Executive Labor Market Segmentation:
How Local Market Density Affects Incentives and Performance

by

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ABSTRACT

I study how the density of executive labor markets affects managerial incentives and thereby firm performance. I find that U.S. executive markets are locally segmented rather than nationally integrated, and that the density of a local market provides executives with non-compensation incentives. Empirical results show that in denser labor markets, executives face stronger performance-based dismissal threats as well as better outside opportunities. These incentives result in higher firm performance in denser markets, especially when executives have longer career horizons. Using state-level variation in the enforceability of covenants not to compete, I find that the positive effects of market density on incentive alignment and firm performance are stronger in markets where executives are freer to move. This evidence further supports the argument that local labor market density works as an external incentive alignment mechanism.

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Chapter 1

INTRODUCTION

Recent empirical findings suggest that geographic factors play an important role in managerial compensation schemes. Francis *et al.* (2016) find a positive relation between the size of the city where a firm is headquartered and its Chief Executive Officer's (CEO's) total as well as equity compensation. Bouwman (2013) shows that CEO compensation is highly influenced by the average compensation level of other CEOs in the local area. Yet, little is known about whether geographic factors also affect non-compensation incentives for executives.

Previous literature shows that non-compensation incentives, including dismissal threat and promotion based tournament incentives, are important sources of managerial incentive alignment. For example, Jenter and Lewellen (2014) show a strong relation between firm performance and CEO turnover and indicate that nearly 40% of turnovers are performance induced. Nielsen (2016) finds that dismissed CEOs experience a 40% annual income decline in the five years following turnovers. With respect to tournament incentives, a survey by Graham *et al.* (2005) shows that 75% of executives agree that the desire to meet earnings targets is driven more by upward mobility in labor markets than by short-term compensation schemes. Moreover, both theoretical and empirical studies show that these non-compensation incentives have positive effects on firm performance (Lazear and Rosen, 1981; Kale *et al.*, 2009).

In this paper, I study how one specific geographic characteristic—local labor market density—affects managerial non-compensation incentives. In denser labor markets, executives might face stronger dismissal threat because of local competition, and stronger tournament incentives because of external opportunities. At the same time, market density might reduce executives' incentives by providing more backup options in the event of dismissal. The primary goal of this paper is to test empirically the existence or non-existence of the above channels and examine how market density affects firm performance through managerial incentive alignment.

One condition necessary for local market density to be important is the presence of geographic segmentation in executive labor markets.[1] If executives tend to move within one large national market rather than many small local markets, then all executives will face the same labor market conditions. To examine whether there is geographic segmentation in U.S. executive labor markets, I use a sample of executive job changes covered by the BoardEx database, and regard a job change (i.e., a hiring) within 60 miles as local. If markets were nationally integrated and firms hired executives randomly from a nationwide pool, then on average, local hirings should account for only 5% of the hirings in the sample. However, the data show that the realized local hiring percentage is 34%, indicating a large bias in local hiring and rejecting the nationwide market hypothesis at the 1% level. This local hiring bias remains large and significant even after adjustment for industry clustering.

Based on the evidence of geographic segmentation, I then turn to the main analysis on how local labor market density affects executives' non-compensation incentives, with market density measured as the number of firms within 60 miles of a firm's headquarters. The first channel of managerial incentive alignment tested is performance-based dismissal threat. Since firms tend to hire executives locally, a market with higher density provides firms with more local outside candidates, thereby allowing them to make more credible dismissal threat to their incumbent executives. Consistent with this hypothesis, empirical results show that CEO turnover-performance

[1] The U.S. executive labor markets are commonly viewed as very mobile. Kedia and Rajgopal (2009) write "it is difficult to argue that top executives are geographically immobile" (p. 125). Yet, some recent empirical findings challenge this view. See, for example, Ang *et al.* (2013), Bouwman (2013), Yonker (2016), and Francis *et al.* (2016).

sensitivity is significantly higher in denser labor markets, implying stronger dismissal threat for executives therein. In addition, when replacing incumbent executives, firms in denser markets are more likely to hire outsiders rather than promote insiders. This result offers further support for the argument that convenient access to external candidates is the reason for higher turnover-performance sensitivity in denser markets.

In addition to the threat of dismissal, outside tournament opportunities are another potential source of executives' non-compensation incentives. Since there are more potential outside job advancements in denser markets, there should also exist higher tournament incentives for executives. To capture tournament incentives, I consider both the size of the tournament prize, i.e., the expected compensation increase when an executive moves to another local firm, and the likelihood of tournament, i.e., how often tournaments occur in a local market. Empirically, the results show that both the prize and likelihood of local outside tournaments are significantly higher in denser labor markets. All else equal, an interquartile increase in market density almost triples and doubles the tournament prize and tournament likelihood, respectively.

Both dismissal threat and outside tournament work as channels through which market density improves managerial incentive alignment. However, there also might be a channel of incentive misalignment, if executives in denser markets have more backup options in the event of dismissal. I test this channel with a sample of executives who lost their jobs and examine their subsequent employment outcomes in a three-year window based on news articles. Regression results indicate that dismissed executives in denser markets do not find new jobs more easily, obtain positions with higher compensation, or experience shorter unemployment durations. One possible explanation is that dismissed executives are forced to leave their local markets as reputation spreads locally. I find empirical evidence supporting this explanation.

Compared to executives who change jobs voluntarily, dismissed executives are significantly less likely to find their next job in the local market.

Given that market density improves executive incentive alignment, a natural question is whether density also enhances firm performance. The empirical challenge here is that market density could have an effect on performance through various channels, so a simple positive correlation between these two variables does not suffice. [2] The method I adopt is to interact market density with executives' career horizons. The logic, as argued in Gibbons and Murphy (1992), is that executives with shorter career horizons (i.e., those closer to retirement) should be less responsive to dismissal threats and tournament incentives. Using age as a proxy of career horizon, I find that the coefficient of the interaction term between market density and executive horizon is significantly positive in performance regressions. In other words, the positive effect of market density on firm performance is stronger for firms with younger executives. In terms of economic magnitude, firms with market density in the top quartile and executive age in the bottom quartile have a 0.27 (0.017) higher industry-adjusted Tobin's Q (return on assets) than firms with market density in the bottom quartile and executive age in the top quartile. These results support the argument that executives in denser markets exert more effort in response to stronger non-compensation incentives, thereby leading to higher firm performance.

As the effects of market density on incentive alignment and firm performance hinge on executives' movements within local labor markets, the effects will be weaker if executives cannot move freely. Restrictions on executive local mobility will shrink the local outside candidate pool for the firms, as well as the local outside employer pool for the executives. State-level covenants not to compete are one such restriction

[2] See Marshall (1920), Duranton and Puga (2004), and Rosenthal and Strange (2004) for economic foundations of the effects of geographic clustering on firms.

that prevents a firm's employees from moving to competing firms. Although almost all states have some form of noncompete covenants, the enforceability of the covenants varies widely across states. The variation in the enforceability provides an opportunity to examine the heterogeneous effects of market density with respect to executive mobility. Interacting the density measure with the enforceability measure, I find that the effects of market density on executives' dismissal threat and tournament likelihood are more pronounced in markets with higher executive mobility. A three-way interaction further shows that executive mobility strengthens the career horizon channel through which density improves firm performance.

In addition to the main findings, I perform a set of robustness checks that consider alternative density measures and address potential confounding factors. This entails adjusting each firm count by its employment size, as larger firms provide more job positions, and including local firms in the sample firm's industry only, as executives often change jobs within industry. The main results remain qualitatively unchanged with these alternative density measures. One might be concerned that there exist potential confounding factors correlated with market density, driving the positive effects of density on incentive alignment and firm performance. For example, institutional investors, who reduce information asymmetry, tend to gather in denser markets (Loughran and Schultz, 2005; Boone and White, 2015), and managers with different abilities could self-sort into different locations. To address such concerns, the regressions include institutional ownership and analyst coverage to control for the channel of information dissemination, board independence for monitoring efficiency, and managerial skill for location sorting of managers. The results show no evidence that these factors confound the density results. This is consistent with the main regression results on the heterogeneous effects with respect to executive career horizon and executive mobility, which also suggest a causal relation between density and both incentives and firm outcomes.

This paper relates to several streams of research in the finance literature. First, it contributes to the burgeoning literature on executive market geography. Several recent studies find geographic patterns in executive compensation structures. Bouwman (2013) shows that CEO compensation level is highly correlated with the average level of local peers. Francis *et al.* (2016) and Ang *et al.* (2013) both find that CEOs in denser markets receive higher compensation, and explain the compensation premium as a result of a larger CEO local network and higher CEO social pressure in denser markets, respectively. Although these papers assume implicitly that geographic segmentation exists in executive labor markets, none of them provides a direct test of the segmentation assumption. [3] Moreover, the literature so far mainly focuses on executive compensation while pays little attention to non-compensation incentives. To this extent, this study fills the gap in the literature by documenting the strong geographical segmentation in U.S. executive labor markets and showing the significant effect of market density on managerial non-compensation incentives.

My paper also contributes to the literature on managerial incentives. Besides explicit incentives from compensation contracts (Morck *et al.*, 1988; McConnell and Servaes, 1990; Coles *et al.*, 2012), another source of incentive alignment comes from non-compensation incentives, including rank-order tournaments and performance-based dismissal threat. Theoretical foundations of rank-order tournament are developed by Lazear and Rosen (1981) and Green and Stokey (1983), who show that tournaments can replace performance-based contracts as an incentive mechanism. On the

[3]Yonker (2016) shows that firms are five times more likely to hire CEOs who grew up in the same state as firms' headquarters. Yet, the bias found in Yonker's paper should be considered as "home" hiring bias rather than local hiring bias. Suppose a New York firm hires an executive who grew up in New York and previously worked in Chicago. The hiring is a home hiring but not a local hiring. Therefore, Yonker's finding on home hiring bias is not direct evidence on the geographic segmentation in executive labor markets.

empirical side, Kale *et al.* (2009) and Coles *et al.* (2013) find that both non-CEO executives' tournament incentives from the within-firm pay gap and CEOs' tournament incentives from the within-industry pay gap have positive effects on firm performance. Like promotions, dismissals also generate incentives. Previous studies find a robust negative relation between firm stock performance and executive turnover probability, although the magnitude is modest.[4] Using more relaxed model assumptions, Jenter and Lewellen (2014) reveal a much larger effect of firm performance on CEO turnover than do previous studies and argue that performance-induced dismissal threat is an essential source of incentives. This study contributes to this literature by showing that one important determinant of the strength of both tournament incentives and dismissal threat is local labor market density.

Finally, this research extends the literature on the effects of geographic clustering on firms. Economists have discussed firm location choices and geographic clustering since Marshall (1920). Marshall theorizes three primary benefits for firms locating in clusters: knowledge spillovers, labor market pooling, and input providers pooling. Empirical evidence that support these channels is provided in Glaeser *et al.* (1992), Jaffe *et al.* (1993), Holmes (1999), and Costa and Kahn (2000). On the other hand, Glaeser (1998) and Tabuchi (1998) show that geographic clustering also can have negative effects on firms, including transportation congestion, pollution, and crime. In addition to these economic foundations, geographic clustering also can affect firms for reasons well established in the finance literature, such as merger and acquisition opportunities (Almazan *et al.* (2010)) and shareholder monitoring (John *et al.* (2011)). The study most closely related to my paper is Knyazeva *et al.* (2013). They consider the size of clusters as a proxy for density of outside director pools and find that firms

[4]See, among others, Coughlan and Schmidt (1985), Warner *et al.* (1988), Weisbach (1988), Jensen and Murphy (1990), Denis *et al.* (1997), Huson *et al.* (2001), and Kaplan and Minton (2012).

in denser markets have higher board independence and better performance. My study considers geographic clustering as a measure of executive market density and shows that geographic clustering can affect firm outcomes via executives' non-compensation incentives.

The rest of the paper is organized as follows. Chapter 2 examines geographic segmentation in U.S. executive labor markets. Chapters 3 and 4 discuss the main results related to managerial incentives and firm performance. Chapter 3 studies how local labor market density affects dismissal threat and outside tournament incentives for executives. Chapter 4 investigates whether market density improves firm performance through incentive alignment. Chapter 5 examines heterogeneity with respect to state-level covenants not to compete enforceability. Chapter 6 conducts robustness checks and considers alternative explanations. Chapter 7 concludes.

Chapter 2

GEOGRAPHIC SEGMENTATION IN U.S. EXECUTIVE LABOR MARKETS

In this section, I document geographic segmentation in U.S. executive labor markets using data on executive job changes from BoardEx. To deliver robust results, I calculate local hiring bias for a set of different distance cutoffs and different expected local hiring probability measures. Appendix B provides further subsample analysis.

2.1 Executive Job Changes Sample

I explore individual employment histories covered by the BoardEx database. BoardEx provides comprehensive biographical information on individuals who have ever been listed as either directors or disclosed top earners in large U.S. companies since 2000. Currently, the database covers about 71% of firms in Compustat, representing 95% of market capitalization.[1] For each individual in BoardEx, I order her employment history in a chronological order and record a job change if the employer in year t is different from the employer in year $t+1$. I do not use cases in which there is a year gap between the end of the old job and the start of the new job. I further restrict job changes to those between U.S. public firms because location data on private firms are not readily available. Since larger firms are more likely to search executives nationwide (as shown in Appendix B) presumably because they benefit more from finding

[1] At each report date, an individual's curriculum vitae is constructed based on the most recent publicly disclosed information. I explore the employment history contained in the curriculum vitae. Since the employment history of either directors or top earners mainly contains senior executive roles in various companies, I call directors and top earners both executives when I refer to their employment history. More than 90% of employment records in BoardEx are post-1980s. See, for example, Fracassi and Tate (2012) and Engelberg *et al.* (2013), for detailed description of the BoardEx database.

capable leaders, the local hiring bias documented here based on public firms could be regarded as a lower bound.

To determine whether an executive's job change, or equivalently a firm's job hiring, is local, I calculate the moving distance between an executive's old firm and new firm as follows. I first merge BoardEx with Compustat by linking the International Security Identification Number (ISIN) from BoardEx with the CUSIP from Compustat. For U.S. firms, the ISIN is constructed by adding "US" to the front and a single-digit check code to the end of the regular nine-digit CUSIP number. I then merge the zip code of firm's headquarters from Compustat with the latitude and longitude of each zip code from the Census 2000 U.S. Gazetteer.[2] Finally, the moving distance is calculated as the zip code distance between the old firm's and the new firm's headquarters based on the Vincenty formula.[3] Applying the above procedure, I obtain an analysis sample consisting of 19,692 executive job changes from 16,277 unique executives and 3,743 unique hiring firms.

2.2 Local Hiring Bias

Following the literature (e.g., Knyazeva *et al.*, 2013; Bouwman, 2013), I define a firm's local area as the area within a 60-mile radius of the firm's headquarters. I consider 100-mile and 250-mile radii as alternative cutoff values. I calculate local hiring bias as the difference between the realized local hiring percentage (N_L/N)

[2]Compustat reports the current headquarters location of firms. Knyazeva *et al.* (2013) show that the overwhelming majority of firms do not relocate. Even for firms that relocate, most of them remain within 60 miles of their previous location. I also implicitly assume that all executives holding senior positions work at firm's headquarters.

[3]The Vincenty formula is often used in measuring distances in the finance literature (see, for example, Pool *et al.*, 2015). It calculates the distance between two points on the surface of a spheroid. The distance in miles between two zip code areas with latitude/longitude (φ_i, λ_i) is calculated as

$$3963.19 \times arctan(\frac{\sqrt{(cos\varphi_2 sin(\lambda_2-\lambda_1))^2 + (cos\varphi_1 sin\varphi_2 - sin\varphi_1 cos\varphi_2 cos(\lambda_2-\lambda_1))^2}}{sin\varphi_1 sin\varphi_2 + cos\varphi_1 cos\varphi_2 cos(\lambda_2-\lambda_1)})$$

and the expected local hiring percentage under the null hypothesis of a nationwide executive market ($\sum_{i=1}^{N} p_i/N$), where N is the total number of hiring events in my sample, N_L is the number of actual local hirings, and p_i is the probability of hiring a local executive for hiring event i under the null hypothesis.

To calculate local hiring bias, I propose several methods to estimate p_i. The first and the most straightforward measure (p_{1i}) is the number of local firms of event firm i divided by the number of firms nationwide. [4] However, this simple ratio measure does not take into account that large firms provide more executives to local labor market than small firms. Thus, in the second measure (p_{2i}) I adjust each firm count, in both the numerator and the denominator, with the firm's employment size.

One concern with local hiring bias calculated using either of the above two measures of p_i is that the bias might actually be driven by a firm's tendency to hire industry insiders rather than locals. [5] Consider Google in Silicon Valley as an example. Suppose, at the extreme, that Google only hires executives from its own industry. Since many of the high-technology firms in the U.S. are located in Silicon Valley, one would observe a high realized percentage of local hiring for Google. To separate the industry bias from the local bias, I calculate a third measure (p_{3i}) using the number of local firms within the same industry as the event firm divided by the total number of firms in that industry nationwide, where industry is classified based on two-digit SIC codes. Under this measure, if Google tends to hire only industry insiders (who happen to be local) but not nonindustry locals, the expected local hiring percentage p_{3i} will account for the industry clustering effect and the local hiring bias will be zero. Finally, the fourth measure (p_{4i}) adjusts the third measure by firm employment size as done for the second measure. To the extent that firms hire executives both within

[4]Throughout the paper, the number of firms is calculated based on firms in the Compustat universe.

[5]Based on my sample, 48.3% of job changes are within the same two-digit SIC industry.

and outside of the industry, the local hiring bias estimated using p_i from the first two (cross-industry) and last two (within-industry) measures could be regarded as upper and lower bounds of the true bias.

Table 2.1 presents the results on the local hiring bias. Column (1) and column (2) list the total number of hiring events N and the number of realized local hirings N_L, respectively. Column (3) shows the realized local hiring percentage, which is calculated as column (2) divided by column (1). Columns (4) and (5) show the total number of expected local hiring and the expected local hiring percentage under the null hypothesis of a nationwide market. Finally, column (6) calculates the local hiring bias as the difference between column (3) and column (5).

In Panel A, I calculate the local hiring bias using the size and industry unadjusted measure, p_{1i}. As shown in the first row, out of 19,692 job hirings, 34% are within the local market (moving distance less than 60 miles). However, if the executive labor market were nationally integrated, the expected local hiring percentage would be around 5%. The difference between the realized and the expected local hiring percentages yields a local hiring bias of 29 percentage points. In other words, firms hire local executives seven times more often than they would if the market were nationally integrated. In the next two rows, I use 100-mile and 250-mile as alternative cutoffs to define a local area. The magnitude of the local hiring bias remains substantial and is around 29 to 31 percentage points. One thing worth noticing is that for hirings with distance between 60-100 and 100-250 miles, the number of actual hirings are close to the numbers of expected hirings. It suggests that the local hiring bias is mostly driven by the hirings within 60 miles of the firm's headquarters. This could further imply that the 60-mile cutoff might be a reasonable one for defining local. In Panel B, I replace the unadjusted expected local hiring measure p_{1i} with the size-adjusted measure p_{2i}. As shown in the last column, the bias continues to exist and becomes even larger.

To address the concern that the local hiring bias is driven by industry clustering, I use the third and fourth measures of p_i in Panels C and D. Consistent with the fact that firms within the same industry often cluster geographically, the numbers of expected local hirings in Panels C and D are almost twice as large as the numbers in Panels A and B. The local hiring bias, however, is still substantially larger than zero in all rows in Panels C and D.

In addition to the economic magnitude, I also compute statistical significance using a two-sided binomial test where a local hiring is considered as a success. Formally, for the binomial test, the number of trials is N, the number of successes is N_L, and the probability of success is the average of p_i ($\sum_{i=1}^{N} p_i/N$). The test results reject the null hypothesis that the executive labor market is nationally integrated for all distance and p_i measures at the 1% level. Overall, the results in Table 2.1 provide clear evidence on geographic segmentation in U.S. executive labor markets. The local (60-mile) hiring bias is between 25 to 31 percentage points, and firms are four to ten times more likely to hire locally than expected if market were integrated.

There are two things worth noting about the local hiring bias. First, I obtain almost same results if I calculate executives' local moving bias instead of firms' local hiring bias. The average actual local moving probability is four to ten times higher than the average expected local moving probability, where the expected probability is calculated as the (size/industry adjusted) number of local firms of an executive's old employer divided by the (size/industry adjusted) number of firms nationwide. Second, in Appendix B, I conduct a set of subsample analyses and explore potential reasons for the geographic segmentation. I find evidence that the segmentation is caused both by firms' and executives' geographic preferences. Yet, the paper's main analyses on how local market density affects executives' labor market incentives do not depend on what is the driving force of the segmentation. It only requires that firms know that they are likely to end up with hiring local executives, and executives know that they are likely to end up with moving to local firms.

Table 2.1: Local Hiring Bias

Notes: The table presents the results on local hiring bias based on a sample of 19,692 executive job changes between the U.S. public firms covered by the BoardEx database. Column (1) reports the total number of hirings. Column (2) reports the number of realized local hirings. A hiring is considered as local if the distance between the headquarters of executive's new and old firms is less than 60 (100/250) miles. Column (3) shows the realized local hiring percentage, which is calculated as column (2) divided by column (1). Column (4) shows the number of expected local hirings based on the null hypothesis that the U.S. executive market is nationwide. Column (5) shows the expected local hiring percentage, which is calculated as column (4) divided by column (1). Column (6) shows the local hiring bias, which is calculated as column (3) minus column (5). Panel A shows the results with p_{1i} as the measure of expected local hiring probability. p_{1i} is calculated as the number of local firms of the event firm i divided by the number of firms nationwide. Panel B uses p_{2i} as the measure, which adjusts each firm count in p_{1i} by firm employment size. Panel C uses p_{3i} as the measure, which is calculated as the number of local firms within the same two-digit SIC industry as the event firm divided by the number of firms of that industry nationwide. Panel D uses p_{4i} as the measure, which adjusts each firm count in p_{3i} by firm employment size. A two-sided binomial test is used to test the null hypothesis that the U.S. executive market is nationwide. The null hypothesis is rejected in each row of the table at the 1% level. For brevity, significance indicators are omitted.

	Hiring # (1)	Local # (2)	Local % (3)	Exp # (4)	Exp % (5)	Bias (pp) (6)
Panel A: p_{1i} (size unadjusted, industry unadjusted)						
60 miles	19692	6713	34.1	1053	5.3	28.7
100 miles	19692	7123	36.2	1344	6.8	29.3
250 miles	19692	8664	44.0	2628	13.3	30.7
Panel B: p_{2i} (size adjusted, industry unadjusted)						
60 miles	19692	6713	34.1	668	3.4	30.7
100 miles	19692	7123	36.2	860	4.4	31.8
250 miles	19692	8664	44.0	1762	8.9	35.0
Panel C: p_{3i} (size unadjusted, industry adjusted)						
60 miles	19692	6713	34.1	1884	9.6	24.5
100 miles	19692	7123	36.2	2260	11.5	24.7
250 miles	19692	8664	44.0	4030	20.5	23.5
Panel D: p_{4i} (size adjusted, industry adjusted)						
60 miles	19692	6713	34.1	1780	9.0	25.1
100 miles	19692	7123	36.2	2055	10.4	25.7
250 miles	19692	8664	44.0	3648	18.5	25.5

Chapter 3

LOCAL MARKET DENSITY AND MANAGERIAL INCENTIVE ALIGNMENT

If firms often hire locally and executives often move locally, then the density of local labor market could affect executives' non-compensation incentives. In this section, I focus on three sources of (dis)incentives: dismissal threat, outside tournament incentives, and new employment after dismissal.

3.1 Summary Statistics for Sample Firms

The analyses of managerial incentives in the following sections are based on a sample consisting of firms with available Execucomp, Compustat, Center for Research in Security Prices (CRSP) and Institutional Shareholder Services (ISS) data from 1996 to 2013. I use the Execucomp database to identify CEO turnovers, and for information on executive characteristics including age, compensation, tenure, etc. All firm level accounting data come from Compustat and all stock data come from CRSP. I also use the ISS database for information on board characteristics and corporate governance.

The key explanatory variable is the density of executive labor market in a firm's vicinity. Since local hiring bias is most substantial in the 60-mile area around hiring firm's headquarters (Table 2.1), I use 60-mile as the cutoff to define local area. I use two main measures of local executive market density. *Local market density 1* is the total number of firms within a 60-mile radius of the sample firm. *Local market density 2* adjusts each firm count in the local area with firm's employment size. Knyazeva *et al.* (2013) use similar measures to characterize the availability of prospective directors near a firm. In robustness checks in Chapter 6.1, I consider two other measures of density assuming that firms only hire industry insiders.

The summary statistics of the main variables are presented in Table 3.1. The sample contains 28,603 firm-year observations and 2,789 unique firms. On average, a local executive market consists of executives from 371 local firms. To address the skewness of the density measures and to mitigate the effect of extreme values on regression results, I measure density in logarithm in all regressions. Panel A also reports other common characteristics of sample firms. Firms on average have total assets of $6.06 billion and annual sales of $3.32 billion. All dollar values are stated in 2000 U.S. dollars deflated or inflated by the Consumer Price Index (CPI). The mean annual stock return, sales growth and return on assets (ROA) are 19%, 14% and 12%, respectively. Executive characteristics are shown in Panel B. A typical CEO is at the age of 56, has been at the helm for five years, and owns 3% of firm's stock. When the top management team is considered, the average age drops to 51 and the average stock ownership drops to 1%. Table A.1 in the Appendix A gives a detailed description of variables used in the paper.

3.2 Performance-Based Dismissal Threat

Since firms usually hire executives locally rather than nationally, firms in denser labor markets should have more outside candidates to choose from. As shown in Parrino (1997), convenient access to outside candidates encourages a firm to replace its incumbent executives with outsiders when an executive's performance turns out to be low.

3.2.1 Turnover-Performance Sensitivity

To show that market density raises dismissal threat for local executives, I use forced CEO turnovers and investigate turnover-performance sensitivity.

For all CEO turnovers in the Execucomp database, I search news reports on Factiva and classify a turnover as forced (e.g. Parrino, 1997) if (i) the report says that the CEO is fired, forced out, or departs due to policy differences; or (ii) the departing CEO is under age of 60, does not announce the retirement at least six months in advance, and does not leave for health reasons or acceptance of another position. Following the literature on CEO turnover, I use industry-adjusted stock return as the performance measure. To capture other causes of CEO departures, I control for CEO age, CEO duality, CEO tenure, CEO ownership, board size, board independence, E-index, firm size, and firm age. I use logit models for all regressions, include industry and year fixed effects, and report coefficients with robust standard errors clustered at firm level.

Table 3.2 shows the results. The dependent variable in columns (1) to (3) is a CEO turnover dummy, which is set to one if the CEO is replaced in the subsequent year. In column (1), I look at turnover-performance sensitivity without interacting performance and density. Since a firm is more likely to replace its CEO when its performance declines but might keep the CEO as long as the performance meets some threshold, I decompose performance into a positive performance variable and a negative performance variable to examine the asymmetry in turnover-performance sensitivity. [1] The negative performance variable is equal to the industry-adjusted return, if the industry-adjusted return is negative, and zero otherwise. The positive performance variable is defined accordingly. Consistent with previous studies, the results in column (1) show that performance is negatively related to the probability of CEO turnovers for firms with below-industry performance, while this negative relation is not significant for firms with above-industry performance.

[1] Jenter and Lewellen (2014) empirically show that the effects of performance on turnover is nonlinear. Also see Hermalin and Weisbach (1998) and Adams and Ferreira (2007).

Columns (2) to (3) test my hypothesis that turnover-performance sensitivity increases with local executive market density. In column (2), I use *Local market density 1* as the density measure and interact it with both negative and positive performance. As there is no significant relation between performance and CEO turnover for firms with return above industry median, the coefficient on the interaction term between density and positive performance is not different from zero. On the other hand, the coefficient on the interaction between density and negative performance is significantly negative. [2] Following Ai and Norton (2003) and Norton *et al.* (2004), I find that the average interaction effect is -0.005 with a z-statistic of -2.29, which is significant at the 5% level. [3] Therefore, for firms with below-industry performance, CEO turnover-performance sensitivity rises as the density of local executive market rises. This result is consistent with my hypothesis that firms located in denser markets have more convenient access to outside candidates and thus dismiss poor performing CEOs more frequently. In terms of economic magnitude, a 20 percentage point decrease in annual stock return from industry median increases the probability of a CEO turnover by 92% for firms with top-quartile density but by only 69% for firms with bottom-quartile density. In addition to its effect on turnover-performance sensitivity, market density also affects the probability of turnover directly. The positive coefficient on density itself plus the negative coefficient on the interaction between negative performance and density imply that firms in denser labor markets have higher CEO forced turnover rate. In column (3), I use *Local market density 2* as an alternative density measure and find statistically and economically similar results.

[2] Similar results are obtained if I split the sample into firms with positive performance and firms with negative performance and estimate the coefficients separately.

[3] I also estimate the effect of market density on turnover-performance sensitivity using a linear probability model. The coefficient on the interaction term is -0.006 and is statistically significant at the 5% level.

Overall, the results in Table 3.2 show that an increase in local labor market density is associated with a significant increase in CEO's turnover-performance sensitivity. This performance-induced dismissal threat could be an important source of incentives for CEOs and presumably all top executives.

3.2.2 Outside Succession

If market density encourages firms to replace poor performing executives by providing local outside candidates, outside succession should be more frequently observed in denser markets. Therefore, I next investigate the relation between market density and outside succession rate as further evidence on the dismissal threat argument.

I use both CEO and non-CEO hirings covered in the Execucomp database. I record a CEO hiring if there is a change in a firm's CEO position and record a non-CEO hiring if an executive appears in a firm's annual proxy for the first time. An executive is classified as an outsider if she has been with the firm for less than one year before taking her CEO or non-CEO position. [4] For CEO hirings, I control for whether the departure of former CEO is forced, since successor choice is strongly related to the reason of turnover (Parrino, 1997). Among 2,456 departing CEOs with available data, 31% are succeeded by outsiders. For 14,943 non-CEO observations, 25% are outside hirings.

Table 3.3 column (1) shows the relation between local labor market density and outside CEO succession probability based on a logit model, where the dependent variable is an outside succession indicator. The coefficient of *Local market density 1* is positive and significant at the 1% level. An interquartile increase in market

[4] For CEOs, I search news articles to collect the start date of being CEO and the date of joining the company. For non-CEO executives, I assume the start date of taking the position as the start date of the fiscal year when the executive is first reported in the firm's annual proxy and use the joining date from Execucomp. Non-CEO executives with missing joining date are coded as insiders. Observations in the year when a firm first appears in Execucomp are excluded.

density raises the probability of firm choosing an outside CEO by about 5.1 percentage points, which is a 17% increase compared to the average outsider rate. In line with the findings from previous studies, forced turnovers are often associated with outside successions. Column (2) shows similar results using *Local market density 2* as an alternative density measure. In columns (3) and (4), I use the sample of non-CEO hirings. The coefficient of market density is still significantly positive, though the marginal effect slightly decreases. These results reinforce the argument behind Table 3.2 that executives in denser markets face stronger dismissal threat because firms have more convenient access to outside replacements.[5]

3.3 Outside Tournament Incentives

In addition to internal dismissal threat, external tournament incentive is another source of non-compensation incentives. In this section, I consider two parts of the tournament incentives, the size of tournament prize and the likelihood of tournaments, and examine how local market density affects both of them.[6]

3.3.1 Tournament Prize

The compensation gap between an executive's old job and the potential new job is usually considered as the prize of a tournament. To the extent that there are more large firms in denser markets and firms size distribution is more skewed to the

[5]One might be concerned that the high probability of hiring outsiders for firms in denser markets could reduce incentives of internal promotion for executives. Yet, for CEOs, since they do not have internal promotion incentives at all, they should not be affected. For non-CEOs, although the probability of being promoted as an insider in any given turnover event is lower in denser markets (Table 3.3), the frequency of turnover is higher (Table 3.2).

[6]Consider a simple model where n risk neutral executives compete for v ($v < n$) job vacancies. Executives choose discretely whether to exert efforts or not, with the cost of effort being d. Jobs are randomly assigned to executives who choose to exert effort. The compensation increase is g for those executives who obtain the new job. In a symmetric mixed strategy Nash equilibrium, the probability of an executive exerting effort is $p = g \cdot \frac{v}{n} \cdot \frac{1}{d}$, where g represents the tournament prize and $\frac{v}{n}$ represents the tournament likelihood.

right, I expect market density to be positively correlated with the size of local pay gap. Empirically, I measure each firm's pay gap as the the difference between its compensation and the compensation of the local 90th percentile firm, where firm compensation is measured as either the mean compensation of its top five earners, or CEO compensation, or mean compensation of non-CEO top executives. For firms with compensation level higher than the local 90th percentile, compensation gap is coded as zero. I use the local 90th percentile rather than the local top to alleviate the impact of outlier compensation caused by unusual and transitory events. I use total compensation (TDC1) and cash compensation (salary plus bonus) as two compensation measures.[7] Cash compensation can be viewed as a more conservative measure, since total compensation is mainly comprised of stocks and options that might not be received by the new executive winning the tournament. Logarithm of compensation gap is used in regressions, so the results reflect the compensation increase relative to current compensation level.

Table 3.4 presents the regression results of local compensation gap on local market density. To control for factors that affect a firm's compensation level and thus the pay gap, I add a set of firm and executive characteristics as control variables in regressions. Column (1) uses mean total compensation of top five earners in the calculation of pay gap. The coefficient of market density is significantly positive at the 1% level, indicating that compensation gap is larger in denser markets. The coefficients of control variables also show the expected signs. For instance, since firm's stock performance and size are positively related to firm's own compensation level, they are negatively related to pay gap. In column (2), the coefficient of density remains significantly positive when I use salary plus bonus as a more conservative

[7] The empirical results remain quantitatively similar if I use estimated total compensation based on method in Coles *et al.* (2014) to accommodate the changes in compensation data reporting in Execucomp after fiscal year 2005 due to the passage of FAS 123R.

measure of compensation. As for magnitude, local compensation gap goes down by almost two-thirds when there is an interquartile decrease in market density, all else being equal. In columns (3) and (4), compensation gaps are calculated using CEO total compensation and mean non-CEO total compensation, respectively. The coefficients of local market density are still significantly positive and are in similar magnitude as the coefficient in column (1). Finally, in columns (5) and (6), I replicate the results in columns (1) and (2) using *Local market density 2* as an alternative measure of market density. The results remain almost unchanged.

The results in Table 3.4 should be viewed as the effects of market density on expected compensation increase, because executives might not move to the local 90th percentile firm in a tournament. Therefore, I also examine how realized compensation increase varies with market density. Based on an Execucomp sample (described in the next subsection) where local job promotions are observed and compensation data are available, I find that the mean realized compensation increase is $1.72 million for executives in markets with top-quartile density, but only $0.57 million for executives in markets with bottom-quartile density. This confirms the findings in Table 3.4 that tournament prize is larger in denser markets.

3.3.2 Tournament Likelihood

The strength of tournament incentives depends not only on the size of the tournament prize but also on the likelihood of tournaments. Kale *et al.* (2009) and Coles *et al.* (2013) both find empirical evidence that the incentive from tournament prize is stronger when the likelihood of tournament is higher. In this subsection, I examine how tournament likelihood varies with local market density.

Executives in denser labor markets should have more local outside opportunities because there are more local firms, and each firm has higher frequency of replacing its incumbent executive with an outsider (as shown in Tables 3.2 and 3.3). On the flip side, these executives also face more competition from their local peers. To empirically test the relation between market density and outside tournament likelihood, I use realized executive job changes covered by the Execucomp database. For each firm-year in Execucomp, I count the number of local tournaments won by executives of that firm in that year.[8] I record a local tournament if (i) an executive's employer (in Execucomp) in year t is different from her employer (in Execucomp) in year $t+1$, (ii) the moving distance is less than 60 miles, and (iii) the new job's compensation (TDC1 deflated by CPI) is higher than the old one's. For a small sample of observations in which executive compensation is not available, I compare total assets of the new firm and total assets of the old firm since firm size is highly correlated with executive compensation (Murphy (1999)).[9] I obtain 1177 tournaments for the analysis sample and 385 are local, which yields an average of 0.016 local tournaments in each firm year. The low realized local promotion probability does not necessarily mean that the local tournament incentives are small. As argued in Coles *et al.* (2013), executives with external opportunities can put pressure on their current firms and require compensation increase, so they can extract benefits of external opportunities without switching firms.

Regression results are presented in Table 3.5. The dependent variable is the number of local promotions in each firm-year observation. In columns (1) and (2), I find that the coefficients of *Local market density 1* and *Local market density 2* are significantly positive, indicating that there are more local tournaments in denser labor markets. Based on column (1), an interquartile increase in density raises the

[8] I only consider top-five executives to deal with the concern that the number of tournaments is affected by the number of executives reported in annual proxies.

[9] The empirical results do not change if I include as tournament cases in which a non-CEO executive becomes a CEO in the new firm but does not experience a compensation increase. These cases account for less than 2% of job changes.

number of local outside tournaments by 0.011. As the sample unconditional mean is 0.016, executives in the market of top quartile density have an almost doubled outside tournament likelihood than executives in the market of bottom quartile density. A more accurate way to measure tournament likelihood as part of tournament incentive is promotion-performance sensitivity, rather than the number of promotions. Yet, compared to turnover-performance relation, promotion-performance relation is more noisy in the data and requires a longer window for performance measure (Fee and Hadlock (2003)). In column (3), I use three-year cumulative return as performance measure and find a marginally significant positive relation between local promotion and performance. In column (4), I interact local market density with performance and find a positive coefficient of the interaction term, significant at the 10% level. Overall, the results in Tables 3.4 and 3.5 suggest that market density is positively associated with both local tournament prize and local tournament likelihood, and hence local tournament incentive.

3.4 Subsequent Employment after Dismissal

So far, the results through Table 3.2 to Table 3.5 show that market density creates non-compensation incentives for executives through two channels: performance-based dismissal threat and outside tournament incentives. In this section, I examine whether market density could also reduce incentives by offering executives more backup options in the event of dismissal. To empirically test this disincentive channel, I examine subsequent employment outcomes of executives losing their jobs.

3.4.1 Sample Construction

I construct a sample of dismissed executives with a procedure closely following Fee and Hadlock (2004). I start the sample with executives under the age of 55, who are listed in an S&P 500 firm's proxy statement in one fiscal year but not in that firm's or any other Execucomp firms' statements in the subsequent year (i.e., "leaving" the firm). I restrict the sample to S&P 500 firms because the press coverage is more comprehensive on these firms than on others. I also restrict the sample period to 2000-2010 for the same practical reason. I exclude executives "leaving" their firms at the age beyond 55 because these "leavings" are likely to be driven by retirement. This procedure yields an initial sample consisting of 1,358 "leaving" executives. For each of these executives, I search on Factiva for news articles that contain both the executive's name and the prior employer's name, and collect information on the executive's departure and employments in the following three years.[10] Among the 1,358 cases, I exclude 288 cases in which news articles show that these executives actually remain in the firm even though they are no longer listed in the proxy statement. I also exclude all cases in which the executive leaves the employer due to health reasons (seven cases), death (five), acceptance of a new position (113), or asset spinoffs (12). The remaining cases form the dismissed executive sample. There are 336 cases in which no news is found on either the executive's departure from the old employer or on the executive joining a new employer. For cases (597) in which some news regarding the executive's employment history is reported, I define the executive's new employer to be the firm where the individual is hired as a full-time executive for the first time after leaving her prior employer. I also measure the unemployment duration of an executive who has changed job using the date of departure from her old job and the date of start at her new job, as reported in news articles.[11] Finally, I assign

[10]As noted in Fee and Hadlock (2004), it is not practical to search news articles just using the executive's name without the employer's name. Also, by comparing the results from news searching and the results from annual Compact Disclosure Compact D database, the authors find that their news searching procedure is sufficient to determine the executive's employment history.

[11]For a small number of cases in which there is news on an executive's joining the new firm but no news on her leaving the old firm, I assume that the executive leaves the firm at the end of the last fiscal year where she appears in the firm's annual proxy.

each executive's reason of departure into forced departure, pursing other interests, retirement, or resignation, based on the definition in Fee and Hadlock (2004).[12]

For my sample of dismissed executives, the rate of new employment in the subsequent three years is 32%. This number is close to the findings in Fee and Hadlock (2004), where they document that 26.8% (38.9%) of executives under the age of 60 (50) find new employment. This low rate indicates that in general leaving a firm involuntarily is a downturn in an executive's career. To provide further information on the subsequent employment outcome of a departing executive, I also assess the quality of the new position. Since it is difficult to obtain data on executive's compensation, I use firm's size as a proxy for the job's quality. Among all new firms that executives join, only two-thirds (63.3%) are publicly traded firms. Moreover, for new firms with data on total assets available, the median ratio of new firm size to old firm size is merely 0.14. Overall, the low new employment rate and the decline in job quality suggest that most of the leavings covered in the sample are career downturns for executives and could be regarded as dismissals, which suits my goal of studying whether market density provides backup options for dismissed executives.

3.4.2 Empirical Results

Table 3.6 provides the regression results on whether local market density helps dismissed executives find new jobs. I include the reasons for departure as controls with resignation being the omitted group. I also include a dummy stating whether the executive holds a CEO position previously, the executive's previous compensation

[12] A departure is classified as forced if the article reporting the turnover uses words such as "oust", "fired", "terminated" or overtly links the turnover with poor performance or scandal, or if the leaving executive is paid with severance. A departure is classified as pursuing other interests if news report says the executive leaves "to pursue other interests". A departure is classified as retirement if news report says the executive decides to retire from the firm. All other departures are classified as resignation. There are 89 cases of forced departure, 98 cases of pursuing other interests, 176 cases of retirement, and 234 cases of resignation.

level, and some characteristics of her previous employer. Column (1) shows the result for the sample including cases in which no news report on departure or hiring is found. The dependent variable is a new employment dummy, which equals one if a dismissed executive finds a new job within three years and zero otherwise. The coefficient of *Local market density 1* is slightly negative but not significant at any conventional level, indicating that dismissed executives in denser markets do not find new jobs more easily. In columns (2) and (3), I exclude cases in which no news is found and use *Local market density 1* and *Local market density 2* as different measures of density. The results resemble the finding in column (1). Columns (4) and (5) address the concern that although market density does not increase the probability of obtaining a new job, it might affect the quality of the new position. The dependent variable in column (4) is a public firm dummy which equals one only if the new position that an executive obtains is in a public firm. In column (5), I scale each new position in public firms with its quality, calculated as the ratio of new firm size to old firm size, and estimate the effect of market density with a tobit model. The coefficients in both columns (4) and (5) are insignificant, indicating dismissed executives in denser market do not find higher quality new jobs. Finally, column (6) examines whether the length of unemployment varies with market density. The tobit result suggests that it takes even more time for an executive in denser markets to find a new job after being dismissed from the previous firm. In sum, Table 3.6 provides empirical evidence against the concern that local market density disincentivizes executives by offering more backup options.

One explanation for the "non-effect" result is that dismissed executives often have to leave their local markets in order to find a new job, probably because executive reputation spreads locally. If this argument is true, a dismissed executive will be less likely to find the next job in her local market as compared to an executive who changes job voluntarily. The empirical evidence in Table 3.7 supports this argument. For dismissed executives who have found new jobs in the three-year window, I obtain location of the new employer from Compustat, and compute the moving distance from the old to the new employer. [13] This procedure yields 105 observations with available data on moving distance. Following the method in Chapter 2, I use the four measures of expected local hiring probability and the three distance cutoffs. As shown in Panel A, among the 105 new jobs obtained by dismissed executives, only 21 new jobs are located within 60 miles of the old job. Although this 20% (21/105) realized local hiring percentage is still significantly above the expected percentage under a nationwide market hypothesis, the local hiring bias (14.9 percentage points, with p_{1i} used) is only about half of the magnitude compared to the bias documented in the non-dismissed sample in Chapter 2 (19,692 job changes covered by BoardEx). To the extant that the dismissed sample might contain some voluntary job changes and the non-dismissed sample might contain some involuntary job changes, the true difference in local hiring probability between dismissed and non-dismissed executives would be even larger.

To provide statistical significance, I conduct a two-sample t-test in Panel B. The local hiring bias in the dismissed sample is lower than the bias in the non-dismissed sample for all expected local hiring probability measures and distance cutoffs. The difference is statistically significant at the 1% level for all rows except the last one which is significant at the 10% level. In unreported results, I also consider the sample consisting of forced executive turnovers only. If the executive reputation argument is true, the probability of obtaining a new job locally should be even lower for executives who lose their previous jobs with a public announcement of being fired. Of all 14

[13] I only consider new employers covered by Compustat here, because in Panel B of Table 3.7, I compare the local hiring bias between the dismissed sample and the non-dismissed sample studied in Chapter 2. The non-dismissed sample includes only job moves between Compustat firms.

forced turnovers, only two executives found a new job locally (60-mile). This 14% (2/14) local percentage is lower than the 20% (21/105) where the full dismissed sample is considered, although the difference is not statistically significant due to the small number of observations.

In sum, the results in Tables 3.6 and 3.7 suggest that local labor market density does not help dismissed executives find a new job more easily because dismissed executives often have to leave their local markets after dismissals.

Table 3.1: Summary Statistics

Notes: The table reports the summary statistics for a sample of Execucomp/Compustat/CRSP/ISS firms with available data from 1996 to 2013. *Local market density 1* is the total number of firms within 60 miles of the firm's headquarters. *Local market density 2* is the total number of firms, each scaled by employment size, within 60 miles of the firm's headquarters. *Market-to-book ratio* is the ratio of market value of assets to book value of assets. *Stock return* is calculated as the cumulative return 12 months before the current fiscal year end. *ROA* is the ratio of operating income to book value of assets. *Average age, average tenure, average ownership* are the average characteristics of executives covered by Execucomp for each firm-year observation. *Local pay gap (TDC1)* is the 90th percentile of local (60 miles) firm compensation minus the sample firm compensation and zero if the difference is negative, where firm compensation is calculated as the mean total compensation (Top5, TDC1) of top-five earners. All dollar values are stated in 2000 dollars deflated or inflated by the Consumer Price Index. See Table A.1 for definition of variables. All variables are winsorized at the 1st and 99th percentile levels.

	Mean (1)	Median (2)	Std. Dev (3)	P25 (4)	P75 (5)
Panel A: Firm characteristics					
Local market density 1 (number)	371.08	273.00	375.78	69.00	534.00
Local market density 1 (logarithm)	5.20	5.61	1.44	4.25	6.28
Local market density 2 (number)	255.02	165.16	272.98	60.56	331.83
Local market density 2 (logarithm)	4.81	5.11	1.50	4.12	5.81
Total assets, $ B 2000	6.06	1.49	11.08	0.50	5.25
Sales, $ B 2000	3.32	1.07	5.30	0.40	3.33
Market value, $ B 2000	4.11	1.31	6.50	0.51	4.03
Market-to-book ratio	1.97	1.45	2.10	1.10	2.14
Stock return	0.19	0.11	0.70	-0.13	0.37
Sale growth	0.14	0.08	0.84	-0.01	0.19
ROA	0.12	0.12	0.13	0.07	0.18
Firm age	25.17	20.00	16.62	11.00	39.00
R&D intensity (%)	3.32	0.00	7.46	0.00	3.34
Board size	9.28	9.00	2.75	7.00	11.00
Board independence	0.69	0.71	0.17	0.60	0.83
E-Index	2.30	2.00	1.34	1.00	3.00
Panel B: Executive characteristics					
CEO age	55.67	56.00	7.48	51.00	60.00
CEO tenure	5.01	4.00	3.59	2.00	7.00
CEO ownership (%)	3.29	0.90	7.22	0.27	2.71
CEO chairman (%)	40.46				
Forced CEO turnover (%)	2.50				
Average executive age	50.82	51.00	5.03	47.60	54.00
Average executive tenure	4.80	4.40	2.28	3.25	6.00
Average executive ownership (%)	0.85	0.33	1.38	0.09	0.99
Local pay gap (TDC1), $ M 2000	2.79	2.56	2.31	1.04	3.94
Local pay gap (TDC1), logarithm	6.78	7.97	2.92	7.07	8.41
Observations	28603				
Unique firms	2789				

Table 3.2: Local Market Density and CEO Turnover-Performance Sensitivity

Notes: The table reports the coefficients from logit models of CEO turnover-performance sensitivity on local market density. The sample consists of firms with available data from 1996 to 2013. The dependent variable is a forced CEO turnover dummy, which equals one if CEO is forced to leave the firm in the next year and zero otherwise. Following Parrino (1997), a turnover is classified as forced if (i) the report says that the CEO is fired, forced out, or departs due to policy differences; or (ii) the departing CEO is under age of 60, does not announce the retirement at least six months in advance, and does not leave for health reasons or acceptance of another position. Performance is measured as the cumulative stock return 12 months before current fiscal year end minus the contemporaneous median industry return (two-digit SIC). *Negative performance* is equal to the industry-adjusted return if the industry-adjusted return is negative and zero otherwise. *Positive performance* is defined accordingly. *Local market density 1* is the logarithm of one plus total number of firms within 60 miles of the firm's headquarters. *Local market density 2* is the logarithm of one plus total number of firms, each scaled by employment size, within 60 miles of the firm's headquarters. *Industry return* is the median of industry stock returns. All CEO characteristics refer to the outgoing CEO. See Appendix for definition of other variables. Industry (two-digit SIC) and year fixed effects are included in all specifications. Standard errors reported in the parentheses are robust and clustered by firm. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Forced turnover		
	(1)	(2)	(3)
Negative performance	-3.0719***	-1.7001**	-1.6276**
	(0.2283)	(0.7274)	(0.7271)
Positive performance	-0.4189	-0.3863	-0.3969
	(0.2835)	(0.9009)	(0.8631)
Local market density 1		0.1283***	
		(0.0330)	
Negative performance × Local market density 1		-0.2454**	
		(0.1218)	
Positive performance × Local market density 1		-0.0091	
		(0.1648)	
Local market density 2			0.1386***
			(0.0349)
Negative performance × Local market density 2			-0.2619**
			(0.1232)
Positive performance × Local market density 2			-0.0072
			(0.1613)
Industry return	-1.4098***	-1.4093***	-1.4138***
	(0.3065)	(0.3140)	(0.3143)
Firm size	0.0284	0.0058	0.0057
	(0.0392)	(0.0375)	(0.0375)
Firm age	0.0023	0.0037	0.0036
	(0.0033)	(0.0032)	(0.0032)
CEO age	-0.0286***	-0.0294***	-0.0295***
	(0.0070)	(0.0069)	(0.0069)
CEO chairman	-0.3815***	-0.3910***	-0.3937***
	(0.1019)	(0.1025)	(0.1025)
CEO tenure	-0.0122	-0.0094	-0.0091
	(0.0145)	(0.0146)	(0.0146)
CEO ownership	-0.0834***	-0.0821***	-0.0825***
	(0.0245)	(0.0244)	(0.0245)
Board size	-0.0571**	-0.0508**	-0.0517**
	(0.0229)	(0.0222)	(0.0222)
Board independence	0.0161	0.0708	0.0794
	(0.2912)	(0.2962)	(0.2955)
E-Index	-0.0310	-0.0136	-0.0139
	(0.0373)	(0.0374)	(0.0374)
Observations	21,756	21,756	21,756
Pseudo R^2	0.084	0.093	0.093

Table 3.3: Local Market Density and Outside Succession

Notes: The table reports the coefficients from logit models of executive outside succession on local market density. The sample consists of firms with available data from 1996 to 2013. The dependent variable in columns (1) and (2) is an outside CEO dummy, which equals one if the incoming CEO has been with the firm for less than one year before being the CEO. The dependent variable in columns (3) and (4) is an outside executive dummy, which equals one if the non-CEO executive has been with the firm for less than one year before the first time listed on the firm's annual proxy. *Local market density 1* is the logarithm of one plus total number of firms within 60 miles of the firm's headquarters. *Local market density 2* is the logarithm of one plus total number of firms, each scaled by employment size, within 60 miles of the firm's headquarters. *Forced turnover* is a dummy variable which equals one if the outgoing CEO is forced out. All CEO characteristics refer to the outgoing CEO. See Appendix for definition of other variables. Industry (two-digit SIC) and year fixed effects are included in all specifications. Standard errors reported in the parentheses are robust and clustered by firm. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Outside Succession			
	CEO		Non-CEO	
	(1)	(2)	(3)	(4)
Local market density 1	0.1248***		0.0915***	
	(0.0367)		(0.0219)	
Local market density 2		0.0876***		0.0472**
		(0.0331)		(0.0207)
Forced turnover	0.5235***	0.5326***		
	(0.1206)	(0.1206)		
CEO age	-0.0127*	-0.0127*		
	(0.0067)	(0.0067)		
CEO tenure	-0.0668***	-0.0674***		
	(0.0161)	(0.0161)		
CEO ownership	-0.0028	-0.0032		
	(0.0107)	(0.0108)		
Industry adjusted return	-0.5468***	-0.5410***	-0.0630**	-0.0600*
	(0.1398)	(0.1399)	(0.0315)	(0.0315)
Firm size	-0.1593***	-0.1543***	-0.1639***	-0.1605***
	(0.0375)	(0.0373)	(0.0231)	(0.0231)
Firm age	-0.0023	-0.0029	-0.0130***	-0.0136***
	(0.0034)	(0.0034)	(0.0020)	(0.0020)
Board size	-0.0583**	-0.0615***	-0.0133	-0.0159
	(0.0233)	(0.0234)	(0.0136)	(0.0136)
Board independence	2.0029***	2.0004***	0.4640***	0.4736***
	(0.4070)	(0.4035)	(0.1759)	(0.1771)
E-Index	0.0248	0.0235	0.0031	-0.0011
	(0.0406)	(0.0406)	(0.0230)	(0.0230)
Observations	2,456	2,456	14,943	14,943
Pseudo R^2	0.096	0.094	0.083	0.082

Table 3.4: Local Market Density and Executive Local Pay Gap

Notes: The table reports the ordinary least squares (OLS) regression of executive local pay gaps on local market density. The sample consists of firms with available data from 1996 to 2013. The dependent variable is the logarithm of pay gap between firm compensation and the 90th percentile of local firm compensation. For firms with compensation higher than the 90th percentile, compensation gaps are coded as zeros. In columns (1) and (5), firm compensation is measured as mean total compensation (TDC1) of firm top five earners. In columns (2) and (6), firm compensation is measured as mean cash compensation (salary+bonus) of firm top five earners. In column (3), firm compensation is measured as CEO total compensation. In column (4), firm compensation is measured as mean total compensation of non-CEO top earners *Local market density 1* is the logarithm of one plus total number of firms within 60 miles of the firm's headquarters. *Local market density 2* is the logarithm of one plus total number of firms, each scaled by employment size, within 60 miles of the firm's headquarters. See Appendix for definition of other variables. Industry (two-digit SIC) and year fixed effects are included in all specifications. Standard errors reported in the parentheses are robust and clustered by firm. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Local pay gap					
	Top5 TDC1 (1)	Top5 Cash (2)	CEO TDC1 (3)	Non-CEO TDC1 (4)	Top5 TDC1 (5)	Top5 Cash (6)
Local market density 1	0.6575***	0.5203***	0.6849***	0.6386***		
	(0.0383)	(0.0304)	(0.0418)	(0.0368)		
Local market density 2					0.7416***	0.5970***
					(0.0339)	(0.0266)
Industry adjusted return	-0.1995***	-0.1690***	-0.2310***	-0.1736***	-0.2015***	-0.1711***
	(0.0318)	(0.0242)	(0.0364)	(0.0290)	(0.0307)	(0.0232)
Firm size	-0.7725***	-0.5512***	-0.7550***	-0.7294***	-0.7837***	-0.5612***
	(0.0337)	(0.0270)	(0.0354)	(0.0324)	(0.0330)	(0.0264)
Firm age	0.0081***	0.0032	0.0036	0.0090***	0.0061**	0.0017
	(0.0029)	(0.0024)	(0.0032)	(0.0028)	(0.0028)	(0.0022)
Average age	0.0161**	-0.0054	0.0144*	0.0172**	0.0160**	-0.0054
	(0.0074)	(0.0067)	(0.0079)	(0.0071)	(0.0072)	(0.0064)
Average tenure	0.0428***	-0.0084	0.0593***	0.0324**	0.0477***	-0.0040
	(0.0134)	(0.0115)	(0.0142)	(0.0128)	(0.0127)	(0.0110)
Average ownership	0.0076	0.0009	0.0232*	0.0040	-0.0072	-0.0109
	(0.0103)	(0.0080)	(0.0134)	(0.0086)	(0.0093)	(0.0083)
Board size	0.0172	-0.0140	0.0307	-0.0046	0.0104	-0.0190
	(0.0169)	(0.0155)	(0.0188)	(0.0167)	(0.0163)	(0.0150)
Board independence	0.2139	0.3616**	-0.0614	0.3427*	0.4475**	0.5505***
	(0.2016)	(0.1760)	(0.2129)	(0.1952)	(0.1924)	(0.1674)
E-Index	0.0885***	0.0576***	0.0666**	0.0964***	0.0885***	0.0581***
	(0.0253)	(0.0210)	(0.0271)	(0.0243)	(0.0241)	(0.0198)
Observations	25,686	25,686	25,686	25,686	25,686	25,686
Adjusted R^2	0.273	0.262	0.232	0.276	0.313	0.307

Table 3.5: Local Market Density and Executive Local Outside Tournament

Notes: The table presents the OLS regression of executive local outside tournament on local market density. The sample consists of firms with available data from 1996 to 2013. The dependent variable is the number of executive local job tournaments in each firm-year observation, where a local tournament is identified if an executive's employer in year t is different from her employer in year $t+1$, the distance between new and old employer's headquarters is less than 60 miles, and the new job's compensation is higher than the old one's or the new firm is larger than the old one in terms of total assets when compensation data is not available. *Local market density 1* is the logarithm of one plus total number of firms within 60 miles of the firm's headquarters. *Local market density 2* is the logarithm of one plus total number of firms, each scaled by employment size, within 60 miles of the firm's headquarters. *Positive performance (3-year)* is equal to the 3-year industry-adjusted return if the industry-adjusted return is positive and zero otherwise. *Negative performance (3-year)* is defined accordingly. See Appendix for definition of other variables. Industry (two-digit SIC) and year fixed effects are included in all specifications. Standard errors reported in the parentheses are robust and clustered by firm. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Number of local outside tournaments				
	(1)	(2)	(3)	(4)	(5)
Local market density 1	0.0057***			0.0044***	
	(0.0007)			(0.0007)	
Local market density 2		0.0048***			0.0036***
		(0.0006)			(0.0007)
Positive performance (3-year)			0.0081*	-0.0044	-0.0035
			(0.0042)	(0.0050)	(0.0042)
Negative performance (3-year)			0.0001	-0.0002	0.0003
			(0.0009)	(0.0012)	(0.0012)
Positive performance (3-year) × Local market density 1				0.0024*	
				(0.0014)	
Negative performance (3-year) × Local market density 1				0.0001	
				(0.0006)	
Positive performance (3-year) × Local market density 2					0.0022*
					(0.0012)
Negative performance (3-year) × Local market density 2					-0.0004
					(0.0006)
Average executive age	-0.0005***	-0.0006***	-0.0005***	-0.0006***	-0.0006***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Average executive tenure	0.0005	0.0005	0.0002	0.0005	0.0005
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Average executive ownership	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
Firm size	0.0025***	0.0025***	0.0031***	0.0025***	0.0025***
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Firm age	0.0000	0.0000	-0.0000	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Board size	0.0010	0.0009	0.0007	0.0009	0.0008
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Board independence	0.0030	0.0045	0.0026	0.0031	0.0051
	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0063)
E-Index	-0.0000	-0.0001	-0.0004	0.0001	-0.0001
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Observations	24,022	24,022	24,022	24,022	24,022
Adjusted R^2	0.004	0.004	0.002	0.004	0.004

Table 3.6: Local Market Density and Dismissed Executive Subsequent Employment

Notes: The table presents the effects of local market density on dismissed executive subsequent employment outcome. The sample consists of executives from S&P 500 firms who left their firms during 2000-2010 for the reason other than death, health, acceptance of a new position, firm spin-off, and who were under the age of 55 at the time of departure. The dependent variable in columns (1) to (3) is a new employment dummy, which equals one if the executive obtains an executive position in a new firm in three years and zero otherwise. The dependent variable in column (4) is a public firm dummy, which equals one if the executive's new employer is a firm covered by Compustat. Column (5) adjusts the public firm dummy in column (4) by quality. For each new employment in a public firm, the quality is measured as the ratio of the new firm's size to the old firm's size. The dependent column (6) is the length of unemployment, which is calculated as the number of days the executive was out of work divided by 365. Column (1) includes observations in which no news is found on either departure or new employment. Columns (2) to (6) include only observations in which news are found. Columns (1) uses an OLS model and includes an additional explanatory variable indicating there is no news found. Columns (2) to (4) use logit models. Column (5) uses a tobit model with lower bound zero. Column (6) uses a tobit model with lower bound zero and upper bound three. Coefficients are reported in all columns. See main text and Appendix for definition of departure reasons and other variables. The omitted departure reason is resign. Year fixed effects are included in all specifications. Standard errors reported in the parentheses are robust and clustered by firm. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Employment outcome after dismissal					
	Including no news (1)	Main sample (2)	Main sample (3)	Public firms (4)	Quality weighted (5)	Length of unemployment (6)
Local market density 1	-0.0095	-0.0778		-0.1082	-0.0762	0.1700*
	(0.0105)	(0.0769)		(0.0879)	(0.0680)	(0.1004)
Local market density 2			-0.0305			
			(0.0700)			
Forced	-0.0010	-0.0503	-0.0586	-0.0061	0.0031	0.2452
	(0.0582)	(0.2611)	(0.2609)	(0.3518)	(0.2690)	(0.3487)
Pursue	0.0906	0.4072	0.4157	0.0441	0.0469	-0.6322*
	(0.0602)	(0.2630)	(0.2624)	(0.3125)	(0.2398)	(0.3548)
Retire	-0.2159***	-1.2287***	-1.2136***	-1.0592***	-0.7797***	1.5650***
	(0.0395)	(0.2649)	(0.2640)	(0.3344)	(0.2357)	(0.3544)
Age	-0.0014	-0.0084	-0.0076	-0.0062	-0.0050	0.0225
	(0.0029)	(0.0266)	(0.0266)	(0.0313)	(0.0241)	(0.0356)
Compensation	0.0157	0.1661	0.1471	-0.0221	-0.0166	-0.2886*
	(0.0132)	(0.1188)	(0.1168)	(0.1340)	(0.1009)	(0.1676)
Previous CEO	-0.1248*	-0.6494	-0.6380	-0.4109	-0.2787	0.7394
	(0.0679)	(0.4259)	(0.4204)	(0.5010)	(0.3892)	(0.5860)
Firm size	0.0084	0.0483	0.0524	0.1148	0.0888*	-0.0349
	(0.0082)	(0.0600)	(0.0592)	(0.0732)	(0.0530)	(0.0829)
Industry adjusted return	0.0038	0.0015	0.0010	-0.1323	-0.1098	0.0737
	(0.0171)	(0.0893)	(0.0893)	(0.1928)	(0.1439)	(0.1197)
Observations	893	577	577	577	577	577
Adjusted R^2	0.182	0.071	0.070	0.053	0.040	0.042

Table 3.7: Local Hiring Bias of Dismissed Executives

Notes: The table presents the local hiring percentage for a sample of dismissed executives who find a new job in a public firm within a three-year window. The sample of dismissed executives is same as the sample used in Table 3.6. Panel A shows the realized local hiring percentage and local hiring bias for the sample of dismissed executives. The columns are same as the columns in Table 2.1. Four different measures of expected local hiring probability and three distance cutoffs are used. See Table 2.1 for details. Panel B compares the local hiring bias between the dismissed sample and the non-dismissed sample. The non-dismissed sample is the 19,692 executive job changes covered by the BoardEx database used in Table 2.1. Columns (1) and (2) report the mean local hiring bias for the dismissed and the non-dismissed samples, respectively. Column (3) shows the difference between columns (1) and (2). Column (4) shows the t-statistic of a mean comparison test on local hiring bias between the dismissed and the non-dismissed sample under the assumption of unequal variance.

Panel A: Local hiring bias: Dismissed sample

	Hiring # (1)	Local # (2)	Local % (3)	Exp # (4)	Exp % (5)	Bias (pp) (6)
p_1, 60-mile	105	21	20.0	5	5.1	14.9
p_1, 100-mile	105	23	21.9	7	6.4	15.5
p_1, 250-mile	105	35	33.3	13	12.2	21.2
p_2, 60-mile	105	21	20.0	3	3.2	16.8
p_2, 100-mile	105	23	21.9	4	4.0	17.9
p_2, 250-mile	105	35	33.3	8	8.0	25.3
p_3, 60-mile	105	21	20.0	11	10.5	9.5
p_3, 100-mile	105	23	21.9	13	12.0	9.9
p_3, 250-mile	105	35	33.3	23	21.7	11.7
p_4, 60-mile	105	21	20.0	11	10.3	9.7
p_4, 100-mile	105	23	21.9	12	11.0	10.9
p_4, 250-mile	105	35	33.3	19	18.5	14.9

Panel B: Comparison between dismissed and non-dismissed samples

	Dismissed (1)	Non-dismissed' (2)	Difference (3)	t-stat (4)
p_1, 60-mile	14.9	28.7	-13.8	3.57
p_1, 100-mile	15.5	29.3	-13.9	3.45
p_1, 250-mile	21.2	30.7	-9.5	2.07
p_2, 60-mile	16.8	30.7	-13.9	3.55
p_2, 100-mile	17.9	31.8	-13.9	3.45
p_2, 250-mile	25.3	35.0	-9.8	2.14
p_3, 60-mile	9.5	24.5	-15.0	3.55
p_3, 100-mile	9.9	24.7	-14.8	3.36
p_3, 250-mile	11.7	23.5	-11.9	2.28
p_4, 60-mile	9.7	25.1	-15.3	3.31
p_4, 100-mile	10.9	25.7	-14.9	3.13
p_4, 250-mile	14.9	25.5	-10.6	1.93

Chapter 4

LOCAL MARKET DENSITY AND FIRM PERFORMANCE

Chapter 3 shows that market density creates non-compensation incentives for executives through dismissal threat and outside tournament incentives. A natural question to study next is whether market density affects firm performance through the incentive channels.

Previous studies show that executives respond to non-compensation incentives and thus improve firm performance (Lazear and Rosen, 1981; Green and Stokey, 1983; Kale *et al.*, 2009; Coles *et al.*, 2013). Based on this stream of literature, I hypothesize that firms located in denser markets have better performance. The empirical challenge here is that local market density could have an impact on performance through a variety of channels other than managerial incentives. Therefore, a simple positive correlation between market density and firm performance does not translate into sufficient evidence on the incentive mechanism proposed in this paper.

To distinguish the incentive channel from others, I combine non-compensation incentives induced by market density with executive's career horizon. Specifically, in a performance regression analysis, I interact market density with executive's expected years remaining prior to retirement, and examine whether the coefficient of the interaction term is positive. The intuition is based on Gibbons and Murphy (1992), who point out that "implicit incentives...should be weakest for workers close to retirement." Since an executive cares less about both dismissal and promotion as she approaches retirement, the effect of implicit incentives on performance should decrease with her age. A nice feature of this identification strategy is that most mechanisms other than incentive alignment work through the channel of firms rather than executives and thus do not interact with career horizon, leaving incentive alignment to be the most possible explanation for a positive coefficient on the interaction term.

Table 4.1 presents the regression results on firm performance. I use two-digit SIC industry-adjusted Tobin's Q as the main performance measure. To control for the effect of other well documented managerial incentives on firm performance, I add CEO stock ownership and intra-firm pay gap in all model specifications. Columns (1) and (2) report the preliminary results of how market density affects firm performance. Consistent with the incentive argument, the coefficients on *Local market density 1* and *Local market density 2* are both positive and statistically significant at the 5% level. In terms of economic magnitude, an interquartile increase in market density raises industry-adjusted Tobin's Q by about 0.06. As for other variables, the coefficient on intra-firm pay gap is positive, indicating that intra-firm tournament incentives also have positive effects on firm performance (Kale *et al.* (2009)).

Although the results in columns (1) and (2) suggest that market density improves firm performance, it alone does not indicate that managerial incentive alignment is the underlying channel. Therefore, in columns (3) and (4), I apply the interaction strategy as described above. Since most executives retire at the age of 60, I measure the average executive's career horizon of a firm-year observation as 60 minus the average age of the executives in that firm year. After including executive horizon and the interaction term, I find that the coefficient on *Local market density 1* becomes insignificant while the coefficient of the interaction term is positive and significant at the 5% level. Theses two results suggest that one main channel through which market density affects firm performance is managerial non-compensation incentives. As for economic magnitude, a 0.0082 coefficient on the interaction term implies that the marginal effect of market density on Tobin's Q is 0.011 ($-0.0380 + 6 \times 0.0082$) for firms with top-quartile average executive age (54), and increases to 0.065 ($-0.0380 + 12.4 \times 0.0082$) for firms with bottom-quartile executive age (47.6). Comparing a firm in a dense market (top quartile 6.28) with young executives (bottom quartile 47.6) with a firm in a non-dense market (bottom quartile 4.25) with old executives (bottom quartile 54), I find that the industry-adjusted Tobin's Q of the former firm is higher than that of the latter one by 0.27. As the mean (median) Tobin's Q is 1.97 (1.45), such difference in firm performance is substantial. Similar results are obtained in column (4) where *Local market density 2* is used. The interacted effect is still positive and significant at the 5% level.[1]

In columns (5) to (6), I replace industry-adjusted Tobin's Q with industry-adjusted ROA as an alternative performance measure. The significantly positive coefficients on the interaction term reinforce the findings in columns (3) and (4). Firms in dense markets with young executives have a 0.017 higher industry-adjusted ROA than firms in non-dense markets with old executives.

In sum, combining market density with executive career horizon, Table 4.1 suggests that firms in denser labor markets have better performance as their executives face stronger non-compensation incentives.

[1] One might be concerned that the interaction effect is driven by nonlinearity in the density effect and correlation between density and executive age. I find that the interaction effect remains quantitatively unchanged if I include quadratic and inverse terms of density in regressions.

Table 4.1: Local Market Density and Firm Performance

Notes: The table presents the OLS regression of firm performance on local market density. The sample consists of firms with available data from 1996 to 2013. The dependent variable is industry-adjusted Tobin's Q in columns (1) to (4) and industry-adjusted ROA in columns (5) to (6). *Local market density 1* is the logarithm of one plus total number of firms within 60 miles of the firm's headquarters. *Local market density 2* is the logarithm of one plus total number of firms, each scaled by employment size, within 60 miles of the firm's headquarters. *60−Average executive age* is 60 minus the average age of executives in the firm-year observation. See Appendix for definition of other variables. Industry (two-digit SIC) and year fixed effects are included in all specifications. Standard errors reported in the parentheses are robust and clustered by firm. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Industry-adjusted Tobin's Q				Industry-adjusted ROA	
	(1)	(2)	(3)	(4)	(5)	(6)
Local market density 1	0.0283**		-0.0380		0.0042*	
	(0.0134)		(0.0253)		(0.0022)	
Local market density 2		0.0269**		-0.0285		0.0042*
		(0.0137)		(0.0246)		(0.0023)
(60−Average executive age) × Local market density 1			0.0082**		0.0005**	
			(0.0034)		(0.0002)	
(60−Average executive age) × Local market density 2				0.0069**		0.0004*
				(0.0034)		(0.0002)
60−Average executive age			-0.0125	-0.0041	-0.0028**	-0.0024*
			(0.0161)	(0.0154)	(0.0012)	(0.0013)
CEO ownership	0.0055	0.0055	0.0066*	0.0066*	0.0007**	0.0007**
	(0.0038)	(0.0038)	(0.0037)	(0.0037)	(0.0003)	(0.0003)
Intra-firm pay gap	0.0406***	0.0406***	0.0404***	0.0405***	0.0021***	0.0020***
	(0.0059)	(0.0059)	(0.0058)	(0.0058)	(0.0004)	(0.0004)
Firm age	-0.0097***	-0.0097***	-0.0076***	-0.0076***	-0.0002	-0.0002
	(0.0013)	(0.0013)	(0.0012)	(0.0012)	(0.0001)	(0.0001)
Firm size	-0.0770***	-0.0768***	-0.0727***	-0.0726***	0.0003	0.0002
	(0.0168)	(0.0168)	(0.0167)	(0.0167)	(0.0019)	(0.0019)
Sale growth	0.2552*	0.2554*	0.2484*	0.2488*	0.0006	0.0006
	(0.1359)	(0.1359)	(0.1332)	(0.1333)	(0.0022)	(0.0022)
R&D intensity	0.2492***	0.2511***	0.2568***	0.2591***	0.0479***	0.0477***
	(0.0467)	(0.0467)	(0.0461)	(0.0463)	(0.0046)	(0.0046)
Board size	-0.0090	-0.0092	-0.0019	-0.0023	0.0006	0.0006
	(0.0078)	(0.0078)	(0.0074)	(0.0075)	(0.0007)	(0.0007)
Board independence	0.0725	0.0745	-0.0052	-0.0035	0.0147	0.0147
	(0.1643)	(0.1643)	(0.1665)	(0.1665)	(0.0122)	(0.0123)
E-Index	-0.1184***	-0.1186***	-0.1146***	-0.1150***	0.0003	0.0004
	(0.0165)	(0.0165)	(0.0163)	(0.0163)	(0.0017)	(0.0017)
Observations	27,230	27,230	27,230	27,230	26,526	26,526
Adjusted R^2	0.078	0.078	0.087	0.086	0.043	0.043

Chapter 5

COVENANTS NOT TO COMPETE ENFORCEABILITY

To provide further evidence for the effects of local labor market density on managerial incentives and firm performance, I exploit heterogeneity with respect to executive's mobility across firms. Since the effects of market density on incentive alignment hinge on movements of executives within local labor markets, the effects would be weaker if executives are not allowed to move freely. To characterize executive mobility, I use the enforceability of state-level covenants not to compete (CNC).[1] CNCs are often used by employers to prevent employees from working for competitors. For example, based on a nationally representative sample of 11,505 labor force participants, Starr *et al.* (2016) find that 38% of employees have signed a CNC at some time in their career, and 18% of employees are currently working under a CNC. The use of CNCs are more prevalent among top executives. Garmaise (2009) finds that at least 70% of Execucomp firms use CNCs with their top executives.

Almost all states, except California and North Dakota, have some form of covenant that prevents a firm's employee from moving to competing firms. However, the enforceability of the covenants varies widely across states, in terms of geographical and time restrictions, employer's protectable interest, employee's burden of proof, etc. The variation in enforceability allows me to examine the heterogeneous effects with respect to executive mobility. Malsberger (2004) provides a comprehensive description of CNCs in the fifty U.S. states and the District of Columbia. I follow Garmaise (2009) and measure enforceability by summing up the scores of 12 questions regard-

[1] CNCs well fit my study on local labor market as they usually have a restricted geographic scope, such as a state, a county, or a 50 mile radius around the place of business.

ing a jurisdiction's enforcement of CNCs. States with higher enforceability scores have lower executive market mobility (Garmaise, 2009). States on average have an enforceability score of four, with Florida being the highest with a score of nine and California and North Dakota being the lowest with a score of zero. The interquartile range is from three to five. A complete list of questions and state scores is provided in Garmaise (2009).

To examine how the effects of local market density vary across markets with different enforceability of CNCs, for each firm-year observation I interact the density measure with the enforceability measure of the state where the firm is headquartered. For the analysis on CEO turnover-performance sensitivity and firm performance, I use a three-way interaction and include all the relevant interaction terms. To keep the coefficients on the non-interacted main terms similar to the original results, I demean the enforceability measure in each regression before interaction.

Table 5.1 presents the results. In columns (1) and (2), I investigate how CNCs affect executive's dismissal threat due to local competition. Consistent with the argument that CNCs shrink the outside candidate pool from which firms can choose replacement executives, the effect of market density on CEO turnover-performance sensitivity is smaller in states where CNCs are more enforceable. The coefficient on the three-way interaction term is significantly positive at the 10% level. Correspondingly, as shown in column (2), CNCs also reduce the positive effect of market density on firm's outside succession rate. Columns (3) and (4) look at executive's outside tournament incentives. For tournament prize, as the effect of market density on local pay gap does not necessarily come from the movements of local executives, the enforceability of CNCs might not strengthen or weaken the density effect. However, for tournament likelihood, CNCs could shrink outside opportunities for executives and thus reduces the density effect. Consistent with these arguments, I find that the coefficient of the interaction is not statistically significant in the tournament prize regression in column (3), while it is significant at the 5% level in the tournament likelihood regression in column (4). An interquartile increase in enforceability score reduces the effect of density on tournament likelihood by 50% relative to the average effect. In column (5), I reexamine the effect of market density on dismissed executive's subsequent employment. Similar to the result in the main analysis, market density does not help dismissed executives find a new job more easily and this result does not change across different levels of CNC enforceability.

Combining the results in columns (1) to (5), I find that the positive effects of market density on managerial incentive alignment are stronger in the environment where CNC enforcement is weaker, i.e., executives are allowed to move more freely. Therefore, I expect the positive effect of density on firm performance, through the channel of managerial incentives, is also stronger for firms in states with lower CNC enforceability. Consistent with this hypothesis, I find in column (6) that the coefficient on the three-way interaction term of market density, executive career horizon, and CNC enforceability, is significantly negative. As for the magnitude, an interquartile increase in enforceability score reduces the interaction effect of market density and career horizon by half.

Overall, using CNC enforceability as an exogenous measure of executive market mobility, I find that the effects of local market density on executive's dismissal threat and tournament incentives are more pronounced in more mobile markets. Accordingly, market mobility also strengthens the executive career horizon channel through which density enhances firm performance.

Table 5.1: Covenants Not to Compete Enforceability

Notes: The table presents the heterogeneous effects of local market density on managerial incentives and firms performance by the enforceability of state-level covenants not to compete (CNC). *Noncompete* is an index summing up the score that each state obtains from 12 questions regarding the jurisdiction's enforcement of CNC. For each firm, CNC enforceability is measured using the enforceability index of the state where the firm is headquartered. *Noncompete* is demeaned in each regression and then interacted with market density. For three-way interaction in turnover-performance sensitivity and firm performance analysis, all possible interaction terms are included in regressions. Column (1) replicates Table 3.2 column (2), where the dependent variable is forced CEO turnover. Column (2) replicates Table 3.3 column (1), where the dependent variable is outside CEO succession. Column (3) replicates Table 3.4 column (1), where the dependent variable is local total compensation gap. Column (4) replicates Table 3.5 column (1), where the dependent variable is the number of executive local tournaments. Column (5) replicates Table 3.6 column (2), where the dependent variable is a new employment dummy for previously dismissed executives. Column (6) replicates Table 4.1 column (3), where the dependent variable is industry-adjusted Tobin's Q. For brevity, only coefficients of density, CNC enforceability, and key interaction terms are reported. See Appendix and previous tables for model specifications and the definition of variables. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Turnover-performance (1)	Outside CEO (2)	Local pay gap (3)	Local tournaments (4)	New employment (5)	Tobin's Q (6)
Local market density 1	0.1092**	0.1319***	0.7061***	0.0047***	-0.0353	-0.0304
	(0.0430)	(0.0387)	(0.0383)	(0.0007)	(0.0867)	(0.0260)
Noncompete	-0.0372	0.0880	0.2572**	0.0030*	0.2617	-0.0651
	(0.0257)	(0.1014)	(0.1083)	(0.0016)	(0.2753)	(0.0405)
Local market density 1 × Noncompete	-0.0221	-0.0317*	-0.0277	-0.0011**	-0.0398	0.0153*
	(0.0202)	(0.0184)	(0.0189)	(0.0005)	(0.0472)	(0.0084)
Negative performance × Local market density 1	-0.2317**					
	(0.1129)					
Negative performance × Local market density 1 × Noncompete	0.0803*					
	(0.0482)					
(60−Average executive age) × Local market density 1						0.0080**
						(0.0036)
(60−Average executive age) × Local market density 1 × Noncompete						-0.0025**
						(0.0012)
Observations	21,756	2,456	25,691	24,022	577	27,230
(pseudo) R^2	0.096	0.103	0.287	0.006	0.072	0.092
Other controls for all panels as in:	Table 3 column 2	Table 4 column 1	Table 5 column 1	Table 6 column 1	Table 7 column 2	Table 9 column 3

Chapter 6

ROBUSTNESS CHECKS

In this section, I test the robustness of the results in Chapters 2 and 3 by considering alternative density measures and examining a set of potential confounding factors.

6.1 Alternative Density Measures

In the analyses so far, I use the number of all firms in the local area as the measure of local market density. Yet, if firms mainly focus on industry insiders when making hiring decisions, a measure including only firms in the same industry as the sample firm could be more appropriate. Hence, as a robustness check, I consider two additional measures of market density *Local market density* 3 and *Local market density* 4, which are equal to the unadjusted and size-adjusted number of local firms in the same two-digit SIC industry as the sample firm, respectively. On average, a firm has 20 other local firms in its industry. The correlation between *density 1* (*density* 2) and *density 3* (*density* 4) is 0.677 (0.564).

Panels A and B in Table 6.1 replicate the analyses in Chapters 2 and 3 with the new density measures. Column (1) corresponds to Table 3.2 columns (2) and (3), where the dependent variable is forced CEO turnover. Consistent with the previous findings, the coefficients of the interaction term are negative in both panels. Yet, the statistical significance decreases to being significant at the 10% level. Column (2) looks at firm's outside succession choice and finds similar results as in Table 3.3. I reexamine executives' outside tournament incentives in columns (3) and (4), where dependent variables are changed to the within industry (two-digit SIC) local compensation gap and local outside tournament, respectively. The results confirm the previous findings that executives in denser markets have higher outside tournament likelihood as well as larger tournament prize. Column (5) replicates Table 3.6 and finds that local market density still has no effect on dismissed executives' subsequent employment. Finally, column (6) replicates the firm performance analysis in Table 4.1. Similar to the main findings, the coefficients on the interaction are significantly positive, implying that market density improves firm performance through managerial incentive alignment.

6.2 Potential Confounding Factors

In this section, I consider several market characteristics correlated with market density and examine whether my main results of density on incentives and performance are robust to the control of these characteristics.

6.2.1 Board Governance

The first confounding factor I examine is board monitoring efficiency. Knyazeva *et al.* (2013) argue that firm's ability to recruit independent directors significantly depends on the local supply of prospective directors. They find empirically that for all firms but the largest quartile of S&P 1500, board independence is positively related to the number of nonfinancial firms within 60 miles. Board independence could have a direct impact on managerial incentives and firm performance. For example, Weisbach (1988) shows that turnover-performance sensitivity is higher for firms with more independent boards. The stronger monitoring role played by independent board could also lead to better firm performance, although the effect is heterogeneous across firms with different characteristics (Coles *et al.*, 2008).

To examine how board independence affects the results of market density, I run a horse race test between my density measure and board independence for all main regressions studied in the paper. Since some managerial incentive outcomes could be affected not only by the board independence level of the event firm but also by its level of other firms at local market, I also include local average board independence in regressions.

In untabulated results, I find that controlling board independence channel has virtually no impact on the positive effects of market density on dismissal threat, tournament incentives, and firm performance. The main results do not change if I replace board independence with board co-option as proposed in Coles *et al.* (2014), though the coefficient of the interaction between density and negative performance in the turnover-performance sensitivity losses statistical significance. Overall, there is no empirical evidence that my main results are driven by board governance.

6.2.2 Institutional Ownership and Analyst Coverage

I next investigate the role of institutional investors and analysts. Previous literature shows that firms in denser markets are owned by more institutional investors and are covered by more analysts, because these sophisticated investors typically located in dense markets and tend to bias towards local firms (Coval and Moskowitz, 1999; Loughran and Schultz, 2005; Malloy, 2005; Bae *et al.*, 2008). As a result, market density is positively correlated with external monitoring strength and information dissemination efficiency, both of which could affect managerial incentives and firm performance (Bushee and Noe, 2000, Boone and White, 2015).

To examine whether the effects of market density on incentives and performance are confounded by external monitoring and information dissemination, I control for institutional ownership and analyst coverage.[1] Untabulated regression results indicate that conditional on external monitoring and information dissemination, local market density still has significant effects on executive's dismissal threat and tournament incentives. The economic magnitudes are similar to those in the baseline models. As for firm performance, the coefficient on executive horizon and market density interaction term is positive and statistically significant at least at the 5% level.

6.2.3 Managerial Skill

Finally, I examine whether the positive effects of market density on incentives and performance are driven by the sorting of skillful managers into dense markets. To empirically test this channel, I measure a firm's managerial skill as the percentage of its top executives holding MBA degrees.[2] I find that executives in denser markets are more likely to hold MBA degrees. Yet, there is no evidence that managerial sorting is the driving force behind the positive effects of density on managerial incentives and firm performance. With the control of managerial skill, the coefficients of market density and corresponding interaction terms are in similar economic magnitude and statistical significance as those reported in baseline regressions.

[1] Analyst coverage information comes from IBES and institutional holdings information comes from Thomson-Reuters Institutional Holdings (13F) database.

[2] Data on executive education level are from BoardEx. The results do not change if I consider doctorate degree or master degree. I do not use managerial skill measures derived from firm performance (e.g.,Demerjian *et al.* (2012)), because these measures do not distinguish between skill and incentive alignment.

Table 6.1: Alternative Market Density Measures

Notes: The table presents the results for robustness checks on alternative measures of local market density. *Local market density 3* is the logarithm of one plus number of firms within 60 miles of sample firm's headquarters and within sample firm's industry. *Local market density 4* adjusts each firm count in *Local market density 3* by firm employment size. Column (1) replicates Table 3.2 columns (2) and (3), where the dependent variable is forced CEO turnover. Column (2) replicates Table 3.3 columns (1) and (2), where the dependent variable is outside CEO succession. Column (3) resembles Table 3.4 columns (1) and (4), but changes the dependent variable to the compensation gap between sample firm total compensation and the 90th percentile total compensation of local same industry firms. Column (4) resembles Table 3.5 columns (1) and (2), but changes the dependent variable to the number of executive local and within-industry tournaments. Column (5) replicates Table 3.6 columns (2) and (3), where the dependent variable is new employment dummy for previously dismissed executives. Column (6) replicates Table 4.1 columns (3) and (4), where the dependent variable is industry-adjusted Tobin's Q. Industries are classified based on two-digit SIC codes. For brevity, only coefficients of density and density interaction terms are reported. See Appendix and previous tables for model specifications and the definition of variables. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Turnover-performance (1)	Outside CEO (2)	Local pay gap (3)	Local tournaments (4)	New employment (5)	Tobin's Q (6)
Panel A: Local executive pool 3						
Local market density 3	0.0651*	0.1044***	1.7009***	0.0034***	-0.0334	-0.0610
	(0.0351)	(0.0344)	(0.0271)	(0.0005)	(0.0642)	(0.0417)
Negative performance × Local market density 3	-0.1670*					
	(0.0970)					
(60−Average executive age) × Local market density 3						0.0134**
						(0.0054)
Observations	21,756	2,456	25,691	24,022	577	27,230
(pseudo) R^2	0.092	0.089	0.434	0.004	0.070	0.095
Panel B: Local executive pool 4						
Local market density 4	0.0701**	0.1023***	1.6792***	0.0030***	-0.0404	-0.0522
	(0.352)	(0.0313)	(0.0275)	(0.0005)	(0.0553)	(0.0359)
Negative performance × Local market density 4	-0.1723*					
	(0.0975)					
(60−Average executive age) × Local market density 4						0.0119**
						(0.0048)
Observations	21,756	2,456	25,691	24,022	577	27,230
(pseudo) R^2	0.092	0.089	0.507	0.005	0.071	0.093
Other controls for all panels as in:	Table 3 column 2	Table 4 column 1	Table 5 column 1	Table 6 column 1	Table 7 column 2	Table 9 column 3

Chapter 7

CONCLUSION

Recent empirical findings shake the conventional wisdom that the market for CEOs is nationally integrated. To provide more direct evidence on geographic segmentation of the executive labor markets, I use executive job changes covered by the BoardEx database and calculate the distance between executive's old and new employers' headquarters. I find that firms hire executives within 60-mile radius seven times more frequently than expected if the executive market were nationally integrated.

Since executives often move locally, they are affected by local labor market conditions beyond national ones. Firms in denser markets tend to dismiss poor performing executives more frequently due to more convenient access to outside candidates. This implies stronger performance-based dismissal threat for executives in denser markets. Besides dismissal threat, outside tournament incentives work as another mechanism of incentive alignment. Executives in denser labor market have better outside opportunities, in terms of both larger compensation gap and higher tournament likelihood. The empirical findings also rule out the concern that market density might disincentivize executives by offering more backup options. Dismissed executives in denser markets do not find new jobs more easily because reputation spreads in local markets. Combining incentives with career horizon, I find that local market density has a positive effect on firm performance, especially when executives are young.

The results in this paper illustrate the point that local market density creates incentives for executives and hence affects firm outcomes. So managerial non-compensation incentives could be used to explain the impacts of geographic clustering on firms. Also, researchers should be careful when implementing geographic conditions as instrumental variables since market density has a direct impact on executive incentives. One potential revenue for future research is to investigate whether incentive alignment through market density affects firms other than just aggregate performance. For example, the option-like features of tournament opportunities could give executive incentives to increase firm risk in terms of higher R&D intensity, more M&A activities, or higher leverage (Kini and Williams, 2012, Coles *et al.*, 2013). On the other hand, dismissal threat might suppress such risk-taking behavior as executives are worried about poor performance. It would be interesting to see which non-compensation incentive dominates and whether firms respond by adjusting the optimal compensation structure.

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APPENDIX A

VARIABLE DEFINITIONS

The appendix defines the variables used in the paper. All accounting data items come from Compustat and are denoted as data numbers. All returns data come from CRSP. All compensation related data come from Execucomp. Governance data and board data come from ISS.

Table A.1: Data Sources and Variable Definitions

Variable	Definition
Firm characteristics	
Local market density 1	Logarithm of one plus the number of firms within 60 miles of the firm's headquarter
Local market density 2	Logarithm of one plus size scaled number of firms within 60 miles of the firm's headquarter. Size scale for each firm is calculated as firm's number of employees divided by the average number of employees of Compustat firms in that year
Local market density 3	Logarithm of one plus the number of firms within 60 miles of the firm's headquarter and within the firm's two-digit SIC industry
Local market density 4	Logarithm of one plus size scaled number of firms within 60 miles of the firm's headquarter and within the firm's two-digit SIC industry
Firm size	Logarithm of toal assets; log(data 6)
Sales	Net annual sales; data 12
Market value	Market capitalization; data 199 $\times$ data 25
Sales growth	Ratio of net sale in year t to net sale in year $t-1$ minus one
Firm age	Current year minus the first year that the firm appeared in Compustat
R&D intensity (%)	Percent of research and development expenditure to capital; data 46 / data 8; zero if missing
Tobin's Q	Market value of asset to book value; (data 6 + data 199 $\times$ data 25 $-$ (data 60 + data 74)) / data 6
Industry-adjusted Tobin's Q	Tobin's Q minus median two-digit SIC industry Tobin's Q
ROA	Ratio of operating income before depreciation to total asset; data 13 / data 6
Industry-adjusted ROA	ROA minus median two-digit SIC industry ROA
Stock return	Cumulative stock return 12 months before the current fiscal year end
Industry return	Median two-digit SIC industry return
Industry-adjusted return	Stock return minus median two-digit SIC industry return
Negative performance	Equal to industry-adjusted return if the industry-adjusted return is negative, and zero otherwise
Positive performance	Equal to industry-adjusted return if the industry-adjusted return is non-negative, and zero otherwise
Board size	Number of directors on the board
Board independence	Percent of independent directors on the board
E-Index	Bebchuk, Cohen, and Ferrell (2009) index of corporate governance; similar to existing work, gap years are filled in with adjoining years
Noncompete	Covenants not to compete enforceability score of the state where the firm is headquartered; state-level enforceability score is an index summing up the score that each state obtains from 12 questions regarding the jurisdiction's enforcement of covenants not to compete (Garmaise, 2009)
Executive characteristics	
CEO age	Current age of the CEO
CEO chairman	CEO is chairman of the board
CEO tenure	Current year minus the first year when the executive was flaged as CEO in Execucomp
CEO ownership	Percent ownership stake of the CEO in the firm
Average executive age	Average age of executives in a firm-year observation

Table A.1 continued

Variable	Definition
Average executive tenure	Average years that executives have been covered by Execucomp under the firm
Average executive ownership	Average percent ownership stake of executives
Intra-firm pay gap	Logarithm of CEO total compensation (TDC1) minus median compensation of non-CEO executives within firm; zero if the difference is non-positive
Forced CEO turnover	CEO in year $t+1$ is different from the CEO in year t; and report says that the CEO is fired, forced out, or departs due to policy differences; or the departing CEO is under age of 60, does not announce the retirement at least six months in advance, and does not leave for health reasons or acceptance of another position
Outside CEO	CEO has been with the firm for less than one year before being CEO
Outside non-CEO executive	Executive has been with the firm for less than one year before the first time listed on that firm's annual proxy
Local pay gap (Top5, TDC1)	Logarithm of the 90th percentile of firm total compensation (TDC1) in local market (within 60 miles) minus firm total compensation; zero if the difference is non-positive. Firm compensation is calculated as the mean compensation of its top five executives
Number of local tournament	Number of local tournaments won by top five executives of a firm in a year. A local tournament is recored if (i) an executive changes employer, (ii) the moving distance is less than 60 miles, and (iii) the new job's compensation (TDC1 deflated by CPI) is higher than the old one's

APPENDIX B

LOCAL HIRING BIAS BY SUBSAMPLES

I provide further evidence on local hiring bias by categorizing all hiring events into different groups.

I first examine whether the benefit of firm conducting a nationwide search or the benefit of executive moving long distance has any heterogeneous effect on the magnitude of the local hiring bias. I also examine the role of firm agency problem and executive geographic preference. Results are presented in Table B.1. For brevity, I only show the results using p_1 as expected local hiring measure. Similar results are obtained if alternative measures are used.

Panel A categorizes sample hiring firms based on their S&P code. As the benefit of finding a suitable leader is higher for larger firms, larger firms should be more likely to hire executives from a nationwide executive pool. The results in Panel A offers evidence supporting this argument. The local hiring bias is strongest, at 32.7%, for firms that are not included in S&P 1500 index. The bias decreases to 30.0% for S&P SmallCap firms, further decreases to 24.8% for MidCap firms, and becomes lowest for S&P 500 firms at 23.9%.[1] Results remain qualitatively unchanged if I categorize sample hiring firms by size quintiles.

In Panel B, I examine whether local hirings happen less frequently for jobs with higher payment. If compensation reflects the importance of the job, firms are more likely to conduct a nationwide search for that position. As for employees, higher monetary benefit is more likely to overweigh the moving cost and hence induces a long distance move. For the subsample in which compensation data are available through Execucomp, I sort the full sample into quintiles based on the total compensation (TDC1) that executives receive at the new position. To control for the rapid compensation increase in the last two decades, I scale each compensation with the

[1]The sample median total assets is 0.41 for firms not in S&P Index, 0.52 for SmallCap firms, 1.81 for MidCap firms, and 11.52 for S&P 500 firms. All amounts are in billions of 2000 dollars.

average compensation level in that year. I find that jobs with compensation at the lowest quintile have the highest local hiring bias at 30.7%. This bias gradually decreases as compensation level rises. The bias for jobs with payment at the highest quintile is 20.7%, which is significantly (at the 1% level) different from the bias at the lowest quintile.

In Panel C, I examine whether local hirings are driven by agency stories. Firms with weaker governance might be more likely to hire local executives for some private benefits their boards and CEOs receive. However, using board independence as a proxy of agency problems, I do not find evidence that the local hiring bias varies monotonically across firms with different level of agency problems.

Panels D and E investigate whether executive's geographic preference explains the local bias. In Panel D, I find a hump-shaped relation between executive age and the local moving bias. Executives with age between 35 and 50 are most likely to relocate within their current geographic area when changing jobs. One possible explanation is that these executives are married and with young kids, so they are not willing to move across the nation. In Panel E, I look at whether executives in more livable places are more inclined to move locally. Following Deng and Gao (2013), I use state livability ranking in 2006 (sample median year) published by Morgan Quitno. [2] Surprisingly, it seems that executives in less livable states are actually more likely to move locally, if anything.

I also study whether the local hiring bias changes over time in Panel F. One might expect that with the increase in information and transportation convenience, firm's searching cost and executive's moving cost would become lower in the latter sample period and thus executive labor markets would become more integrated. However, I

[2] The ranking is based on a score of 44 factors, including positive factors, such as personal income, education level, sunny days, and negative factors, such as crime rate, unemployment rate, population per square mile.

do not find such time pattern in my sample. In fact, it seems that the local hiring bias becomes more substantial in recent years.

Finally, I investigate whether the local hiring bias only exists certain in industry or in the densest area (e.g., cities like New York). I categorize all sample hiring firms based on their Fama-French 30 industry classification and their market density, which is measured as the total number of firms within 60 miles of hiring firm's headquarter. In untabulated results, I find that the local hiring bias is both economically and statistically significant across all industries and all density deciles. For most subsamples, the bias is between 20% to 30%.

Overall, the subsample analysis indicates that the local hiring bias is prevalent among all industries, all markets with different density, all time periods, and even in the largest firms and highest paid positions. Furthermore, there is evidence that both firm preference and executive preference play a role in the local hiring and moving bias. Also, the local bias is better explained by the optimal matching between firms and executives rather than by agency problems.

Table B.1: Local Hiring Bias: Subsamples

	Hiring # (1)	Local # (2)	Local % (3)	Exp # (4)	Exp % (5)	Bias (pp) (6)
Panel A: S&P codes						
Not in S&P Index	9240	3492	37.8	467	5.1	32.7
SmallCap	1935	671	34.7	91	4.7	30.0
MidCap	2102	614	29.2	94	4.5	24.8
S&P 500	6415	1936	30.2	401	6.3	23.9
Panel B: Compensation (Quintile 1: lowest)						
Quintile 1	393	136	34.6	15	3.9	30.7
Quintile 2	393	127	32.3	15	3.8	28.5
Quintile 3	393	118	30.0	19	4.8	25.2
Quintile 4	393	113	28.8	19	4.8	23.9
Quintile 5	392	103	26.3	22	5.6	20.7
Panel C: Board independence (Quintile 1: lowest)						
Quintile 1	3664	1280	34.9	214	5.9	29.1
Quintile 2	3090	1036	33.5	166	5.4	28.2
Quintile 3	2966	1169	39.4	159	5.4	34.0
Quintile 4	2887	992	34.4	139	4.8	29.5
Quintile 5	2811	880	31.3	154	5.5	25.8
Panel D: Age						
<30	299	90	30.1	17	5.6	24.5
30-34	904	306	33.8	48	5.3	28.5
35-39	1867	653	35.0	93	5.0	30.0
40-44	3044	1079	35.4	154	5.1	30.4
45-49	3113	1086	34.9	162	5.2	29.7
50-54	2358	754	32.0	119	5.0	26.9
55-59	1085	357	32.9	56	5.1	27.8
>=60	304	100	32.9	16	5.3	27.6
Panel E: State livability ranking (1: highest)						
1-10	3567	1198	33.6	200	5.6	28.0
11-20	1081	273	25.3	45	4.2	21.1
21-30	2830	735	26.0	134	4.7	21.3
31-40	10110	3849	38.1	596	5.9	32.2
41-50	2030	642	31.6	74	3.6	28.0
Panel F: Years						
Before 1990	243	70	28.8	13	5.4	23.4
1990-1994	741	203	27.4	39	5.3	22.1
1995-1999	2239	670	29.9	116	5.2	24.7
2000-2004	4318	1372	31.8	219	5.1	26.7
2005-2009	7215	2631	36.5	384	5.3	31.1
After 2010	4936	1767	35.8	282	5.7	30.1