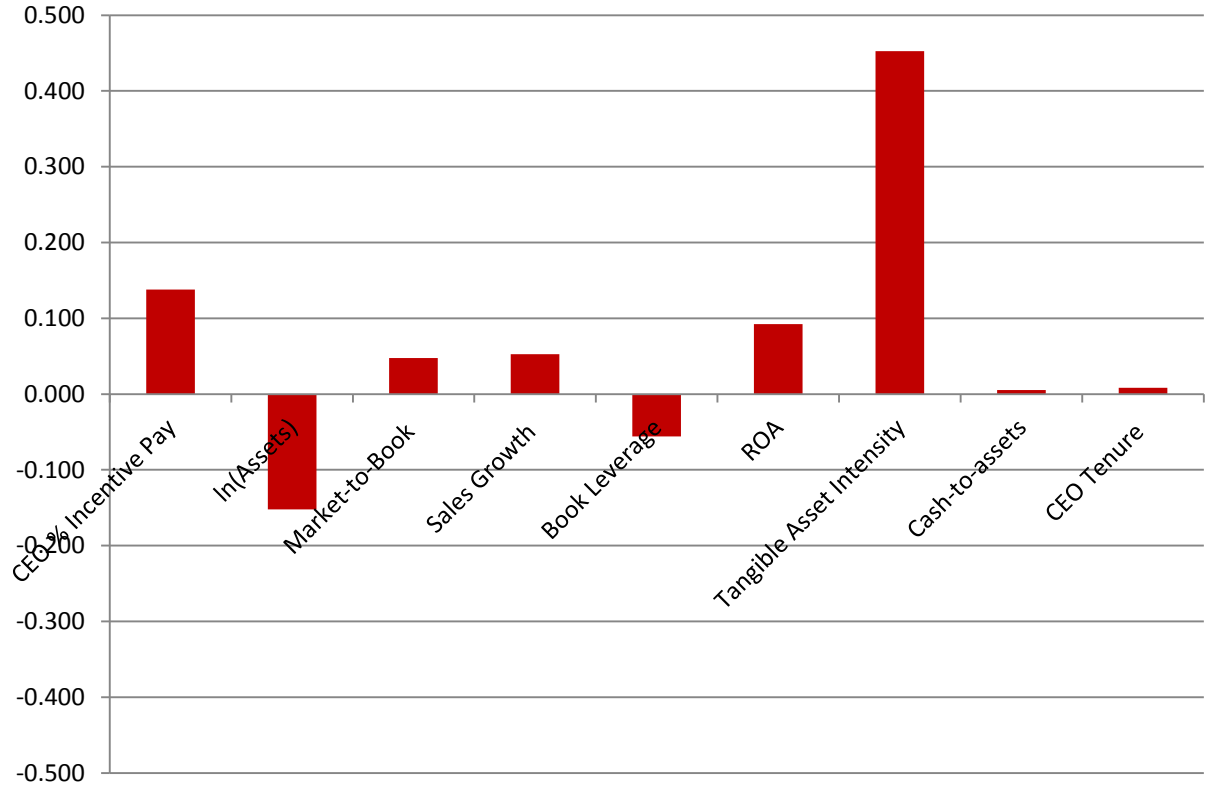

Figure 7

The economic effect of CEO incentives on Market-to-Book: OLS

The economic effects of one-standard-deviation increase in the x variable on *Market-to-Book* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *Market-to-Book* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 7, Column 1, and standard deviations of executive variables and firm characteristics reported in Table 1.

Figure 8

The economic effect of CEO incentives on Market-to-Book: IV

The economic effects of one-standard-deviation increase in the x variable on *Market-to-Book* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *Market-to-Book* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 7, Column 2, and standard deviations of executive variables and firm characteristics reported in Table 1.

Figure 9

The economic effect of CEO incentives on Firm risk: OLS

The economic effects of one-standard-deviation increase in the x variable on *Firm risk* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *Firm risk* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 7, Column 3, and standard deviations of executive variables and firm characteristics reported in Table 1.

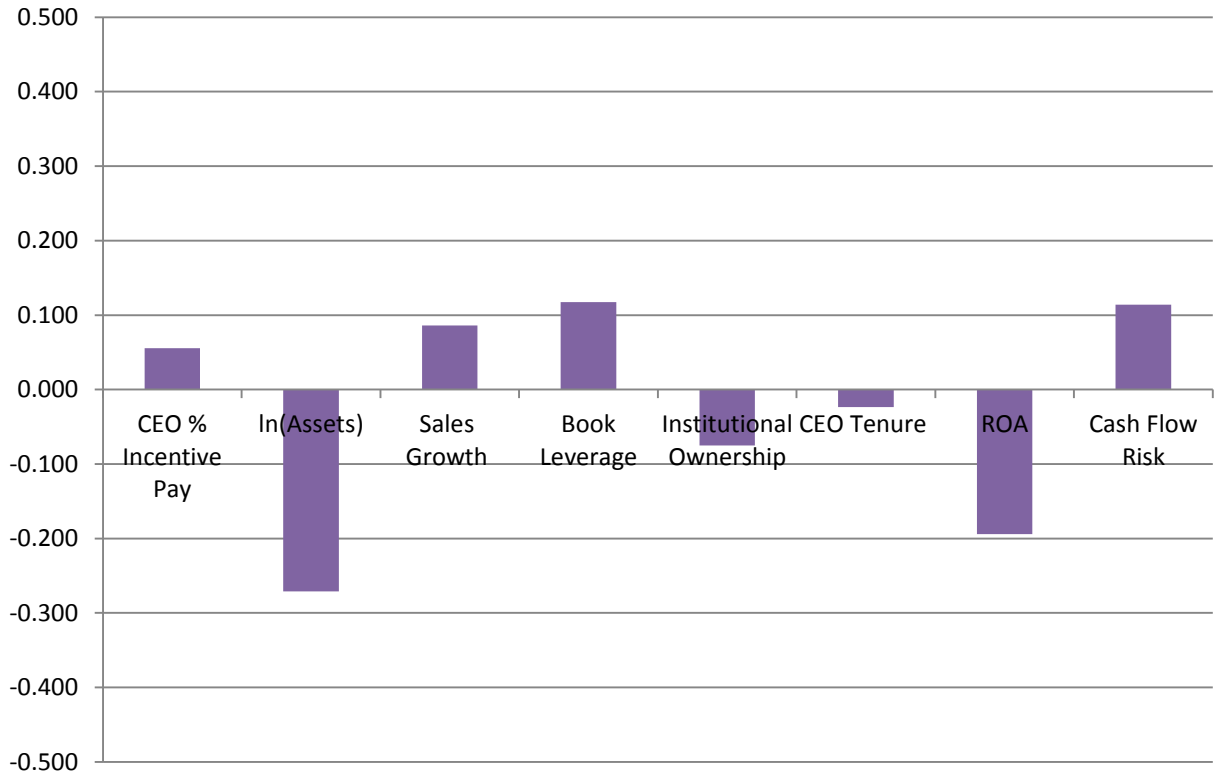

Figure 10

The economic effect of CEO incentives on Firm risk: IV

The economic effects of one-standard-deviation increase in the x variable on *Firm risk* are shown below. Each effect represents the predicted change (measured by the unit of one standard deviation) in *Firm risk* in response to a one-standard-deviation increase in the x variable, holding other determinants constant. The effects are computed from the coefficient estimates in Table 7, Column 4, and standard deviations of executive variables and firm characteristics reported in Table 1.

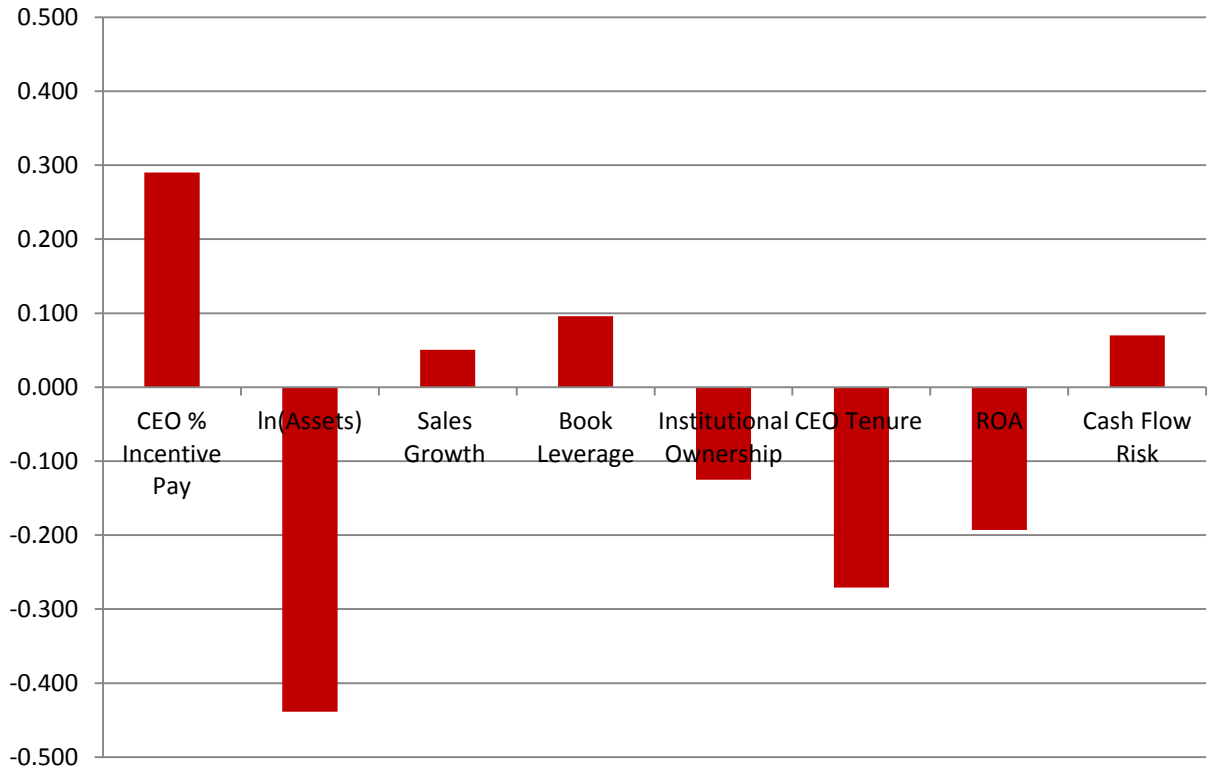

Table 1

Summary Statistics

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars.

Panel A: Executive variables

	N	Mean	Median	SD
CEO characteristics				
CEO Age	21658	55	55	8
CEO Tenure	21658	9	8	5
CEO-Chairman Indicator	21658	0.60	1.00	0.4
CEO compensation				
CEO Total Pay ($ thousands)	21658	5,922	3,230	13,241
CEO %Incentive Pay	21658	0.57	0.63	0.29
Avg. CEO Local Peer % Incentive Pay	21658	0.55	0.54	0.12
Median CEO Local Peer % Incentive Pay	21658	0.61	0.60	0.15
Avg. CEO Local Industry Peer % Incentive Pay	16819	0.56	0.59	0.20
Median CEO Local Industry Peer % Incentive Pay	16819	0.60	0.64	0.22
Avg. CEO Industry Peer % Incentive Pay	21658	0.54	0.54	0.12
Median CEO Industry Peer % Incentive Pay	21658	0.59	0.60	0.16
Management team compensation				
Mgmt Team Total Pay ($ thousands)	21658	8,479	5,066	13,779
Mgmt Team %Incentive Pay	21658	0.54	0.58	0.26
Avg. Mgmt Team Local Peer % Incentive Pay	21658	0.54	0.53	0.10
Median Mgmt Team Local Peer % Incentive Pay	21658	0.57	0.56	0.12

Avg. Mgmt Team Local Industry Peer % Incentive Pay	16819	0.56	0.58	0.17
Median Mgmt Team Local Industry Peer % Incentive Pay	16819	0.58	0.60	0.18
Avg. Mgmt Team Industry Peer % Incentive Pay	21658	0.51	0.52	0.12
Median Mgmt Team Industry Peer % Incentive Pay	21658	0.55	0.56	0.13
Distribution of peer firms				
Number of Local Peer Firms	21658	93	72	79
Number of Local Industry Peer Firms	16819	8	4	10
Number of Industry Peer Firms	21658	61	49	38

Panel B: Firm characteristics

	N	Mean	Median	SD
Assets ($ millions)	21658	7,122	1,369	29,856
ln(Assets)	21658	7.38	7.22	1.57
Sale Growth	21658	0.13	0.09	0.28
Cash-to-assets	21658	0.09	0.08	0.11
CAPEX Intensity	21658	0.06	0.04	0.06
Tangible Asset Intensity	21658	0.28	0.22	0.22
R&D Intensity	21658	0.03	0.00	0.07
R&D Intensity Indicator	21658	0.52	1	0.50
Book Leverage	21658	0.21	0.20	0.18
Institutional Ownership (%)	21658	71.86	74.44	23.09
Market-to-Book	21658	2.15	1.63	2.17
ROA	21658	0.14	0.14	0.10
Excess Stock Return (%)	21658	0.71	0.42	4.05
Excess Stock Return (%) of Local Peer Firms	21658	0.68	0.46	1.32

Firm Risk	21658	0.11	0.09	0.07
Cash Flow Risk	21658	0.05	0.03	0.06

Table 2

Local peers and CEO incentives

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars. Control variables are lagged by one year. We use fixed effect regressions with firm and year fixed effects. Robust t-statistics adjusted for clustering by firm are reported in the parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: CEO %Incentive Pay	(1)	(2)	(3)	(4)
Avg. CEO Local Peer % Incentive Pay	0.144***	0.149***	0.147***	0.146***
	(3.075)	(3.267)	(3.253)	(3.206)
ln(Assets)		0.0408***	0.0423***	0.0420***
		(6.584)	(6.895)	(6.773)
Excess Stock Return		0.341***	0.341***	0.341***
		(5.957)	(5.968)	(5.960)
ROA		0.104***	0.104***	0.104***
		(3.256)	(3.331)	(3.342)
Firm Risk		-0.0588	-0.0655	-0.0648
		(-1.446)	(-1.623)	(-1.604)
Cash Flow Risk		0.0686	0.0624	0.0608
		(1.080)	(1.001)	(0.973)
Institutional Ownership		0.0535***	0.0527***	0.0529***
		(3.150)	(3.142)	(3.142)
R&D Intensity Indicator		0.00451	0.00431	0.00422
		(0.223)	(0.219)	(0.215)
Tangible Asset Intensity		-0.0739*	-0.0663*	-0.0675*
		(-1.883)	(-1.700)	(-1.733)
CEO Age $\times 10^{-2}$			-0.229***	-0.229***
			(-4.598)	(-4.614)
CEO Tenure $\times 10^{-3}$			-0.392	-0.406
			(-0.347)	(-0.359)
CEO-Chairman Indicator			0.0118*	0.0119*
			(1.841)	(1.849)
ln(Per Capita Income)				0.0290
				(0.406)
State Income Tax $\times 10^{-2}$				-0.236
				(-1.118)
Observations	21,658	21,658	21,658	21,658
Adjusted R^2	0.441	0.450	0.451	0.451

Table 3

Local labor market and CEO incentives: Subsample analysis

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars. Control variables are lagged by one year. We use fixed effect regressions with firm and year fixed effects. Column (1) reports results based on subsample that excludes the top 10 MSAs ranked by population from the 2000 US Census Bureau data. Column (2) reports results based on subsample that excludes the top 20 MSAs ranked by population from the 2000 US Census Bureau data. Column (3) reports results based on subsample that excludes firms that have assets in the top 25th percentile. Column (4) reports results based on subsample that only includes firms that have assets in the top 25th percentile. Column (5) reports results based on subsample that excludes the S&P 500 firms. Column (6) reports results based on subsample that only includes the S&P 500 firms. Robust t-statistics adjusted for clustering by firm are reported in the parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: CEO %Incentive Pay	Excluding Top10 MSA	Excluding Top20 MSA	Excluding Large (Top 25%) Firms	Large (Top 25%) Firms Only	Non S&P 500	S&P 500
Avg. CEO Local Peer % Incentive Pay	0.132***	0.147***	0.175***	0.0538	0.154***	0.106
	(2.631)	(2.701)	(3.288)	(0.675)	(2.791)	(1.342)
ln(Assets)	0.0409***	0.0412***	0.0520***	0.00367	0.0506***	0.0125
	(5.016)	(4.451)	(6.646)	(0.250)	(6.437)	(0.944)
Excess Stock Return	0.253***	0.346***	0.340***	0.386***	0.376***	0.190
	(3.431)	(3.861)	(5.510)	(2.980)	(5.906)	(1.634)
ROA	0.0823*	0.0913	0.0992***	0.104	0.0914***	0.145*
	(1.943)	(1.625)	(2.952)	(1.165)	(2.683)	(1.898)
Firm Risk	-0.0154	-0.0152	-0.0542	-0.154	-0.0856**	-0.00727
	(-0.297)	(-0.259)	(-1.218)	(-1.533)	(-1.977)	(-0.0732)
Cash Flow Risk	0.0210	0.0291	0.0585	0.450*	0.0212	0.398**
	(0.206)	(0.191)	(0.915)	(1.747)	(0.330)	(2.029)
Institutional Ownership	0.0626***	0.0688***	0.0497**	0.0149	0.0497**	0.0332
	(3.545)	(2.987)	(2.557)	(0.485)	(2.567)	(1.098)
R&D Intensity Indicator	0.0279	0.0101	0.0124	0.0224	0.00178	0.0206
	(1.056)	(0.307)	(0.514)	(0.671)	(0.0679)	(0.662)

Tangible Asset Intensity	-0.103*	-0.126**	-0.0495	-0.0443	-0.0754	-0.0854
	(-1.951)	(-2.127)	(-1.008)	(-0.676)	(-1.519)	(-1.197)
CEO Age $\times 10^{-2}$	-0.254***	-0.252***	-0.247***	-0.542	-0.289***	-0.0511
	(-4.002)	(-3.309)	(-4.283)	(-0.582)	(-4.756)	(-0.563)
CEO Tenure $\times 10^{-3}$	-0.889	-2.04	-1.17	-0.849	-0.747	-1.05
	(-0.584)	(-1.086)	(-0.845)	(-0.416)	(-0.509)	(-0.541)
CEO-Chairman Indicator	0.0184**	0.0202**	0.00716	0.0212	0.0127	0.0128
	(2.220)	(2.048)	(0.930)	(1.646)	(1.583)	(1.131)
ln(Per Capita Income)	0.0355	0.0826	0.0137	0.0518	-0.0223	0.148
	(0.437)	(0.920)	(0.157)	(0.386)	(-0.241)	(1.204)
State Income Tax $\times 10^{-2}$	-0.282	-0.350	-0.323	-0.132	-0.307	-0.136
	(-0.842)	(-0.974)	(-1.199)	(-0.339)	(-1.067)	(-0.403)
Observations	12,716	9,057	16,190	5,401	15,339	6,252
Adjusted R^2	0.457	0.467	0.430	0.417	0.429	0.444

Table 4

Local peers and CEO incentives: Robustness check

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and Thomson Reuters 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars. Control variables are lagged by one year. We use fixed effect regressions with firm and year fixed effects. Robust t-statistics adjusted for clustering by firm are reported in the parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: CEO %Incentive Pay	(1)	(2)	(3)	(4)	(5)	(6)
Avg. CEO Local Peer % Incentive Pay	0.143***	0.146**	0.146**	0.146***	0.136***	0.145***
	(3.145)	(2.413)	(2.416)	(3.200)	(2.780)	(3.181)
Avg. CEO Industry Peer % Incentive Pay	0.191***					
	(4.587)					
Avg. CEO Local Industry Peer % Incentive Pay		0.0282*				
		(1.877)				
Median CEO Local Industry Peer % Incentive Pay			0.0299**			
			(2.214)			
Avg. Excess Returns of Local Peer Firms				0.0952		
				(0.532)		
ln(Avg. CEO Local Peer Total Pay)					0.00413	
					(0.399)	
Number of Local Peers						0.000317
						(1.106)
ln(Assets)	0.0419***	0.0399***	0.0399***	0.0421***	0.0420***	0.0420***
	(6.786)	(5.605)	(5.592)	(6.773)	(6.776)	(6.773)
Excess Stock Return	0.342***	0.317***	0.317***	0.334***	0.340***	0.341***
	(5.979)	(4.845)	(4.857)	(5.837)	(5.950)	(5.961)
ROA	0.102***	0.122***	0.122***	0.103***	0.104***	0.105***
	(3.314)	(3.981)	(3.979)	(3.320)	(3.349)	(3.353)
Firm Risk	-0.0726*	-0.0682	-0.0687	-0.0635	-0.0650	-0.0659
	(-1.804)	(-1.544)	(-1.555)	(-1.567)	(-1.609)	(-1.631)
Cash Flow Risk	0.0471	0.124**	0.124**	0.0603	0.0605	0.0601

	(0.758)	(2.459)	(2.456)	(0.965)	(0.970)	(0.961)
Institutional Ownership	0.0524***	0.0584**	0.0584**	0.0531***	0.0530***	0.0529***
	(3.079)	(2.520)	(2.523)	(3.135)	(3.144)	(3.138)
R&D Intensity Indicator	0.00425	-0.0100	-0.00995	0.00455	0.00421	0.00448
	(0.217)	(-0.430)	(-0.425)	(0.231)	(0.214)	(0.228)
Tangible Asset Intensity	-0.0663*	-0.0370	-0.0373	-0.0678*	-0.0675*	-0.0673*
	(-1.696)	(-0.818)	(-0.825)	(-1.735)	(-1.730)	(-1.724)
CEO Age $\times 10^{-2}$	-0.219***	-0.190***	-0.189***	-0.227***	-0.229***	-0.229***
	(-4.414)	(-3.335)	(-3.323)	(-4.549)	(-4.614)	(-4.600)
CEO Tenure $\times 10^{-3}$	-0.477	-0.402	-0.416	-0.453	-0.410	-0.396
	(-0.424)	(-0.298)	(-0.309)	(-0.400)	(-0.362)	(-0.350)
CEO-Chairman Indicator	0.0110*	0.00709	0.00709	0.0117*	0.0119*	0.0120*
	(1.703)	(0.953)	(0.952)	(1.811)	(1.849)	(1.867)
ln(Per Capita Income)	0.0316	0.0439	0.0411	0.0317	0.0254	0.00607
	(0.445)	(0.524)	(0.490)	(0.440)	(0.350)	(0.0821)
State Income Tax $\times 10^{-2}$	-0.207	-0.308	-0.308	-0.237	-0.230	-0.00224
	(-0.985)	(-1.325)	(-1.324)	(-1.122)	(-1.085)	(-1.058)
Observations	21,658	16,819	16,819	21, 658	21,658	21,658
Adjusted R^2	0.453	0.439	0.439	0.452	0.451	0.441

Table 5

Local peers and management team incentives

Panel A: Full sample and subsample

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars. Column (1) reports results based on the full sample. Column (2) reports results based on subsample that excludes the top 10 MSAs ranked by population from the 2000 US Census Bureau data. Column (3) reports results based on subsample that excludes the top 20 MSAs ranked by population from the 2000 US Census Bureau data. Column (4) reports results based on subsample that excludes firms that have assets in the top 25th percentile. Column (5) reports results based on subsample that only includes firms that have assets in the top 25th percentile. Column (6) reports results based on subsample that excludes the S&P 500 firms. Column (7) reports results based on subsample that only includes the S&P 500 firms. Control variables are lagged by one year. We use fixed effect regressions with firm and year fixed effects. Robust t-statistics adjusted for clustering by firm are reported in the parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Mgmt Team %Incentive Pay	Full Sample	Excluding Top10 MSA	Excluding Top20 MSA	Excluding Large (Top 25%) Firms	Large (Top 25%) Firms Only	Non S&P 500	S&P 500
Avg. Mgmt Team Local Peer % Incentive Pay	0.175***	0.170***	0.187***	0.152***	0.0230	0.133**	0.0999
	(4.164)	(3.704)	(3.762)	(3.110)	(0.314)	(2.501)	(1.607)
ln(Assets)	0.0482***	0.0469***	0.0451***	0.0558***	0.0262**	0.0551***	0.0387***
	(9.208)	(6.731)	(5.859)	(7.973)	(2.529)	(8.049)	(4.510)
Excess Stock Return	0.417***	0.419***	0.490***	0.415***	0.398***	0.415***	0.409***
	(9.154)	(7.638)	(7.134)	(8.076)	(3.953)	(7.716)	(4.579)
ROA	0.112***	0.110***	0.143**	0.101***	0.172***	0.0789**	0.313***
	(3.382)	(2.595)	(2.430)	(2.799)	(2.621)	(2.213)	(5.731)
Firm Risk	0.0267	0.0577	0.0600	0.0552	-0.211**	0.0260	0.00399
	(0.672)	(1.179)	(1.146)	(1.220)	(-2.559)	(0.575)	(0.0488)
Cash Flow Risk	0.139**	0.152	0.176	0.110*	0.523***	0.0860	0.437***
	(2.354)	(1.529)	(1.227)	(1.905)	(2.596)	(1.531)	(3.010)
Institutional Ownership	0.0506***	0.0421***	0.0393**	0.0550***	0.0332	0.0520***	0.0312
	(4.195)	(2.924)	(2.308)	(3.636)	(1.123)	(3.576)	(1.462)
R&D Intensity Indicator	-0.00433	0.00441	-0.00477	-0.00146	0.0104	-0.0189	0.0315

	(-0.239)	(0.164)	(-0.143)	(-0.0684)	(0.354)	(-0.780)	(1.288)
Tangible Asset Intensity	-0.0889***	-0.0725*	-0.0992**	-0.0748*	-0.0883	-0.0910**	-0.0950*
	(-2.608)	(-1.755)	(-2.095)	(-1.771)	(-1.443)	(-2.120)	(-1.749)
CEO Age $\times 10^{-2}$	-0.109**	-0.126**	-0.127**	-0.111**	0.0826	-0.150***	0.0494
	(-2.537)	(-2.382)	(-1.993)	(-2.090)	(1.147)	(-2.637)	(0.780)
CEO Tenure $\times 10^{-2}$	-0.210**	-0.249**	-0.381***	-0.324***	-0.186	-0.282**	-0.154
	(-2.454)	(-2.222)	(-2.846)	(-2.977)	(-1.277)	(-2.426)	(-1.131)
CEO-Chairman Indicator	0.0249***	0.0272***	0.0334***	0.0206***	0.0287***	0.0261***	0.0204**
	(4.514)	(3.801)	(3.993)	(3.082)	(3.155)	(3.603)	(2.481)
ln(Per Capita Income)	-0.0133	0.0363	0.0592	-0.0377	0.0329	-0.0348	0.0444
	(-0.213)	(0.495)	(0.749)	(-0.488)	(0.311)	(-0.417)	(0.457)
State Income Tax	-0.00103	-0.00117	-0.00204	-2.45e-05	-0.00537**	-0.000879	-0.00161
	(-0.541)	(-0.408)	(-0.644)	(-0.00975)	(-1.971)	(-0.328)	(-0.651)
Observations	21,658	12,716	9,057	16,190	5,401	15,339	6,252
Adjusted R^2	0.432	0.465	0.472	0.390	0.442	0.378	0.501

Table 5

Local peers and management team incentives

Panel B: Robustness check

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and Thomson Reuters 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars. Control variables are lagged by one year. We use fixed effect regressions with firm and year fixed effects. Robust t-statistics adjusted for clustering by firm are reported in the parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Mgmt Team %Incentive Pay	(1)	(2)	(3)	(4)
Avg. Mgmt Team Local Peer % Incentive Pay	0.169***	0.230***	0.229***	0.175***
	(4.021)	(3.889)	(3.877)	(4.159)
Avg. Mgmt Team Industry Peer % Incentive Pay	0.196***			
	(6.064)			
Avg. Mgmt Team Local Industry Peer % Incentive Pay		0.0528***		
		(2.841)		
Median Mgmt Team Local Industry Peer % Incentive Pay			0.0529***	
			(3.092)	
Avg. Excess Returns of Local Peer Firms				0.127
				(0.811)
ln(Assets)	0.0479***	0.0511***	0.0510***	0.0483***
	(9.259)	(8.391)	(8.376)	(9.218)
Excess Stock Return	0.423***	0.424***	0.424***	0.417***
	(9.321)	(8.215)	(8.230)	(9.151)
ROA	0.112***	0.124***	0.125***	0.112***
	(3.450)	(3.387)	(3.409)	(3.385)
Firm Risk	0.0145	0.0217	0.0213	0.0260
	(0.369)	(0.470)	(0.460)	(0.655)
Cash Flow Risk	0.122**	0.183***	0.182***	0.139**
	(2.134)	(2.921)	(2.911)	(2.356)
Institutional Ownership	0.0498***	0.0598***	0.0599***	0.0505***

	(4.108)	(3.741)	(3.767)	(4.190)
R&D Intensity Indicator	-0.00453	-0.0316	-0.0314	-0.00436
	(-0.253)	(-1.439)	(-1.431)	(-0.240)
Tangible Asset Intensity	-0.0855**	-0.0715*	-0.0713*	-0.0891***
	(-2.501)	(-1.730)	(-1.725)	(-2.615)
CEO Age $\times 10^{-2}$	-0.103**	-0.104**	-0.104**	-0.109**
	(-2.393)	(-1.998)	(-1.999)	(-2.530)
CEO Tenure $\times 10^{-2}$	-0.209**	-0.273***	-0.274***	-0.210**
	(-2.469)	(-2.752)	(-2.761)	(-2.458)
CEO-Chairman Indicator	0.0241***	0.0271***	0.0271***	0.0248***
	(4.379)	(4.188)	(4.190)	(4.500)
ln(Per Capita Income)	-0.0191	0.0269	0.0204	-0.00853
	(-0.307)	(0.359)	(0.273)	(-0.137)
State Income Tax $\times 10^{-3}$	-0.804	-0.618	-0.621	-1.06
	(-0.426)	(-0.291)	(-0.292)	(-0.560)
Observations	21,658	16,819	16,819	21, 658
Adjusted R^2	0.434	0.410	0.410	0.432

Table 6

CEO incentives and firm investment

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars. All independent variables are lagged by one year. Column (2) and (4) report second-stage results of instrumental variable regressions, where *CEO % Incentive Pay* is estimated by the average of CEO Local Peer %Incentive Pay, log of median CEO local peer cash pay, and second-stage controls. Economic Significance of *CEO % Incentive Pay* represents the predicted change (measured by the unit of one standard deviation) in the dependent variable in response to a one-standard-deviation increase in the *CEO % Incentive Pay* variable, holding other determinants constant. All regressions include 2-digit SIC industry fixed effects and year fixed effects. Robust t-statistics adjusted for clustering by firm are reported in the parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) R&D Intensity OLS	(2) R&D Intensity IV	(3) CAPEX Intensity OLS	(4) CAPEX Intensity IV
CEO % Incentive Pay	0.0154***	0.167***	0.00559***	0.0689**
	(7.857)	(2.847)	(3.897)	(2.229)
ln(Assets) × 10^{-2}	-0.170***	-1.25***	-0.256***	-0.646***
	(-3.144)	(-3.560)	(-6.369)	(-3.314)
Market-to-Book × 10^{-2}	0.607***	0.583***	0.298***	0.153*
	(8.833)	(2.939)	(7.312)	(1.803)
Sales Growth	-0.00211	-0.00346	0.0143***	0.0132***
	(-1.099)	(-0.932)	(9.601)	(8.051)
Book Leverage	-0.0112***	-0.0113*	-0.0200***	-0.0217***
	(-2.768)	(-1.816)	(-6.374)	(-6.281)
ROA	-0.125***	-0.184***	0.0579***	0.0647***
	(-11.91)	(-6.937)	(10.22)	(9.005)
Tangible Asset Intensity	0.00251	0.0199***	0.139***	0.144***
	(0.609)	(2.581)	(29.03)	(24.85)
Cash-to-assets	0.0993***	0.0988***	0.00866***	0.00339
	(14.83)	(9.409)	(2.663)	(0.777)
CEO Tenure × 10^{-4}	-0.702	4.01	-0.556	1.18
	(-0.373)	(1.334)	(-0.501)	(0.810)
Kleibergen-Paap rk LM statistic		24.59***		26.61***
Anderson-Rubin Wald F-statistic		6.39***		3.02**
First-stage Cragg-Donald F statistic		19.06		31.06
Hansen J-statistic		0.040		0.503
Hausman test (endogeneity of CEO %incentive pay)		10.31***		4.51**
Economic Significance of CEO % Incentive Pay	0.064 δ	0.334 δ	0.023 δ	0.138 δ
Observations	21,397	21,397	21,255	21,255

Table 7

CEO incentive pay, firm value, and firm risk

We use the 1992-2012 sample of Compustat/CRSP firms with available Execucomp data and 13f institutional holdings, excluding utility and financial firms (SIC codes 4900-4999 and 6000-6999) and firms headquartered outside the United States. Variable definitions are described in Appendix A. Monetary terms are expressed in 2012 dollars. All independent variables are lagged by one year. Column (2) and (4) report second-stage results of instrumental variable regressions, where *CEO % Incentive Pay* is estimated by the average of CEO Local Peer %Incentive Pay, log of median CEO local peer cash pay, and second-stage controls. Economic Significance of *CEO % Incentive Pay* represents the predicted change (measured by the unit of one standard deviation) in the dependent variable in response to a one-standard-deviation increase in the *CEO % Incentive Pay* variable, holding other determinants constant. All regressions include 2-digit SIC industry fixed effects and year fixed effects. Robust t-statistics adjusted for clustering by firm are reported in the parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) M/B OLS	(2) M/B IV	(3) Firm Risk OLS	(4) Firm Risk IV
CEO % Incentive Pay	0.367***	3.139***	0.0134***	0.145***
	(6.075)	(2.714)	(6.916)	(3.744)
ln(Assets)	-0.0670***	-0.210***	-0.0115***	-0.0186***
	(-3.928)	(-3.496)	(-23.03)	(-8.356)
Sales Growth	0.716***	0.605***	0.0215***	0.0126***
	(12.60)	(8.613)	(11.48)	(5.083)
Book Leverage	-1.023***	-1.010***	0.0456***	0.0373***
	(-6.588)	(-6.239)	(10.45)	(7.299)
Institutional Ownership	0.0975	-0.362	-0.0227***	-0.0379***
	(0.989)	(-1.581)	(-8.655)	(-4.609)
CEO Tenure $\times 10^{-2}$	1.25***	1.96***	-0.0332***	-0.0379**
	(2.858)	(3.325)	(-2.771)	(-2.100)
Tangible Asset Intensity	-0.245**	0.0655		
	(-2.077)	(0.385)		
R&D Intensity Indicator	0.320***	0.158*		
	(5.202)	(1.814)		
ROA			-0.136***	-0.135***
			(-20.49)	(-16.99)
Cash Flow Risk			0.133***	0.0814***
			(3.722)	(2.666)
Kleibergen-Paap rk LM statistic		33.94***		32.70***
Anderson-Rubin Wald F-statistic		3.98**		11.19***
First-stage Cragg-Donald F statistic		42.27		41.426
Hansen J-statistic		0.706		1.128
Hausman test (endogeneity of CEO %incentive pay)		5.52**		18.01***
Economic Significance of CEO % Incentive Pay	0.049 δ	0.203 δ	0.056 δ	0.290 δ
Observations	21,397	21,397	21,314	21,314