Managerial Labor Market Competition and Incentive Contracts

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Abstract

This paper assesses the impact of managerial labor market competition on executive incentive contracts. I develop a dynamic contracting framework that embeds the moral hazard problem into an equilibrium search environment. The competition for executives increases total compensation, and generates a new source of incentives, called *labor market incentives*, which substitutes for performance-based incentives (e.g. bonus, stocks, options, etc.). The model is estimated using a newly assembled dataset on job turnovers for executives from U.S. publicly listed firms. The structural estimates show that the model is capable of explaining and predicting the empirical puzzles that executives of larger firms experience higher compensation growth, and receive higher performance-based incentives.

Key Words: executive compensation, managerial labor market, firm-size premium, dynamic moral hazard problem, search frictions

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1 Introduction

Executives are incentivized by having their compensation closely tied to firm performance in forms of bonuses, stocks, and options, etc. Traditionally, it is believed that incentive contracts are designed to align the interests of executives with those of shareholders. In recent decades, however, we have seen that competition for executives is increasingly influential in shaping incentive contracts. According to IBM's proxy statement, there is a "battle for talent" in the industry. To react to that, IBM targets the executive compensation to the 50th percentile among a large group of benchmark companies both inside and outside the industry. They further adjust the individual compensation according to "the skills and experience of senior executives that are highly sought after by other companies and, in particular, by IBMs competitors."[1] Similarly, Johnson & Johnson regards "competitiveness" as the first guiding principle in designing executive compensation programs. They compare executive compensation against "appropriate peer companies that are of similar size and complexity, ... to attract, retain, and motivate high-performing executives".[2]

Despite its relevance in the industry, a characterization of how firms compete for executives is still missing in the literature, and its consequence on executive incentive contracts has remained unclear. For example, in assignment models (e.g., Gabaix and Landier 2008, Edmans et al. 2009), the competition is embed in the equilibrium, and since the models are static, no dynamic features can be derived; in models of multiple periods (e.g., Holmström 1999, Oyer 2004), the managerial labor market is completely competitive, and all firms, large or small, compete with the same spot market wage; other dynamic models (e.g., Gayle et al. 2015) focuses on the firm and title rank choice of executives rather than the competition among firms.[3]

This paper put forward the direct competition among heterogeneous firms along the lines of Postel-Vinay and Robin (2002) in a tractable framework that combines dynamic moral hazard and equilibrium labor search. The model considers two types of agents: executives and firms. Executives are heterogeneous in their productivity which evolves stochastically depending on the current and past effort. Firms are heterogeneous in time-invariant asset size. In analogous to Gabaix and Landier (2008), both the executive productivity and the firm size contribute to the output and they are complementary

[1] See details in IBM proxy statement (published in March of 2018), section 2 "how and why compensation decisions are made". (*https://www.ibm.com/annualreport/2017/assets/downloads/IBM_Proxy_2018.pdf*, visited on Oct 27, 2018.

[2] See details in Johnson and Johnson's proxy statement published in March of 2018. (*http://www.investor.jnj.com/_document/2018-proxy-statement?id=00000162-2469-d298-ad7a-657f7bcf0000, visited on Oct 27, 2018.*)

[3] As pointed out in the *directions for future research* by Edmans et al. (2017), "Most models of incentives in market equilibrium are static. It would be useful to add a dynamic moral hazard problem where incentives can be provided not only through contracts, but also by ... the promise of being hired by a larger firm. This would, among other things, analyze how contracting incentives interact with ... hiring incentives. These different incentive channels may conflict with as well as reinforce each other." This statement well describes the rationale and contribution of this paper.

in the production. While the output is observable, the effort is not. Thus, a moral hazard problem arises. To resolve the problem, the firm and the executive sign a long-term incentive contract. Importantly, the executive has limited commitment to the relationship, and may encounter outside poaching offers. By making use of poaching offers, the executive can renegotiate with the current firm, or transits to a larger poaching firm. Essentially, the current and the poaching firms are engaged in a Bertrand competition for the executive.

This competition from poaching offers impacts the managerial incentive contracts via two channels. *First*, as in Postel-Vinay and Robin (2002), the competition from outside offers increases executives total compensation. When the poaching firm is smaller than the current firm, the executive may use it to negotiate with the current firm for a higher pay. When the poaching firm is larger, it can always outbid the current firm since firm size contributes to the production. Thus, the executive uses the current firm as the threat to negotiate with the poaching firm and transits to the poaching firm. In either case, the executive climbs up the job ladder towards a higher compensation level and (or) a larger firm size. *Second*, poaching offers generate a new source of incentives and consequently reduce the needs for performance-based incentives. Poaching firms are willing to bid higher for more productive executives, thanks to the contribution of executive productivity in the production function. The productivity of an executive, on the other hand, is stochastically determined by his past effort. Together, they imply that taking effort today will lead to a more favorable offer from the same poaching firm in the future. This potential gain from the labor market competition becomes a new source of incentives, which is called *labor market incentives* in this paper. Consequently, firms can take advantage of the labor market incentives, and give less performance-based incentives to executives, but still resolve the moral hazard issue.

These two channels enable the model to shed light on two empirical puzzles: the *firm-size growth premium* and *firm-size incentive premium*. The firm-size growth premium refers to empirical fact that starting with the same total compensation, the executive of a larger firm experiences a higher compensation growth. For a 1% increase in firm size, the total compensation growth rate increases by 10%. This fact is firstly documented in this paper, and it complements the stylized facts on executive pay levels (e.g. Edmans et al. 2017). My explanation is intuitive: According to the first channel above, executive compensation grows because of the competition from poaching offers. Larger firms are more capable of countering outside offers due to the firm size effect in production, thus their executives tend to experience higher compensation growth.

The firm-size incentive premium refers to the empirical fact that performance-based incentives increase with firm size, a relationship that holds after controlling for executives total compensation, firm performance, etc. In the data, a 1% increase in firm size leads to a 0.35% increase in performance-based incentives. [4] The second channel above

[4]The performance-based incentives are measured by the dollar change in firm-related wealth per per-

helps to explain this premium. An executive is motivated by two sources of incentives which substitute each other: the performance-based incentives and the labor market incentives. I show that the labor market incentives decrease with firm size, thus the performance-based incentives increase with firm size.

Regarding to why labor market incentives decrease with firm size, my model gives two reasons. First, executives from larger firms are on "higher" positions of the job ladder, and the chance to receive an outside offer that can improve upon the current value is lower. Thus, the labor market incentives for executives from larger firms are smaller. Second, executives from larger firms are expected to be more compensated in the future (as explained in the first puzzle), thus the certainty equivalents of their future expected utilities are higher. Given the diminishing marginal utility, at a higher certainty equivalent, the marginal utility of a more favorable outside offer is smaller. Consequently, the labor market incentives are smaller for executives from larger firms.

Reduced-form empirical evidence are provided to support the model set-up. For this, I assembled a new dataset by merging ExecuComp and BoardEX databases. ExecuComp is the standard data source for executive compensation studies. It contains annual records on top executives' compensation of firms comprising the S&P 500, MidCap, and SmallCap indices. BoardEX contains detailed executive employment history, and it helps to identify the employment status of each executive after the spells in ExecuComp. In the final data sample, there are 35,088 executives and a total number of 218,168 executive-year observations spanning the period 1992 to 2016. Using the merged data, I document a job-to-job transition rate around 5%, which is stable over the years and across industries. Moreover, there is a job ladder on the firm size dimension: about 60% of job-to-job transitions are towards larger firms, and for the rest transitions 20% of them are due to a promotion from a non-CEO title to a CEO title. This justifies the hierarchical job ladder featured in the model. Finally, the empirical findings confirm that the "position" on the job ladder matters for the chance of job-to-job transitions. Specifically, using a Cox model, I find that executives in larger firms are less likely to have job-to-job transitions, which is in line with the model's prediction.

Numerically solving for the optimal contract becomes difficult in the presence of the incentive compatibility constraint, limited-commitment constraints, together with shocks of large support, as one needs to solve for the promised value in each state of the world. I address this issue by using the recursive Lagrangian approach (Marcet and Marimon 2017). Under this approach, I solve for one Lagrangian multiplier in order to solve for the whole optimal contract. This multiplier represents the weight of the executive in a constructed Pareto problem, and it keeps track of the incentive compatibility constraint, limited commitment constraints and job-to-job transitions. Based on this multiplier, optimal incentive pay and promised values can be solved.

centage change in firm value. In the regressions, I control for total compensation, firm performance indicators, industry and year fixed effects. See section 2 for more details.

Using the simulated method of moments (SMM), I estimate the model by targeting the data moments of executive compensation, incentives and job turnovers, as well as moments on firm size and profitability. Importantly, I do not explicitly target the firm-size premiums in compensation growth and performance-based incentives. Yet, the estimated model quantitatively captures both. The predictions of the estimated model are very close to the premium estimates from the data, which reassures that the model mechanism plays an essential role in explaining both premiums. A counter-factual decomposition shows that the labor market incentives account for more than 40% of total incentives among small-firm executives, around 15% for medium-firm executives and less than 5% for large-firm executives.

Finally, there is a clear policy implication of the model regarding how to regulate the compensation of overpaid executives especially in large firms. Rather than only focusing on large firms, it is more important to lower the willingness to bid for executives in small and medium firms, via various ways such as more independent compensation committee, greater mandatory pay (or pay ratio) disclosure, say-on-pay legislation, etc. In this way, the competitive pressure in the overall managerial labor market decreases. In the model, there is a spillover effect that a higher willingness to bid from some firms not only boosts the executive pay in those firms but also increases the pay in all firms that are higher on the job ladder. In a counterfactual analysis based on the estimated model, I show that, compare to the increase in the willingness to bid from large firms, the same increment in that of small and medium firms has a similar effect on the compensation of large firms, yet a more substantial impact on the compensation of the whole managerial market.

This paper contributes to two strands of literature in understanding pay differentials between small and large firms. The first strand explains the differentials using the assignment models. Gabaix and Landier (2008), Tervio (2008), and Eisfeldt and Kuhnen (2013) present competitive assignment models to explain why total compensation increases with firm size. Consistent with these studies, I use a multiplicative production function to characterize the contribution of executives. My model has a similar prediction on the relationship between total compensation and firm size. Since my model is dynamic, it also captures the growth of total compensation, which is absent in the existing literature. More importantly, the view on the pay differentials between small and large firms is different. In this paper, executives are paid much higher in larger firms, not because they are talented (e.g., Gabaix and Landier 2008), but because they are lucky to be matched with a large firm that can counter outside offers. Further along this strand of research, Edmans et al. (2009) and Edmans and Gabaix (2011) add a moral hazard problem to the assignment framework and explain why performance-based incentives increase in firm size. Their explanation is based on the notation that total compensation increases with firm size. Yet these models do not explain why after controlling for total compensation, firm-size incentive premium still exists. My model is a dynamic

and search-frictional version of their framework. Besides the explanation highlighted in Edmans et al. (2009), the search frictions added in my model give rise to labor market incentives which contribute to understanding the firm-size incentive premium.

The second strand of literature explains the pay differentials using agency problems. Margiotta and Miller (2000) derive and estimate a multi-period principal-agent model with moral hazard. Based on this model, Gayle and Miller (2009) show that large firms face a more severe moral hazard problem, hence higher equity incentives are needed to satisfy the incentive compatibility condition. Gayle et al. (2015) embed the model of Margiotta and Miller (2000) into a generalized Roy model and they find that the quality of the signal is unambiguously poorer in larger firms, and that explains most of the pay differentials between small and larger firms. In contrast to my focus on managerial labor market competition, Gayle et al. (2015) find that the career concern channel does not explain the size premium in their estimation. The critical difference between Gayle et al. (2015) and my model is that in Gayle et al. (2015) job-to-job transitions are based on Roy model and are in general not directed to larger firms, whereas the driving force of my explanation is a hierarchical job ladder that goes from small to large firms. The different modeling of job-to-job transitions explains why labor market incentives contribute much less in their framework. Using executives' job-to-job transition data, I show that the hierarchical job ladder over firm size does exist.

In terms of modeling, this paper links two strands of literature. One strand is the extensive literature on optimal long-term contracts with private information and(or) commitment frictions, e.g., Townsend (1982), Rogerson (1985), Spear and Srivastava (1987), Phelan and Townsend (1991), Harris and Holmstrom (1982), Thomas and Worrall (1990) and Phelan (1995). Builds on this literature, I embed an optimal contracting problem with moral hazard and two-sided limited commitment into an equilibrium search model. In doing so, the outside environment is endogenized which significantly changes the optimal contract. Another important strand of literature uses structural search models to evaluate wage dispersions. Postel-Vinay and Robin (2002), Cahuc et al. (2006), and Lise et al. (2016) among others estimate models with risk-neutral workers and sequential auctions; Menzio and Shi (2010), Tsuyuhara (2016) and Lamadon (2016) among others construct theoretical models, estimate or calibrate structural models using directed search. Compared to this literature, I add a dynamic moral hazard problem which allows me to understand how search frictions influence a long-term contract. The extreme case in my model where firms with size below a threshold only pay a flat wage corresponds to Postel-Vinay and Robin (2002)

This paper is also closely related to Abrahám et al. (2016) who aim to explain wage inequality in the general labor market by combining repeated moral hazard and on-the-job search. Other than the differences in topics, there is a critical difference that distinguishes the two papers: the productivity of agents is independent over time in Abrahám et al. (2016) while it is persistent in my model. Therefore, in my model, working hard

today rewards the agent in the future labor market. It is this feature that gives rise to the labor market incentives and explains the firm-size incentive premium. This feature is absent in their model.

The rest of the paper is organized as follows. In Section 2, I present the motivating facts of the firm-size premiums in compensation growth and performance-based incentives. I further show both premiums are closely related to the labor market competition by confirming empirically that the premiums significantly increase when the managerial labor market is more active. I then set up the model in section 3, where I characterize the optimal contract and explain the puzzles. Section 4 presents the reduced-form evidence. Section 5 estimates the model. Section 6 discusses the policy implications. Section 7 concludes.

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