Prestige, Promotion, and Pay

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Abstract

We develop a theory in which financial (and other professional services) firms design career structures to "sell" prestigious jobs to qualified candidates. Firms create less-prestigious entry-level jobs, which serve as currency for employees to pay for the right to compete for the more prestigious jobs. In optimal career structures, entry-level employees ("associates") compete for better paid and more prestigious positions ("managing directors" or "partners"). The model provides new implications relating job prestige to compensation, employment, competition, and the size of the financial sector.

Keywords: Job Prestige, Professional Careers, Financial Services Firms.

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> "*Among brokerage houses, there is a well-defined hierarchy of prestige, with investment banking powerhouses such as Goldman Sachs or Merrill Lynch considered high status and more regional and specialized brokerage houses considered lower status. Being an analyst at a high-status brokerage house is typically a better job (e.g., higher compensation and prestige) than being one at a low-status counterpart*." (Hong and Kubik (2003)).

Some sectors of the financial industry – such as investment banking – show a clear hierarchy of prestige among firms (Hayes (1971); Johnson and Miller (1988); Podolny (1993); Podolny and Phillips (1996); Hong and Kubik (2003); Bidwell et al. (2015)). There is also a perception that more prestigious financial firms offer higher compensation. In their study of security analysts' careers, Hong and Kubik (2003) show that more accurate forecasters are more likely to move to firms with higher compensation and prestige. Bidwell et al. (2015) show evidence suggesting that the starting compensation varies little across investment banks with different prestige rankings, but pay rises more quickly with career progression in more prestigious banks. Similarly, at the industry level, Ellul, Pagano, and Scognamiglio (2020) show evidence that the starting compensation is similar in finance and non-finance jobs, but pay rises more quickly with career progression in finance jobs.

We present a model in which professional services firms are endowed with prestigious jobs, such as partner positions in finance, accounting, consulting, and law. We assume that employees perceive the prestige of a job and its monetary compensation as complements. Job prestige has significant implications for how firms design internal career paths for their employees. We consider implications for jobs within a firm, across firms in the same industry, and across industries.

At the firm level, we show that firms optimally design internal career paths by creating several less-prestigious entry-level jobs. All employees work initially in such jobs, but only some are later promoted to the more prestigious job. In an optimal career path, wages increase upon promotion. That is, optimal career paths resemble promotion-to-partner structures in which entry-level employees ("associates") compete for a limited number of better paid and more prestigious positions ("managing directors" or "partners"), as observed in many financial and other professional services firms.

We show that firms with more prestigious jobs pay higher wages at the top and have steeper pay profiles, wider spans of control, and lower promotion probabilities. The result that wages increase with prestige is somewhat surprising. Ever since Adam Smith (1776), economists have used the theory of compensating differentials as the main framework for thinking about the interaction between pecuniary and non-pecuniary job attributes (see Rosen (1986)).[1] According to this theory, wages should be decreasing in the desirability of a job. By contrast, in our model, wages are increasing in job prestige.

In equilibrium, industries with more prestigious jobs have wider spans of control (that is, the ratio of associates to partners) and thus employ a high number of workers. Our model shows that prestige-driven career paths may cause misallocation of talent, in the sense that sectors with more prestigious jobs may grow too large. Misallocation occurs because firms in high-prestige sectors poach workers from sectors with high social value but low payoff contractibility. Our model thus provides a possible explanation for the

[1]For evidence of workers' and executives' preferences for non-pecuniary job attributes and compensating differentials, see Stern (2004), Mas and Pallais (2017), Focke, Maug, and Niessen-Ruenzi (2017), and Krueger, Metzger, and Wu (2021).

common view that the financial services industry is inefficiently large.[2]

We also consider the interactions among internal organization, labor market competition and product market competition. An unexpected result is that when competition for workers intensifies, wages fall. An increase in the demand for employees forces firms to hire fewer associates. From an associate's perspective, the lower wage upon promotion is offset by a higher probability of being promoted. We also show how competitive pressure in the product market affect workers' careers. Finally, we consider the case in which the prestige of a job is determined by its scarcity. Firms can increase job prestige by creating fewer top jobs. We show that, in equilibrium, less-productive jobs are more prestigious.

The main economic force in our model is the desire of firms to extract surplus from employees by "selling" scarce prestigious jobs.[3] To do so, firms offer long-term employment contracts in which less-prestigious entry-level jobs serve as "currency" for employees to pay for the right to compete for the more prestigious jobs. The intuition is as follows. If a firm offers a prestigious job to an employee, the employee is willing to work for low compensation. The employee's marginal utility of income is high in a prestigious job, both because of the complementarity between prestige and pay and because marginal utilities decrease in income. Thus, the firm can often hire the employee to perform an additional job at a low monetary cost. This low compensation cost implies that the firm can create a new job, even when this job would not be profitable on its own. In short, the prestige of the top-level job makes the creation of entry-level jobs profitable. We call such long-term

[2]For empirical analyses of the growth of finance, see Greenwood and Scharfstein (2013) and Philippon and Reshef (2013).

[3]We can think of firms that offer prestigious jobs as entities that sell conventional goods to the market and simultaneously sell non-market goods (that is, prestigious jobs) to their employees (as in Rosen, 1986).

employment contracts *career path contracts*.

Career path contracts may dominate spot contracts for three reasons. First, a career path contract allows the employer to extract more surplus from young employees, who work in low-quality jobs early in their careers. Second, a career path contract allows the employee to transfer utility across periods; the complementarity between consumption and job prestige implies that consumption is relatively more valuable after the employee is promoted to a more prestigious job. Third, because employees are willing to accept a lower probability of promotion in exchange for a higher wage upon promotion, firms attach high wages to the more prestigious jobs and are thus able to hire more workers than necessary to fill such jobs.

There are two sets of theories that explain the career structures in professional services firms. In the first group, we find theories that emphasize moral hazard problems. In such models, the prospect of promotion provides entry-level employees with incentives to work hard and accumulate human capital.[4] The second group of theories argues that firms design their career structures to select and screen candidates for the top positions.[5] Moral hazard and talent selection issues are undoubtedly important determinants of career design. Empirically, both groups of theories have been successful at explaining several facts associated with career paths in professional services firms.[6] To isolate the

[4]Axelson and Bond (2015) develop an incentive-based theory of finance jobs. Galanter and Palay (1991) use economic theories of tournaments to explain the career structure of law firms.

[5]Examples include Landers, Rebitzer and Taylor (1995) and Barlevy and Neal (2019).

[6]For an empirical assessment of some of these theories, see O'Flaherty and Siow (1995), Rebitzer and Taylor (1995), Landers, Rebitzer and Taylor (1996), Ferrall (1996), Sauer (1998), Rebitzer and Taylor (2007), and Barlevy and Neal (2019).

important economic forces in our theory and to clarify our contribution, we abstract from some of the important features found in the theoretical literature. In particular, in our model, actions are observable and contractible, workers are homogeneous, information is symmetric, and there is no learning of types, skill acquisition, or exogenous uncertainty. While both moral hazard and selection problems can explain several details of financial career design, our goal is to show that a model with none of these frictions can generate a rich set of predictions. Some of these predictions overlap with previous models (e.g., the optimality of up-or-out structures, as in Axelson and Bond (2015)), while others are new to our setup, such as the impact of prestige on wage levels, wage dynamics, the span of control, and allocation of labor across sectors.

Our paper is related to the literature on job design. This literature focuses on the question of how to allocate existing tasks or jobs to different agents in the organization (e.g., Itoh (1994); Hemmer (1995); Prendergast (1995)). In our model, job design serves a different purpose: the creation of new jobs improves a firm's ability to extract rents from its employees. In a related paper, Ke, Li and Powell (2018) develop a dynamic moral hazard model in which firms can create new jobs at both the bottom and the top of the promotion hierarchy. In another related paper, Auriol and Renault (2008) consider a job design problem in which the firm allocates a fixed amount of status to a fixed number of jobs in the organization, in a setting with moral hazard problems. Our model differs from those in many respects, but primarily because of our focus on endogenous job creation as a means to extract rents from those competing for the prestigious jobs.

Few papers present theories of the span of control in professional services firms. Spurr (1987) develops a selection model in which the value of the legal claims handled by a firm determines the optimal span of control. Garicano and Hubbard (2007) develop a knowledge-based hierarchy model that links the span of control in law firms to the size of the market for legal services. Axelson and Bond (2015) develop a moral-hazard model in which the amount of capital required in a high-level task determines the nature of the equilibrium: either (i) all workers start at a low-stakes task and are then promoted to a high-stakes task or (ii) some workers are allocated to the high-stakes task when young while others spend their whole lives in the low-stakes task. In both cases, the ratio of low-stakes to high-stakes jobs can be interpreted as the span of control. Our paper differs from these papers by emphasizing the effect of job prestige on the span of control, which leads to new predictions.

An interpretation of some of our results is that associates are assigned to menial tasks. This setting is similar to Axelson and Bond (2015), who also consider an extension of their model in which firms make low-level jobs worse by lengthening hours worked on low-productivity tasks, in order to recoup some of the surplus that workers enjoy in high-level jobs. On a similar vein, Fudenberg and Rayo (2019) develop a model of accumulation of general human capital in which workers are simultaneously assigned to desirable tasks (that is, tasks that improve their skills) and menial tasks. The performance of menial tasks compensates the principal for offering general training to workers.

Terviö (2009) develops a model based on talent discovery and shows that some occupations may offer high compensation even when talent is not scarce. In our model, some jobs also offer high compensation despite workers being in excess supply. Terviö's results are explained by employer learning under limited liability. In contrast, in our model there is no learning and limited liability constraints need not to bind.

More generally, our paper adds to the growing theoretical literature on financial-sector labor markets. This literature has focused on issues such as the level and composition of pay, the allocation of talent, and market failures.[7]

The paper is organized as follows. In Section I, we discuss the assumption of complementarity between pay and prestige. In Section II, we introduce our model. We characterize the optimal career path contracts in Section III. In Section IV, we discuss three extensions to the main setup. Section V concludes.

I Preferences over Job Prestige and Pay

In this section, we motivate and describe our assumptions on preferences. We consider agents who have preferences over pay (or consumption) and a non-pecuniary job attribute, which we call *prestige*. Such preferences are represented by a utility function, $u(q, w)$, where and q is prestige and w is the level of pay. We normalize q to be a positive attribute of the job, that is, $u_q > 0$. Our key assumption concerns the sign of the cross-marginal effects, u_{qw}. How should compensation and prestige interact?

The economic literature on status typically assumes that the value of an extra dollar (or consumption) is higher for those with higher status. This assumption is made by Hopkins and Kornienko (2004), Becker, Murphy, and Werning (2005), Auriol and Renault (2008),

[7]Examples include Murphy, Shleifer, and Vishny (1991), Philippon (2010), Glode, Green and Lowery (2012), Thanassoulis (2012), Strobl and Van Wesep (2013), Bond and Glode (2014), Axelson and Bond (2015), Bolton, Santos, and Scheinkman (2016), Glode and Lowery (2016), Acharya, Pagano, and Volpin (2016), Bénabou and Tirole (2016), Biais and Landier (2020), Van Wesep and Waters (2022), and Berk and van Binsbergen (2022).

Ray and Robson (2012), and Auriol, Friebel, and von Bieberstein (2016), among others.[8] Becker, Murphy, and Werning (2005) argue that "*higher status raises the marginal utility of a given level of income partly because persons with high status often have access to clubs, friends, and other "goods" that are costly but are not available to those with low status*" (p. 284). Similarly, higher income increases the marginal utility of status, as argued by Auriol and Renault (2008): "*richer agents care more about their status in the sense that they are willing to exert more effort in order to improve it*" (p. 310).[9]

In his classic study of status among clerical workers, Homans (1953) describes a situation in which workers are assigned to one of two jobs – cash posters and ledger clerks – for which there was a clear ranking of status but no differences in pay. Some workers reported that those in the higher-status job (ledger clerks) "*ought to get just a few dollars more just to show that the job is more important*" (Homans (1953), p. 8). Homans argues that "*by emotional logic if one job is better than another, it ought to get better pay*" (p.9).[10]

More generally, Cassar and Meier (2018) argue that compensation and job "meaning" (broadly interpreted as positive feelings and attitudes towards one's own job) may be substitutes or complements; they conclude that the evidence is mixed on this point. One reason for pay and job meaning to be complements is that pay may affect one's perception

[8]Roussanov (2010) assumes that consumption and status are separable, but status is created by relative wealth, which implies that status concerns are more important for wealthier agents.

[9]By contrast, if visible consumption is a signal of unobserved income, it is possible that poorer individuals choose higher levels of visible consumption in an attempt to gain more status (see Charles, Hurst, and Roussanov (2009)).

[10]The idea that pay and job status need to be balanced is also found in subsequent organizational theory studies (see, e.g., Anderson et al. (1969) and Cook (1975)).

of self-worth: "*the sense of competence could be affected by the wage if wages are interpreted by workers as a signal or recognition of the worker's talent. If financial compensation affects both consumption and work meaning, it suggests the possibility of complementarities between financial pay and job meaning*" (Cassar and Meier (2018), p. 225). In a similar vein, Gardner, Van Dyne, and Pierce (2004) argue that the pay level "*sends an important message to employees about their worth (value) to the organization*" (p.310). There is also evidence that pay affects one's sense of worth at the very top of hierarchies: Edmans, Gosling, and Jenter (2021) provide survey evidence that CEOs attribute meaning to their pay levels and that decreases in pay may be "*detrimental to the CEO's sense of worth*."

We model the complementarity between job prestige and pay by assuming that the marginal value of a dollar in compensation is higher in high-status jobs, $u_{wq} > 0$. Differences in cultures across sectors and occupations can create variation in the strength of the complementarity between prestige and pay. For example, the culture in the financial sector is more geared towards ostentatious consumption and financial rewards. In such a case, it is natural to think of financial performance as a measure of status. Thus, we expect the complementarity between prestige and pay to be particularly strong in the financial sector. In contrast, while IT jobs may be as prestigious as finance jobs, it is possible that they do not exhibit such a strong complementarity between pay and prestige.

II Setup and Benchmark Model

In this section we present our setup and benchmark model.

A Jobs

Let j denote a particular job. When an employer assigns an agent to job j, the job generates a pecuniary benefit to the employer, R_j, and a non-pecuniary benefit to the agent, q_j, which we call prestige. An agent who works in job j and consumes $w_j \geq 0$ enjoys utility $u\left(q_j, w_j\right)$. Similar to Becker, Murphy, and Werning (2005), we assume that the first derivatives of u are strictly positive, $u_w > 0$ and $u_q > 0$, and the second derivatives are $u_{ww} < 0$ and $u_{wq} > 0$. This last assumption implies that w and q are complements, as discussed in the previous section.

We initially assume that job prestige is an exogenous parameter and keep this assumption for most of the analysis. In Section IV, we consider the case in which prestige is a function of the scarcity of a job. In that context, we allow firms to optimally choose the prestige of their jobs.

B Firms and Agents

We consider a sector with a mass F of professional services firms with infinite lifespans. Each firm in the sector is capable of creating several jobs with characteristics (R_h, q_h). We refer to such jobs as *h-jobs* or *high-prestige jobs*; the reason for this terminology will become clear in Section III, where we introduce a second set of jobs. A firm can create a continuum of mass $m_h \in [0, \overline{m}_h]$ of h-jobs.[11]

Labor supply in the sector is inelastic. In each period, a continuum of mass E of identical young agents enters the sector. We assume that young agents are in excess supply

[11]The analysis is similar if we allow firms in the sector to be heterogeneous, that is, if job characteristics are firm-specific, (R_{hi}, q_{hi}).

relative to the maximum number of h-jobs: $E > \overline{m}_h F$ (we endogenize this assumption in Section IV). Agents live for two periods: young age and old age. For simplicity, we assume that agents do not discount their future utility.

We assume that agents are born without an endowment. Similarly, we assume that agents face borrowing constraints and thus cannot borrow against their future income (saving is allowed). These assumptions simplify the analysis but are not necessary for the results. In the Internet Appendix, we analyze the general case of positive endowment and no borrowing constraints.

Agents can work either for a firm in the sector or in an alternative sector, which can also be interpreted as self-employment. We refer to jobs in the alternative sector as *outside jobs*. An outside job has characteristics (R_0, q_0). We assume that $q_0 \leq q_h$ to simplify the exposition; this assumption has no important implication for the analysis (in the Internet Appendix, we also consider the case in which $q_0 > q_h$). When working in an outside job, agents (either young or old) receive an exogenous wage $\underline{w}$ and enjoy utility $u(q_0, w_0)$, where w_0 is the agent's consumption level, which may differ from $\underline{w}$ in equilibrium.[12] We discuss how to endogenize $\underline{w}$ in Section IV.

A firm can offer either a spot contract to agents (young or old) in each period or a long-term contract in which the same agent works for the firm for two consecutive periods. We make two contractibility assumptions. The first is *exclusivity*: an agent cannot sign

[12]We assume that the utility function $u(q, w)$ is the same for all jobs, for simplicity only. That is, utility depends only on consumption and prestige, and not on other job characteristics. Our model can easily accommodate different utility functions for different jobs. In that case, some jobs can exhibit a higher or lower degree of complementarity between pay and prestige.

two employment contracts simultaneously. The second is *one-sided commitment*: firms can commit to any contingent reward structure through bilateral contracts with employees, but an employee has the option to quit at any time.

C Benchmark Model: Equilibrium

Because $\overline{m}_h F < E$, firms do not need to compete for employees for job h; each firm behaves as a monopsonist in the labor market (we will introduce competition among firms in Section III). Because firms are homogeneous, we consider a representative firm. In each period, the firm hires a mass m_h of employees to fill vacancies in job h.

We are interested in the case in which the firm wants to create h-jobs. Thus, we assume the following:

Assumption A1: Job h is *individually desirable*: $u(q_h, R_h) > u(q_0, \underline{w})$.

That is, if an agent enjoys all the benefits of job h, the agent would accept an offer to work in the sector. This assumption implies that the optimal amount of h-jobs created is $\overline{m}_h$.[13] Assumption A1 is always satisfied for some parameters. For example, A1 holds for $R_h > \underline{w}$ (we note, however, that this condition is not necessary for our analysis). Thus, A1 does not impose any constraints on the functional form of the utility function. To save on notation, we define $\underline{u} \equiv u(q_0, \underline{w})$.

Let w be the wage that the firm offers in a spot contract. Because we allow agents to save, wages and consumption in a given period can be different from one another. In particular, wages can be negative, but consumption cannot. The firm maximizes its (per

[13] When prestige is endogenous, the optimal number of prestigious jobs can be an interior solution; see Section IV, Subsection C.

period) profit $\overline{m}_h(R_h - w)$ subject to each employee's participation (IR) and non-negative consumption (NC) constraints. When presenting the results, we focus on interior solutions (thus the NC constraint does not bind), although in some of the proofs we consider the more general case in which consumption could be zero in equilibrium. In the Internet Appendix, we present the complete results and proofs without assuming interior solutions.

The next proposition shows that, in the benchmark model, there is no reason for firms to offer long-term contracts.

Proposition 1. *In the benchmark model, the firm is indifferent between spot contracts and long-term contracts. The optimal spot wage is* $w^a = u^{-1}(\underline{u}; q_h)$.

Proof. The proof is in the Appendix. □

Note that w^a is decreasing in q_h, that is, the employee "pays" for the high-prestige job by accepting a lower wage. This is the well-understood compensating differentials result (e.g., Rosen, 1986).

III Optimal Career Paths

In this section, we expand the benchmark model to allow for the creation of additional jobs. Because job h is individually desirable, firms always create the maximum number of such jobs, that is, $m_h = \overline{m}_h$. The same would be true if firms could create other types of individually desirable jobs. Thus, the interesting case is when firms can create *individually undesirable jobs.*

Suppose that, in addition to h-jobs, firms can create a mass $m_l \in [0, \overline{m}_l]$ of jobs with characteristics (R_l, q_l). Job l is a *low-prestige job*: $q_l < q_0$. We make the following assumption:

Assumption A2: Job l is *individually undesirable*: $u(q_l, R_l - x) + u(q_0, \underline{w} + x) < 2u(q_0, \underline{w})$ for any $x \in [0, R_l]$.

According to A2, an agent would not accept to work in job l even if she is paid R_l, which is the revenue generated by the job, and could optimally save some of the proceeds for future consumption. Assumption A2 thus implies that job l would not be created as a standalone job. However, as we will show, job l may still be created as part of an optimal long-term employment contract, provided that the following assumption holds:

Assumption A3: Jobs h and l are *jointly desirable*: $u(q_l, R_l - x) + u(q_h, R_h + x) > 2u(q_0, \underline{w})$ for any $x \in [0, R_l]$.

Assumption A3 implies that a firm can design a career involving jobs l and h that is both profitable and would be accepted by the agents. A3 implies that an agent would accept a career in which she earns R_l in job l, saves some of the proceeds for future consumption, and then works in job h for wage R_h.

The interesting case is when $\overline{m}_l > \overline{m}_h$, that is, firms can create more l-jobs than h-jobs. In addition, we assume that $\overline{m}_l F > E$, that is, if firms wish to create too many l-jobs, they will have to compete for employees (that is, agents will be in short supply).

A *Long-term Contracts*

Since each firm can create up to $\overline{m}_l$ low-prestige jobs, condition $\overline{m}_h F < E$ is no longer sufficient to guarantee that agents are in excess supply. Define J_i as the (per-period) equilibrium mass of jobs offered to workers in cohort $i \in \{young, old\}$. Market clearing requires $J_i \leq E$.

Firms can offer long-term contracts only to agents who live for two periods, that is, young agents. Let L denote a long-term contract offered to a young agent. We define a long-term contract by $L = (x, m_1, m_{2l}, m_{2h}, w_1, w_{2l}, w_{2h}, w_s)$, where $x \in \{l, h\}$ is the job offered in the first period of employment, m_1 is the mass of jobs offered to young agents in the first period of the contract, m_{2j} is the mass of jobs j that can only be filled by employees who have worked in the firm for one period, w_1 is the first-period wage, w_{2j} is the second-period wage for job $j \in \{l, h\}$, and w_s is a payment to those employees who leave the firm in period 2 (that is, a severance payment). For consistency, we assume that $w_s \geq 0$, because a negative severance payment would be equivalent to assuming that agents can borrow against their future incomes. We relax this assumption in the Internet Appendix.

A spot contract can always be written as a long-term contract. For example, the spot contract described in Section II can be implemented using a long-term contract such as $(h, \overline{m}_h, 0, 0, w^a, 0, 0, 0)$.

Here we discuss some properties of optimal long-term contracts. First, we note that, in equilibrium, optimal contracts must satisfy the aggregate feasibility constraint $J_i \leq E$. Next, we have the following result:

Lemma 1. *Optimality of up-or-out contracts: If a long-term contract strictly dominates spot contracts,*

1. *(**Out**) No old employee is retained in job l, that is, $m_{2l} = 0$, and*

2. *(**Up**) Entry-level jobs are l-jobs ($x = l$) and second-period jobs are h-jobs, which are all reserved for insiders ($m_{2h} = \overline{m}_h$).*

Proof. The proof is in the Appendix. □

Part 1 of the lemma says that, in an optimal contract, firms never ask old employees to work in job l. Since job l is individually undesirable, the only reason for retaining old employees in job l is to decrease compensation costs. However, shifting pay to states in which the employee works in job l never slackens the employee's participation constraints. Thus, firms never assign old employees to l-jobs.

Part 2 of the lemma implies that in any optimal (strictly) long-term contract, the employee is first assigned to the low-prestige job and then promoted (with some probability) to the high-prestige job. The intuition for this result is as follows. In an optimal long-term contract, firms must choose wages that equalize the (consumption) marginal utilities in each job. The complementarity between pay and prestige implies that the firm will pay higher wages for job h. Thus, because both prestige and pay are higher in job h, the employee's utility is higher when working in that job. When the employee is assigned to the low-prestige job first, she is willing to work for less than her utility in the outside job in the first period, expecting to be promoted to the more prestigious job in the second period.

The argument above fails if prestige and pay were instead substitutes, that is, $u_{wq} < 0$. In that case, the firm would no longer pay a higher wage in job h, implying that firms may find it optimal to design careers in which agents first work in the high-prestige job and then move to the low-prestige job.

Because all m_1 young employees who are hired through a long-term contract are initially assigned to the low-prestige job, and there is a measure $\overline{m}_h$ of high-prestige jobs, we interpret $\frac{m_1}{\overline{m}_h} \equiv s$ as a measure of the *span of control,* which is the ratio of low-level to high-level employees.

B Career Path Contracts

We define a *career path contract* as a long-term contract that cannot be replicated by a combination of spot contracts. Our goal is to find conditions under which career path contracts are strictly optimal and thus dominate spot contracts. Because of Lemma 1, we simplify the notation and describe a career path contract as (m_l, w_1, w_2, w_s), where m_l is the mass of young agents who are offered this contract, and (w_1, w_2, w_s) are the *career wages*: w_1 is the wage in job l in period 1, w_2 is the wage in job h in period 2, and w_s is the severance payment. When firms offer career path contracts, we call an employee in the first period of her contract an "associate" and an employee in the second period a "partner."[14]

With career path contracts, it is possible for firms to hire a mass $m_l \geq \overline{m}_h$ of young agents and promote just a subset of them to the the high-prestige job. When the firm hires m_l young employees, these employees rationally expect to be promoted to the high-prestige job with probability $p = \frac{\overline{m}_h}{m_l} \leq 1$. The aggregate demand for young agents is $J_{young} = m_l F$. Because it is now possible for young agents to be in short supply, we need to solve for the equilibrium in the entire sector. In equilibrium, both agents and firms behave optimally taking the strategies of the other players as given.

We assume that all firms simultaneously offer contracts (m_l, w_1, w_2, w_s) to young agents, who then choose which offers to accept. With a long-term contract, the firm can replicate the agents' optimal saving decisions. Thus, without loss of generality, we assume that the

[14]For convenience, we use the term "partner" to refer to the holder of a prestigious job. In our model, both associates and partners are employees of the firm; the term "partner" is not meant to imply that the firm is organized as a partnership.

firm chooses the employees' consumption levels in each period, subject to the employees' optimal saving decisions. Because the employees' optimal saving policy maximizes joint surplus, firms do not need to consider this policy as a constraint on their maximization problem.

Let U denote the lifetime utility of a young agent. A symmetric equilibrium in this economy is a vector $(U^*, m_l^*, w_1^*, w_2^*, w_s^*, p^*)$ such that:

(i) Labor markets clear: $E \geq m_l^* F$.

(ii) Agents have rational beliefs about their promotion probabilities: $p^* = \frac{\overline{m}_h}{m_l^*}$.

(iii) Agents optimally choose whether to work in the sector or in the outside job, which implies $U^* = \max\left\{u(q_l, w_1^*) + p^* u(q_h, w_2^*) + (1-p^*)u(q_0, \underline{w} + w_s^*), 2u(q_0, \underline{w})\right\}$.

(iv) Given U^*, vector $(m_l^*, w_1^*, w_2^*, w_s^*)$ maximizes firms' period profits:

$$\max_{m_l \in [\overline{m}_h, \overline{m}_l], w_1 \geq 0, w_2 \geq 0, w_s \geq 0} \pi = m_l \left(R_l - w_1\right) + \overline{m}_h \left(R_h - w_2\right) - \left(m_l - \overline{m}_h\right) w_s \tag{1}$$

subject to the following participation constraints:

$$\begin{cases} u(q_l, w_1) + \frac{\overline{m}_h}{m_l} u(q_h, w_2) + \left(\frac{m_l - \overline{m}_h}{m_l}\right) u(q_0, \underline{w} + w_s) \geq U^* & IR_1 \\ u(q_h, w_2) \geq u(q_0, \underline{w} + w_s) & IR_2 \end{cases} . \tag{2}$$

(v) There is no profitable deviation for firms: if $u(q_l, w_1^*) + p^* u(q_h, w_2^*) + (1-p^*)u(q_0, \underline{w} + w_s^*) > 2u(q_0, \underline{w})$, then it must be that $E = m_l^* F$.

To understand Condition (v), suppose that $u(q_l, w_1^*) + p^* u(q_h, w_2^*) + (1-p^*)u(q_0, \underline{w} + w_s^*) > 2u(q_0, \underline{w})$. This condition implies that all agents employed in the sector earn rents. If $E > m_l^* F$, some agents work outside the sector and enjoy no rents. Thus, a firm can choose to hire an additional mass $\epsilon > 0$ of agents and offer a contract $(m_l^* + \epsilon, w_1^*, w_2^*, w_s^*)$, with $\epsilon > 0$ sufficiently small so that the contract is accepted. This would increase the profit of the firm and is therefore a profitable deviation.

To solve for the equilibrium, we first prove the following result:

Lemma 2. *In an optimal career path contract, the lifetime participation constraint (IR_1) binds and the second-period participation constraint (IR_2) does not bind.*

Proof. The proof is in the Appendix. □

The lifetime participation constraint binds because firms do not need to leave rents to employees. With career path contracts, firms can extract rents from agents by creating individually undesirable jobs and hiring more agents to fill such positions. The second-period participation constraint does not bind because the second-period job must give higher utility to the agent than the entry-level job.

We can now characterize the optimal career path contract. Two cases may arise in equilibrium: *safe career paths*, that is, young employees are always promoted ($m_l^* = \overline{m}_h$), or *risky career paths*, in which some employees may not be promoted ($m_l^* > \overline{m}_h$). We first characterize these two types of equilibria and then prove the existence of a unique equilibrium. We also establish conditions under which this unique equilibrium implies safe or risky career paths.

B.1 Safe career paths

Consider first a safe career path contract, that is, a contract in which $m_l^* = \overline{m}_h$. In this case, the labor market is always slack. Define the function

$$w_2(w_1) = u^{-1}\left(2\underline{u} - u(q_l, w_1); q_h\right). \tag{3}$$

Function $w_2(w_1)$ corresponds to the second-period wage that would make the lifetime participation constraint bind. We can rewrite the firm's problem (assuming $m_l^* = \overline{m}_h$) as

$$\max_{w_1 \geq 0} \pi = \overline{m}_h \left(R_l - w_1 + R_h - w_2(w_1)\right). \tag{4}$$

The following proposition describes the unique solution to this problem.

Proposition 2. *The optimal safe career path contract is uniquely given by* $L^b = \left(m_l^b, w_1^b, w_2^b, w_s^b\right)$*, where* $m_l^b = \overline{m}_h$*,* $w_s^b = 0$*,* $w_2^b = w_2(w_1^b)$*, and* w_1^b *is given by* $u_w(q_l, w_1^b) = u_w(q_h, w_2(w_1^b))$*. In the optimal contract,* $w_2^b > w_1^b$*.*

Proof. The proof is in the Appendix. □

This proposition fully characterizes the optimal long-term contract under the assumption of safe promotion. Young agents work in an undesirable job at the start of their careers and receive low pay. Older employees are promoted with probability one to better jobs and earn higher wages. In the optimal contract, wages are set to equalize the marginal utilities across the two jobs. This happens because agents benefit from smoothing consumption intertemporally. Because the marginal utility of income is increasing in job prestige, wages increase over time.[15]

To illustrate the intuition for why safe career paths can be optimal, we consider a simplified example with a risk-neutral utility function $u(q,w) = q + w + \theta q w$, $q_l = q_0 = 1$, and $q_h > 1$. Note that $\theta = u_{wq} > 0$ is a measure of complementarity strength. In this case, the optimal spot contract (assuming an interior solution) is $w^a = \frac{\underline{w}(1+\theta)+1-q_h}{1+\theta q_h}$. Suppose instead that the firm offers a safe career path with wages (w_1^b, w_2^b). Because of the linearity of the utility function, $q_h > 1$ implies that the marginal value of a dollar is always higher in job h, implying that $w_1^b = 0$ (because the utility function is linear, at least one of the wages must be a corner solution). Thus, from the lifetime participation constraint, it follows that $w_2^b = \frac{2\underline{w}(1+\theta)+1-q_h}{1+\theta q_h}$. The safe career path contract dominates the spot contract if $R_h + R_l - w_2^b \geq R_h - w^a$, which is equivalent to $\Delta \equiv w_2^b - w^a = \frac{\underline{w}(1+\theta)}{1+\theta q_h} < R_l$. Because $\frac{d\Delta}{d\theta} < 0$, an increase in the degree of complementarity increases the relative profitability of the safe career path contract.

If instead $\theta \leq 0$ (that is, the utility function is submodular), prestige and pay are substitutes. In this case, it can be shown that in an optimal long-term contract the agent is

[15] The notion that pay and prestige are often bundled in a job is an old one and not unique to the finance industry. In his classic study on bureaucracy, Downs (1967) asserts that "*power, income, and prestige are concentrated at the top of the hierarchy*" (p. 58). In the context of careers in law, Phillips (2001) notes that "*promotion to partner is clearly a substantial increase in both the associate's pecuniary and non-pecuniary rewards*" (p. 1066). Kordana (1995) refers to the bonus received by partners as consisting of "*the security, prestige, and large income that partnership confers*" (p. 1911).

initially assigned to job h at zero wage. We then have:

$$\Delta = \frac{\underline{w}(1+\theta q_h - \theta)}{1+\theta q_h} - \frac{\theta(1-q_h)^2}{(1+\theta q_h)(1+\theta)} \geq \underline{w}. \tag{5}$$

Because Assumption A2 implies $\underline{w} > R_l$, we conclude that the spot contract always dominates the safe career path contract when $\theta \leq 0$. This example thus illustrates the importance of the complementarity between prestige and pay for the optimality of career path contracts.

When $\theta > 0$, a safe career path contract dominates the spot contract if and only if $q_h \geq \frac{\underline{w}(1+\theta) - R_l}{\theta R_l}$. That is, if job h is sufficiently prestigious, the firm is better off offering the employee a long-term contract, in which pay increases over time. An increase in job prestige implies that the firm needs to pay less to move from a spot contract to a safe career path contract.

The next proposition shows that this result holds more generally. For expositional simplicity only, we now assume that $\lim_{q\to\infty} u(q,0) \geq 2\underline{u}$. In the Internet Appendix, we present a version of this proposition when this assumption does not necessarily hold.

Proposition 3. *There exists a unique threshold q' such that the safe career path dominates the spot contract if and only if $q_h \geq q'$.*

Proof. The proof is in the Appendix. □

As job h becomes more prestigious, the firm can reduce its wage bill (w^a in the spot contract and $w_1^b + w_2^b$ in the safe career path contract). Because $w_2^b \geq w^a$, the employee's marginal utility in job h is lower in the career path contract. Thus, the firm has more scope to reduce the wage in the safe career path contract than in the spot contract (as we can also see in the example above). Thus, career path contracts become relatively more profitable to the firm as the prestige of job h increases.

B.2 Risky Career Paths

We now consider the case where $m_l^* > \overline{m}_h$, that is, the optimal contract is a risky career path contract. Because the lifetime participation constraint must bind (see Lemma 2), for a given level of lifetime outside utility U we have

$$u(q_l, w_1) + \frac{\overline{m}_h}{m_l} u(q_h, w_2) + \left(\frac{m_l - \overline{m}_h}{m_l} \right) u(q_0, \underline{w} + w_s) = U. \tag{6}$$

Suppose that the firm changes w_1 by ϵ and w_2 by $-\epsilon \frac{m_l}{\overline{m}_h}$. Such a change has no impact on the firm's expected profit. Its effect on an employee's lifetime utility is

$$u_w(q_l, w_1)\epsilon - \frac{\overline{m}_h}{m_l} u_w(q_h, w_2) \frac{m_l}{\overline{m}_h} \epsilon = [u_w(q_l, w_1) - u_w(q_h, w_2)]\, \epsilon. \tag{7}$$

Thus, unless $u_w(q_l, w_1) = u_w(q_h, w_2)$, there is a profitable deviation for the firm that increases its profit while satisfying the lifetime participation constraint. The same argument applies for $u_w(q_0, \underline{w} + w_s)$, which implies the following lemma:

Lemma 3. *In an equilibrium where $m_l^* > \overline{m}_h$, all marginal utilities (with respect to consumption) must be equal:*

$$u_w(q_l, w_1) = u_w(q_h, w_2) = u_w(q_0, \underline{w} + w_s). \tag{8}$$

The firm offers a career path contract that equalizes the marginal utilities of consumption across time and states. Because firm profit is linear in wages while the agent's utility is concave, the optimal contract offers the agent both consumption smoothing and risk sharing benefits.

Having shown that marginal utilities must be equal in the optimal contract, we now establish the conditions that determine the optimal career wages. Suppose that (m_l, w_1, w_2, w_s) is an optimal contract. Rewrite the lifetime participation constraint as:

$$\frac{\overline{m}_h}{m_l}\left[u(q_h, w_2) - u(q_0, \underline{w} + w_s)\right] = U - u(q_l, w_1) - u(q_0, \underline{w} + w_s). \tag{9}$$

The left-hand side is an employee's net expected prize (in utility) from winning the promotion. The right-hand side is an employee's net cost from accepting a career path contract. Suppose the firm hires an additional employee without changing w_1 and w_s. To keep the lifetime participation constraint satisfied, the net expected prize must remain constant and equal to $U - u(q_l, w_1) - u(q_0, \underline{w} + w_s)$. Thus, each new employee costs the firm $U - u(q_l, w_1) - u(q_0, \underline{w} + w_s)$ in utility terms, which can be converted to dollar terms by dividing it by $u_w(q_l, w_1)$ (note that all marginal utilities are the same in equilibrium).

The marginal increase in profit per (unit mass of) employee is $R_l - w_1 - w_s$. Note that the marginal profit does not depend on w_2 because the number of top positions is fixed at $\overline{m}_h$. The marginal profit also does not depend on m_l because there are constant returns to scale, that is, the marginal product of an employee in job l, R_l, is independent of the number of employees.

Thus, the equalization of marginal costs and benefits implies

$$\frac{U - u(q_l, w_1) - u(q_0, \underline{w} + w_s)}{u_w(q_l, w_1)} = R_l - w_1 - w_s, \tag{10}$$

otherwise there is a profitable deviation for the firm. This result and the previous lemma imply that the optimal values for w_1 and w_s are independent of w_2 and m_l:

Lemma 4. *In an equilibrium where $m_l^* > \overline{m}_h$, for any given U there is a unique optimal pair of entry-level wage, $w_1(U)$, and severance pay, $w_s(U)$, which are given by*

$$u_w(q_l, w_1(U)) = u_w(q_0, \underline{w} + w_s(U)) \tag{11}$$

and

$$\frac{U - u(q_l, w_1(U)) - u(q_0, \underline{w} + w_s(U))}{u_w(q_l, w_1(U))} = R_l - w_1(U) - w_s(U). \tag{12}$$

Proof. The proof is in the Appendix. □

The next lemma characterizes the optimal w_2.

Lemma 5. *In an equilibrium where $m_l^* > \overline{m}_h$, there is a unique optimal $w_2(U)$, where*

$$u_w(q_h, w_2(U)) = \frac{U - u(q_l, w_1(U)) - u(q_0, \underline{w} + w_s(U))}{R_l - w_1(U) - w_s(U)}. \tag{13}$$

Proof. The proof is in the Appendix. □

Because prestige and compensation are complements, the marginal utility of consumption is higher in job h, and thus the optimal contract assigns a higher consumption level to partners (that is, $w_2(U) > w_1(U)$). This implies that wages increase over time for those who remain in the firm.

To complete the characterization of the equilibrium, we now proceed in steps. First, we consider the case of a *slack labor market*; that is, the equilibrium is such that $m_l^* F < E$. This case implies (from (v)) that $U^* = 2u(q_0, \underline{w})$. In this case, all firms behave as if they were monopsonists in the labor market. Second, we consider the case of a *tight labor market*, that is, $m_l^* F = E$. In a tight labor market, firms actively compete with each other. Finally, we characterize the conditions under which each case (a slack or tight market) is the unique equilibrium.

B.3 Equilibrium in a Slack Labor Market

Here we characterize the unique equilibrium when career paths are optimal and the labor market is slack (that is, an equilibrium such that $m_l^* F < E$).[16] If a risky career path contract is optimal, we have that

$$\frac{\overline{m}_h}{m_l^*} = \frac{2\underline{u} - u(q_l, w_1(2\underline{u})) - u(q_0, \underline{w} + w_s(2\underline{u}))}{u(q_h, w_2(2\underline{u})) - u(q_0, \underline{w} + w_s(2\underline{u}))} = p^* < 1. \tag{14}$$

The next proposition follows directly from equation (14), Lemma 4, and Lemma 5.

Proposition 4. *The optimal risky career path contract in a slack labor market is uniquely given by* $(m_l^c, w_1^c = w_1(2\underline{u}), w_2^c = w_2(2\underline{u}), w_s^c = w_s(2\underline{u}))$ *where*

$$m_l^c = \overline{m}_h \frac{u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)}{2\underline{u} - u(q_l, w_1^c) - u(q_0, \underline{w} + w_s^c)}. \tag{15}$$

The next proposition shows when the risky career path contract is optimal.

Proposition 5. *In a slack labor market, there exists q'' such that the risky career path contract dominates both the spot and the safe career path contracts if and only if $q_h \geq q''$.*

[16]This condition can be written as $\max\left\{\frac{u(q_h, w_2(2\underline{u})) - u(q_0, \underline{w} + w_s(2\underline{u}))}{2\underline{u} - u(q_l, w_1(2\underline{u})) - u(q_0, \underline{w} + w_s(2\underline{u}))}, 1\right\} < \frac{E}{\overline{m}_h F}$.

Proof. The proof is in the Appendix. □

Proposition 5 implies that if job h is sufficiently prestigious, the optimal contract is a risky career path contract. Note that, in a risky career path contract, the firm hires more young agents than necessary to fill positions in the high-prestige job. Such agents initially work in the low-prestige job (that is, as associates) and, then, only some of them are promoted to the more prestigious job (that is, they become partners).

Propositions 4 and 5 have several novel implications, which we summarize as corollaries.

Corollary 1. *When risky career paths are optimal, firms with more prestigious jobs (that is, jobs with higher q_h) have steeper pay profiles (that is, the difference $w_2^c - w_1^c$ is larger), wider spans of control, and lower probability of promotion.*

As q_h increases, the marginal rate of substitution between consumption in periods 2 and 1 decreases, making consumption in period 2 relatively more valuable at the margin. Thus, as q_h increases, the wage in period 2 also increases. Because the wage in the first period is independent of q_h, higher q_h implies a steeper pay profile. As both q_h and w_2^c increase, employees enjoy higher utility when promoted to the prestigious job and, thus, the firm can offer a contract with a lower probability of promotion and a wider span of control while still satisfying the employees' participation constraints.

Empirically, we can interpret changes in q_h in three non-mutually exclusive ways: as a change in the prestige of the top job, a change in the prestige of the sector relative to other sectors, or a change in the prestige of a firm relative to other firms in the same sector.

First, keeping q_l constant, an increase in q_h implies an increase in the difference in prestige between the top job and the entry-level job. Testing such within-firm predictions is challenging because of the need of identifying multiple career paths within the same company. Some suggestive evidence can be found in law firms. Kordana (1995) shows direct evidence that the span of control (the ratio of associates to partners) varies across departments in a given law firm. Corporate law departments have wider spans than litigation departments, which then have wider spans than tax departments. This variation could be explained by differences in status across areas of law. Sandefur (2001) provides evidence that activities involving corporate and litigation matters are more prestigious than those involving individual clients, such as tax matters.

Second, keeping q_0 constant, an increase in q_h implies an increase in the difference in prestige between firms in the sector and firms in the outside sector. Consistent with the view that the financial sector has a large number of prestigious jobs, Ellul, Pagano, and Scognamiglio (2020) show that the typical career profile in finance has a steeper slope than non-finance careers.

Third, if we allow firms in the sector to be heterogeneous and have different q_{hi}, an increase in q_{hi} implies an increase in firm i's prestige. In their study of security analysts, Hong and Kubik (2003) highlight that "*security analysts' wages at top-tier brokerage houses are substantially higher than at lower status houses. (...) While measures of prestige are somewhat arbitrary, market participants readily agree that only a small number of traditional banking powerhouses such as Goldman Sachs or Merrill Lynch belong in the top tier*." Bidwell et al. (2015) show related evidence that more prestigious investment banks have steeper career profiles.[17]

[17] Sauer (1998) estimates a structural model of law careers and finds that the probability of promotion from associate to partner is lower at elite law firms (defined as larger firms) than at non-elite law firms.

Corollary 2. *When risky career paths are optimal, firms with better entry-level jobs (that is, jobs with higher q_l and R_l) have higher career wages, wider spans of control, and lower probability of promotion.*

Higher q_l or R_l decrease the ratio of the marginal cost to the marginal benefit of hiring an additional employee. Thus, firms with higher q_l or R_l are willing to create more low-prestige jobs and also to pay more to attract additional employees.

Corollary 3. *When risky career paths are optimal, a more desirable outside job is associated with lower career wages, narrower spans of control, and higher probability of promotion.*

Higher $\underline{u}$ increases the ratio of the marginal cost to the marginal benefit of hiring an additional employee. Thus, when agents have better outside options, firms create fewer low-prestige jobs and are less willing to increase pay to attract additional employees.

B.4 Equilibrium in a Tight Labor Market

Here we characterize the unique equilibrium in the case where the labor market is tight (that is, an equilibrium such that $m_l^* F = E$). In this case, the employees' outside utility is endogenously determined in equilibrium. For simplicity, we focus on characterizing the case in which the equilibrium is symmetric.[18]

Proposition 6. *There exists* $\widehat{q}$ such that if $q_h > \widehat{q}$, *the labor market is tight. If the equilibrium is symmetric, the optimal contract is uniquely given by* $(m_l^d = \frac{E}{F}, w_1^d = w_1\left(U^d\right), w_2^d =$

[18] In a tight labor market, an asymmetric equilibrium could arise where some firms offer career path contracts while others offer spot contracts. Whether the unique equilibrium is symmetric or asymmetric depends on the functional form of $u(q, w)$.

$w_2\left(U^d\right), w_s^d = w_s\left(U^d\right))$ *where*

$$U^d = u(q_l, w_1^d) + u\left(q_0, \underline{w} + w_s^d\right) + \frac{\overline{m}_h F}{E}(u(q_h, w_2^d) - u\left(q_0, \underline{w} + w_s^d\right)). \tag{16}$$

Proof. The proof is in the Appendix. □

Proposition 6 shows that, as job h becomes more prestigious, firms are willing to create more low-prestige jobs until they become constrained by the supply of workers. This happens at $q_h = \widehat{q}$. For values of $q_h > \widehat{q}$, the number of low-prestige jobs is determined by the ratio of the supply of young employees and the number of firms in the sector. In this equilibrium, firms can no longer extract all surplus from employees, who now enjoy rents (relative to the outside job). That is, as the top jobs in a sector become more prestigious, competition limits the amount of surplus that firms can extract from associates through risky career path contracts.

The next result follows directly from Proposition 6.

Corollary 4. *In an equilibrium where the labor market is tight, an increase in the relative supply of employees ($\frac{E}{\overline{m}_h F}$) widens the span of control and increases career wages.*

An increase in the relative supply of employees is analogous to a decrease in the employees' outside option. From Corollary 3, we know that in a slack labor market, a decrease in the outside utility widens the span of control and increases career wages. The same forces are at work here.

A perhaps unexpected result is that more competition among firms decreases the wages paid to employees. An increase in the sector demand for employees forces firms to hire fewer associates. From an associate's perspective, the lower wage upon promotion is offset by a higher probability of being promoted.

As the labor market tightens, employees enjoy more rents, which is stated formally in the next corollary:

Corollary 5. *If $q_h > \widehat{q}$, employees' lifetime utility weakly increases with the prestige of job h.*

If the labor market is tight, workers in the sector enjoy a "sector premium." Differently from incentive-based explanations for sector premia (e.g., Axelson and Bond, 2015), in our model this premium comes from endogenous scarcity of workers. Such scarcity is manufactured, in the sense that firms create jobs solely as mechanism for extracting rents from workers.

The next corollary summarizes the optimal equilibrium contracts:

Corollary 6. *If $q_h \leq \widehat{q}$, the labor market is slack and the equilibrium contract is: (i) a spot contract if $q_h \leq \min\{q', q''\}$; (ii) a safe career path contract if $q_h \geq q'$ and $q_h \leq q''$; (iii) a risky career path contract if $q_h > q''$. If $q_h > \widehat{q}$, the labor market is tight and the optimal contract is a risky career path.*

IV Extensions

In this section, we consider three natural extensions to the basic model: (i) we endogenize the number of firms in the sector, (ii) we discuss the determination of wages in the outside sector and its implications for the allocation of labor, and (iii) we endogenize job prestige.

A Equilibrium with Endogenous Entry

Here we endogenize the mass of firms that choose to enter the sector. As the number of firms in the sector increases, competition in both the market for associates and the market for professional services intensifies. Thus, we can study the effects of competition in the product market on labor market outcomes.[19]

We assume that the degree of competition in the product market affects R_h, but not R_l (for simplicity). A natural measure of the intensity of competition is the number of firms in this market, F. In addition, we introduce parameter ρ, which can be interpreted as a measure of the degree of product substitutability or an indicator of the mode of competition (e.g., price versus quantity setting). We assume that that the competition parameters affect R_h, thus we write $R_h = R(F, \rho)$ and assume that $\frac{\partial R(F,\rho)}{\partial F} < 0$ and $\frac{\partial R(F,\rho)}{\partial \rho} < 0$.

Suppose that at the beginning of the game ($t = 0$), firms need to pay a once-and-for-all entry cost $\iota > 0$, after which they can start operating at $t = 1$ in perpetuity. The mass of firms that enter the sector, F, is now an endogenous variable. Because $\iota > 0$, it must be that $\overline{m}_h F < E$ in equilibrium (otherwise a firm earns zero profit after entering), thus our original assumption that $\overline{m}_h F < E$ is now endogenized. If firms have a discount rate of r, then the equilibrium number of firms in the sector, F^*, is given by the zero-profit

[19]Hart (1983), Scharfstein (1988), Schmidt (1997), Raith (2003), and Golan, Parlour, and Rajan (2015) develop models of the effect of product market competition on internal efficiency through the design of incentive contracts; Ferreira and Kittsteiner (2016) model the effect of competition on internal efficiency through the choice of business strategies.

condition:[20]

$$R(F^*,\rho) = w_2^* + \frac{w_1^*}{p^*} + \frac{w_s^*(1-p^*)}{p^*} - \frac{R_l}{p^*} + \frac{r\iota}{\overline{m}_h}. \tag{17}$$

If the labor market is slack, marginal changes in the competition parameters have no effect on the optimal career path contracts. As q_h increases, more firms enter the market, and each incumbent firm wants to hire more employees. Thus, there exists $q(\rho,\iota)$ such that if $q_h > q(\rho,\iota)$, the labor market is tight, that is, $m_l^c F > E$. Formally, this result follows from the fact that m_l^c increases with q_h and that $\frac{R_l}{p^c} - w_2^c - \frac{w_1^c}{p^c} - \frac{w_s^c(1-p^c)}{p^c}$ also increases with q_h, which imply that F^*, defined as $R(F^*,\rho) = w_2^* + \frac{w_1^*}{p^*} + \frac{w_s^*(1-p^*)}{p^*} - \frac{R_l}{p^*} + \frac{r\iota}{\overline{m}_h}$, increases with q_h.

The next proposition shows the impact of competition on wages.

Proposition 7. *If $q_h > q(\rho,\iota)$ (that is, the labor market is tight), career wages*

i) increase with the cost of entering the sector, ι; and

ii) increase with the degree of competition among incumbents in the product market, ρ.

Proof. The proof is in the Appendix. □

The competitiveness of an industry has two dimensions: the threat of entry and the rivalry among incumbents. Parameters ι and ρ capture these two dimensions. Proposition 7 shows that these different notions of competition have opposing effects on career wages: lower entry costs decrease career wages, while tougher competition among incumbents increases career wages.

[20]If the zero-profit condition is such that all incumbent firms offer spot contracts, for simplicity we set $p = 1$ and $w_1 = R_l = 0$, so that the condition below includes that case.

B The Allocation of Labor across Sectors

Here we discuss the implications of career path contracts for the allocation of labor across sectors. An outside firm that hires a worker at wage $\underline{w}$ has profit per worker equal to $R_0 - \underline{w}$. If we assume that outside firms are in excess supply, their profits will be zero, which implies $\underline{w}^* = R_0$ in equilibrium.

It is possible that jobs in the outside sector are more socially valuable than some of the jobs in the primary sector. For example, Lockwood, Nathanson, and Weyl (2017) argue that high-paying professions (such as finance) have negative externalities, while other sectors (such as technology) have positive externalities. Similarly, Axelson and Bond (2015) consider the case in which workers are more productive in one sector but are "lured" by high-paying jobs in another sector, in which they are less productive.

Let $R_e \geq 0$ denote the social externality created by each employee working in the outside sector. That is, R_e is a non-contractible payoff enjoyed by some unspecified agents in the economy. In what follows, we assume that $R_h > R_0 + R_e$, so that filling all job-h vacancies is socially efficient. Suppose that we are in an equilibrium with risky career path contracts (that is, $q_h > q''$) in which the labor market in the primary sector is slack. Then we have the following result:

Proposition 8. *If $R_l - w_1^c - w_s^c \leq R_e$, in a risky career path equilibrium the primary sector is inefficiently large.*

Proof. The proof is in the Appendix. □

If the outside sector has high social value but low payoff contractibility (that is, high R_e), then the risky career path equilibrium may be socially inefficient. Intuitively, in such a case, the outside sector cannot compete with the primary sector by increasing wages, thus talent flows from the outside sector to the less socially-valuable primary sector (as in Axelson and Bond (2015), talent is lured to the high-paying sector). Note that misallocation of labor can only occur when some jobs are sufficiently prestigious (that is, when q_h is sufficiently high). A consequence of this analysis is that sectors with prestige-driven career path contracts can be inefficiently large.

C *Job Scarcity and Prestige*

We now consider the case in which job prestige is determined by the scarcity of the job. Specifically, we assume that the quality of the job is such that $q_h = f(m_h)$, with $f_{m_h} < 0$. Now, firms do not necessarily want to create the maximum number of high-prestige jobs because there is a trade-off: more h-jobs increase profits in the product market but reduce profits in the "market for jobs." Our analysis so far can be interpreted as the case in which the high-prestige job is very productive and, therefore, firms always create the maximum number of these jobs (that is, we are always in a corner solution where $m_h^* = \overline{m}_h$).

Suppose that $f(\overline{m}_h) \geq q''$, which is a sufficient condition for risky career path contracts to be optimal. For simplicity, assume that we are in the case of a slack labor market. We now write a career path contract as $(m_l, m_h, w_1, w_2, w_s)$. Because the optimal w_1 and w_s are independent of both q_h and m_h, we know that their optimal values will be w_1^c and w_s^c as given in Proposition 4. By contrast, because m_h affects q_h, m_h affects both w_2 and m_l. To find the optimal m_h, we solve the following program:

$$\max_{m_h \in [0, \overline{m}_h], w_2, m_l} \pi = m_l \left(R_l - w_1^c\right) + m_h \left(R_h - w_2\right) - \left(m_l - m_h\right) w_s^c \tag{18}$$

subject to

$$u_w(f(m_h), w_2) = \frac{2\underline{u} - u(q_l, w_1^c) - u(q_0, \underline{w} + w_s^c)}{R_l - w_1^c - w_s^c} \tag{19}$$

$$m_l = \max\left\{ m_h \frac{u(f(m_h), w_2) - u(q_0, \underline{w} + w_s^c)}{2\underline{u} - u(q_l, w_1^c) - u(q_0, \underline{w} + w_s^c)}, \overline{m}_l \right\}. \tag{20}$$

Using (19) and (20), we can rewrite (18) as a function of m_h only. A solution exists because the objective function is continuous in m_h and $[0, \overline{m}_h]$ is a compact set. When the solution is interior, we can prove the following result:

Proposition 9. *Jobs with higher R_h are less prestigious, have narrower spans of control, and lower wages for job h.*

Proof. The proof is in the Appendix. □

Firms can produce prestige by reducing the number of h jobs. When R_h is high (low), the cost of producing prestige is high (low). Hence, when firms are endowed with scarce but relatively unproductive jobs (that is, lower R_h) they may prefer to restrict the supply of such jobs in order to increase their prestige, thus extracting more surplus from employees who compete for such jobs.

The three extensions discussed in this section can be combined to generate further predictions. If a sector becomes more competitive (e.g., a lower cost of entry), more firms enter the sector and R_h goes down. Then, firms reduce the number of h-jobs in order to make them relatively more prestigious. As a consequence, wages in those top jobs increase and the span of control widens. If the outside sector is more socially valuable than the primary sector but has low payoff contractibility, the primary sector may become inefficiently large when barriers to entry are reduced.

V Concluding Remarks

Our paper starts with the assumption that the top-level jobs in financial firms offer significant non-pecuniary benefits such as prestige and status. Our model then shows that firms design optimal “up-or-out” career structures such that, when an employee is promoted, she enjoys an increase in both income and prestige. Firms with more prestigious jobs have steeper pay profiles and wider spans of control. As firms hire more workers, the labor market eventually becomes tight and firms become constrained in how much surplus they can extract from workers. When more firms enter the sector, more competition for workers narrows the span of control and reduces wages. Finally, we show that, when prestige is endogenous, jobs that are less productive are more prestigious.

Our model has several new empirical predictions linking prestige to pay, career structures, and the span of control. Some of these predictions can also be explained by alternative theories. For example, a positive relation between prestige and span of control is also compatible with a model in which a more intense screening process can increase the prestige of a job. This alternative theory provides a reverse causality explanation for the same correlation. Similarly, higher pay may increase the prestige of a job. In general, testing the model’s predictions requires finding exogenous variation in prestige levels between jobs within a firm, between sectors or industries, or between firms. When such exogenous variation can be found (as, e.g., in Focke, Maug, Niessen-Ruenzi (2017)), one can separate the model’s predictions from alternative explanations.

Our model identifies the differences in job prestige as an important determinant of employment levels across sectors. Because firms design employment contracts to “sell” career paths to young associates, sectors with more prestigious top-level jobs attract more associates in equilibrium. If a job becomes more prestigious over time, employment in that sector will also increase. Our model shows that sectors with prestige-driven career path contracts may become inefficiently large. This occurs when such sectors divert labor away from other sectors with high social value but low payoff contractibility (that is, sectors with positive externalities).

Appendix: Proofs

PROOF OF PROPOSITION 1: We allow young agents to save $f \geq 0$, thus $w - f$ is the agent's consumption when young. We first show that the agent's optimal saving policy is to set $f = 0$.

Consider first the case in which an agent works for the firm when young and then works in the outside job when old. The firm maximizes its (per period) profit subject to each employee's participation (IR) and optimal savings decision (OS):

$$\max_{w} \overline{m}_h(R_h - w) \tag{A.21}$$

subject to

$$\begin{cases} u(q_h, w - f) + u(q_0, \underline{w} + f) \geq 2u(q_0, \underline{w}) & \text{IR} \\ f = \arg\max_{x \in [0,w]} u(q_h, w - x) + u(q_0, \underline{w} + x) & \text{OS} \end{cases}. \tag{A.22}$$

The IR constraint must bind. If $f > 0$, then $u(q_h, w - f) < u(q_0, \underline{w}) < u(q_0, \underline{w} + f)$, which implies that $w - f < \underline{w} + f$ because $q_h \geq q_0$. Because $-u_w(q_h, w - f) + u_w(q_0, \underline{w} + f) < 0$, the agent prefers not to save and thus $f = 0$.

Now, consider the case in which an agent works in the outside job when young and then works for the firm when old. The principal's program is:

$$\max_{w} \overline{m}_h (R_h - w) \tag{A.23}$$

subject to

$$\begin{cases} u(q_h, w+f) \geq u(q_0, \underline{w}+f) & \text{IR} \\ f = \arg\max_{x \in [0,\underline{w}]} u(q_0, \underline{w}-x) + u(q_h, w+x) & \text{OS} \end{cases} . \tag{A.24}$$

Because the IR constraint must bind, $q_h \geq q_0$ implies $w \leq \underline{w}$, and the agent's lifetime utility is $u(q_0, \underline{w} - f) + u(q_h, w + f) = u(q_0, \underline{w} - f) + u(q_0, \underline{w} + f)$. The agent chooses her optimal savings to maximize her lifetime utility. Equalization of the marginal utilities in each period implies that $u(q_0, \underline{w} - f) + u(q_0, \underline{w} + f)$ is maximized at $f = 0$. Intuitively, the agent does not want to save because saving reduces the wage the firm is willing to pay in the second period. We conclude that, because agents (optimally) do not save, the firm is indifferent between hiring young or old agents with a spot contract.

Finally, in a long-term contract where the same agent works for the firm for two periods, consumption will be the same in both periods, thus we again have that $f = 0$. Thus, the firm is indifferent between spot contracts and long-term contracts.

We can now characterize the optimal spot contract. If there is no savings, the IR constraint is reduced to $u(q_h, w) \geq u(q_0, \underline{w}) = \underline{u}$. The firm will choose the lowest possible wage for which the IR constraint is satisfied. The optimal wage is uniquely defined by $w^a = u^{-1}(\underline{u}; q_h)$; the existence of w^a is implied by A1 and $u_w > 0$.

PROOF OF LEMMA 1: We first show that Assumption A2 implies that:

$$u(q_l, R_l + x) < u(q_0, \underline{w} + x) \text{ for any } x \geq 0. \tag{A.25}$$

Note that if $R_l \leq \underline{w}$ then, because $q_l < q_0$, (A.25) holds. Now suppose that $R_l > \underline{w}$. At $x = 0$ we have $u(q_0, \underline{w}) - u(q_l, R_l) > 0$ because of A2. Since $u_{qw} > 0$ and $R_l > \underline{w}$, then $u_w(q_0, \underline{w} + x) - u_w(q_l, R_l + x) > 0$, therefore (A.25) holds.

We now prove Part 1 of the lemma. Consider an optimal contract L. If an old employee is assigned to job l in period 2, the second-period participation constraint $u(q_l, w_{2l}) \geq u(q_0, \underline{w} + w_s)$ must hold. From Assumption A2, this implies that $w_{2l} > R_l$. Define $x \equiv w_{2l} - R_l$ and consider a deviation where the firm chooses $w'_s = x$. Under this deviation, from (A.25) we know that $u(q_l, w_{2l} = R_l + x) < u(q_0, \underline{w} + x)$, so the agent is strictly better off leaving the firm under w'_s. The change in payoff for the firm is $-R_l + w_{2l} - w'_s = 0$, so the firm is indifferent. Therefore, it is possible to find $\epsilon > 0$ sufficiently small such that offering the severance payment $w''_s = w'_s - \epsilon$ makes both the firm and the agent better off. This implies that, in an optimal long-term contract, no old worker is retained in job l, that is, $m_{2l} = 0$.

We now prove Part 2 of the lemma. Consider an optimal long-term contract L that strictly dominates spot contracts. Suppose L is such that $x = h$ and the employee rationally expects to remain in this job with probability p when old (that is, the contract is such that $\frac{m_{2h}}{m_1} = p$). Note that $m_1 = \overline{m}_h$ because all h jobs need to be filled and, by assumption, contract L strictly dominates spot contracts. Part 1 of this lemma implies that, with probability $1 - p$, the employee will not be retained. If $p = 0$, the employee works for the firm only when young and the long-term contract is identical to a spot contract; L does not strictly dominate a spot contract, which is a contradiction. Thus, suppose that $p > 0$. Because the sector as a whole creates a mass $\overline{m}_h F$ of jobs for young employees, and since $\overline{m}_h F < E$, in equilibrium young employees must not earn any rents, thus their lifetime outside utility is $2\underline{u}$. Under this contract, an employee's participation constraints are

$$u(q_h, w_{2h}) \geq u(q_0, \underline{w} + w_s), \tag{A.26}$$

$$u(q_h, w_1) + (1-p)u(q_0, \underline{w} + w_s) + pu(q_h, w_{2h}) \geq 2\underline{u}. \tag{A.27}$$

Because of (A.26), setting $m_{2h} = \overline{m}_h$ (which implies $p = 1$) increases the left-hand side of (A.27), which allows the firm to reduce the cost of contract L. If $p = 1$ and (A.27) binds in an optimal contract, the firm will pay the same wage to the employee in both periods; the per-period cost of an employee is w' such that $2u(q_h, w') = 2\underline{u}$. This is the same cost that the firm would pay to replace an existing employee with an outsider in job h. Note that contract L with $m_{2h} = \overline{m}_h$ is equivalent to two consecutive spot contracts, which contradicts the assumption that the long-term contract strictly dominates the spot contract. Similarly, if (A.27) does not bind, then we have $w_1 = w_{2h} = 0$, which is again identical to two consecutive spot contracts. Thus, a long-term contract can only strictly dominate a spot contract if $x = l$. In that case, the contract holders' lifetime participation constraint is

$$u(q_l, w_1) + (1-p)u(q_0, \underline{w} + w_s) + pu(q_h, w_{2h}) \geq 2\underline{u}, \tag{A.28}$$

where $p = \frac{m_{2h}}{m_1}$. This condition is relaxed for higher p. If the firm sets $m_{2h} < \overline{m}_h$, some h-jobs will be offered to outsiders with a spot contract. Because offering more h-jobs to holders of contract L relaxes their participation constraint, and by assumption L strictly dominates spot contracts, all h-jobs must be given to long-term contract holders ($m_{2h} = \overline{m}_h$).

PROOF OF LEMMA 2: If IR_2 binds in an equilibrium, we have that the lifetime participation constraint can be written as $u(q_l, w_1^*) + u(q_0, \underline{w} + w_s^*) \geq U^*$. Because $U^* \geq 2\underline{u}$, from A2 this condition requires $w_1^* > R_l - w_s^*$. Thus, the principal is making a loss for a mass $m_l^* - \overline{m}_h$ of employees. The principal could instead hire only $\overline{m}_h$ employees at the same wage w_2^* and avoid this loss. IR_1 remains unchanged and IR_2 can now be met with $w_s = 0$. We conclude that IR_2 never binds in equilibrium.

We now show that IR_1 binds. In the case of a tight labor market, $U^* = u(q_l, w_1^*) + p^* u(q_h, w_2^*) + (1 - p^*) u(q_0, \underline{w} + w_s^*)$, thus IR_1 trivially binds. In the case of a slack labor market, we have that $U^* = 2\underline{u}$. If IR_1 does not bind, the principal can reduce either w_1^* or w_s^* (or both) by a small amount while still satisfying the lifetime participation constraint. If these cannot be reduced because $w_1^* = w_s^* = 0$, the firm can hire a small additional mass ε of workers in period one without changing the wages offered to existing workers, while reducing their probability of promotion by some small Δp. This would increase the firm's profits by εR_l. Thus, IR_1 must bind in all cases.

PROOF OF PROPOSITION 2: Here we consider and characterize the case where the optimal career path contract is such that $m_l = \overline{m}_h$ (that is, $p = 1$). Because promotion to job h is guaranteed, we set $w_s = 0$ without loss of generality.

From the firm's maximization problem in (4), we obtain the first order condition:

$$\frac{\partial \pi}{\partial w_1} = -1 + \frac{u_w(q_l, w_1)}{u_w(q_h, w_2(w_1))} = 0, \tag{A.29}$$

and the second order condition:

$$\frac{\partial^2 \pi}{\partial w_1^2} = \frac{u_{ww}(q_l, w_1)}{u_w(q_h, w_2)} - u_{ww}(q_h, w_2) \frac{u_w(q_l, w_1)}{(u_w(q_h, w_2))^2} \left[-\frac{u_w(q_l, w_1)}{u_w(q_h, w_2)} \right] < 0, \tag{A.30}$$

which holds everywhere (that is, the problem is globally concave). For $\frac{u_w(q_l,0)}{u_w(q_h,w_2(0))} > 1$, we can show that a unique interior solution exists. The function $\widetilde{w}_2(w_1)$ defined by $u_w(q_l, w_1) = u_w(q_h, \widetilde{w}_2)$ is strictly increasing in $w_1 \geq 0$ while $w_2(w_1)$ is strictly decreasing. Since $u_w(q_l, 0) > u_w(q_h, w_2(0))$ implies $w(0) > \widetilde{w}(0)$, we know that a unique fixed point $w_1^b > 0$ such that $w(w_1^b) = \widetilde{w}(w_1^b)$ must exist. In this case, w_1^b is given by $u_w(q_l, w_1^b) = u_w(q_h, w_2(w_1^b))$ and $w_2^b = u^{-1}\left(2\underline{u} - u(q_l, w_1^b); q_h\right)$.

The first-order condition implies that the marginal utilities in each period must be equalized. Since for a given w, $u_w(q_h, w) > u_w(q_l, w)$, then, in equilibrium, $w_2^b > w_1^b$.

PROOF OF PROPOSITION 3: To compare the safe career path contract with the spot contract, define the difference in profit between a safe career path contract and a spot contract as

$$\Delta\pi = R_h + R_l - w_1^b - w_2^b - R_h + w^a = R_l - \Delta w, \tag{A.31}$$

where $\Delta w \equiv w_1^b + w_2^b - w^a$ is the wage cost difference between the safe career path contract and the spot contract. Note that the participation constraints imply that $\Delta w \geq 0$. The next result shows how prestige affects the relative cost of these two different types of contracts.

We first show that $\frac{\partial(w_2^b + w_1^b)}{\partial q_h} < 0$. From the lifetime participation constraint in a safe career path contract we have:

$$u_w(q_l, w_1^b)\frac{\partial w_1^b}{\partial q_h} + u_w(q_h, w_2^b)\frac{\partial w_2^b}{\partial q_h} + u_q(q_h, w_2^b) = 0. \tag{A.32}$$

In equilibrium $u_w(q_l, w_1^b) = u_w(q_h, w_2^b)$, which we replace in (A.32) and re-arrange: $\frac{\partial w_2^b}{\partial q_h} + \frac{\partial w_1^b}{\partial q_h} = -\frac{u_q(q_h, w_2^b)}{u_w(q_h, w_2^b)} < 0$.

We now show that the wage cost difference decreases in q_h:

$$\frac{\partial \Delta w}{\partial q_h} = -\frac{u_q(q_h, w_2^b)}{u_w(q_h, w_2^b)} + \frac{\partial w^a}{\partial q_h}, \tag{A.33}$$

Because $q_h \geq q_0$, then $u(q_h, w^a) = \underline{u}$ and $\frac{\partial w^a}{\partial q_h} = -\frac{u_q(q_h,w^a)}{u_w(q_h,w^a)}$, then $\frac{\partial \Delta w}{\partial q_h} = -\frac{u_q(q_h,w_2^b)}{u_w(q_h,w_2^b)} + \frac{u_q(q_h,w^a)}{u_w(q_h,w^a)}$. Since

$$\frac{\partial\left(\frac{u_q(q_h,w)}{u_w(q_h,w)}\right)}{\partial w} = \frac{u_{qw}(q_h, w)u_w(q_h, w) - u_{ww}(q_h, w)u_q(q_h, w)}{u_w(q_h, w)^2} > 0 \tag{A.34}$$

and $w_2^b > w^a$, it follows that $\frac{\partial \Delta w}{\partial q_h} < 0$. Because Δw is decreasing in q_h and because we assume that $\lim_{q \to \infty} u(q, 0) \geq 2\underline{u}$, it follows that $\lim_{q_h \to \infty} \Delta w = 0$.

Now we show when the safe career path dominates the spot contract. For $q_h = q_l$ we have $w_1 = w_2 = w^a = u^{-1}(\underline{u}; q_l)$, thus $\Delta\pi = R_l - u^{-1}(\underline{u}; q_l) < 0$ because the job is individually undesirable. At this point, the spot contract dominates the safe career path contract. For $q_h \to \infty$ we have $\lim_{q_h \to \infty} \Delta\pi = R_l > 0$. Thus, there exists $q_h = q'$ such that $\Delta\pi(q') = 0$. Because Δw is decreasing in q_h, q' is unique and the safe career path contract dominates the spot contract for any $q_h > q'$.

PROOF OF LEMMA 4: As shown in the text the optimal $w_1(U)$ and $w_s(U)$ are given by the following two equations:

$$-1 + \frac{u_w(q_l, w_1)\left(R_l - w_1(U) - w_s(U)\right)}{U' - u(q_l, w_1(U)) - u(q_0, \underline{w} + w_s(U))} = 0 \tag{A.35}$$

$$u_w(q_l, w_1) = u_w(q_0, \underline{w} + w_s) \tag{A.36}$$

We now show that a solution for $w_1(U)$ and $w_s(U)$ exists and is unique.

Case 1: $u_w(q_l, 0) \geq u_w(q_0, \underline{w})$. Define define $w_1(w_s)$ from the equality $u_w(q_l, w_1) = u_w(q_0, \underline{w} + w_s)$ for $w_s \geq 0$. Notice that $w_1(0) \geq 0$ in this case. We have that:

$$\frac{\partial w_1}{\partial w_s} = \frac{u_{ww}(q_0, \underline{w} + w_s)}{u_{ww}(q_l, w_1)} > 0. \tag{A.37}$$

Now define the function

$$\omega(w_s) = -1 + \frac{u_w(q_0, \underline{w} + w_s)\,(R_l - w_1(w_s) - w_s)}{U - u(q_l, w_1(w_s)) - u(q_0, \underline{w} + w_s)}. \tag{A.38}$$

Consider first the case in which $\omega(0) > 0$. This implies that the first-order condition for w_s is violated at $w_s = 0$ and $w_1 = w_1(0)$. Define $x > 0$ such that $R_l - w_1(x) - x = 0$. Then, at $w_s = x$ we have $\omega(x) = -1$. Thus, there exists at least one $w_s^* \in (0, x)$ such that $\omega(w_s^*) = 0$. To show that the solution is unique, we derive the second order condition:

$$\begin{aligned}\frac{\partial^2 \pi}{\partial w_s^2}(w_s) \;=\;& \frac{\frac{\partial w_1(w_s)}{\partial w_s} u_w(q_0, \underline{w} + w_s)}{U - u(q_l, w_1(w_s)) - u(q_0, \underline{w} + w_s)} \left(-1 + \frac{u_w(q_l, w_1(w_s))\,(R_l - w_1 - w_s)}{U - u(q_l, w_1(w_s)) - u(q_0, \underline{w} + w_s)}\right) \\ &+ \frac{u_w(q_0, \underline{w} + w_s)}{U - u(q_l, w_1(w_s)) - u(q_0, \underline{w} + w_s)}\omega(w_s) \\ &+ \frac{u_{ww}(q_0, \underline{w} + w_s)\,(R_l - w_1 - w_s)}{U - u(q_l, w_1(w_s)) - u(q_0, \underline{w} + w_s)}.\end{aligned}$$

We have that $\frac{\partial^2 \pi}{\partial w_s^2}(w_s^*) < 0$ for any w_s^* for which the first order conditions are satisfied. This implies that there is at most one w_s^* that solves the first-order condition, which must be a maximum. If $\omega(0) \leq 0$, then the solution for w_s is not interior, that is, $w_s = 0$. The full solution of this case is in the Internet Appendix.

Case 2. Suppose $u_w(q_l, 0) < u_w(q_0, \underline{w})$. Then we use $u_w(q_l, w_1) - u_w(q_0, \underline{w} + w_s) = 0$

to define $w_s(w_1)$ for $w_1 \geq 0$ and a similar analysis follows.

PROOF OF LEMMA 5: The first order condition for w_2 is given by:

$$-1 + \frac{u_w(q_h, w_2)\,(R_l - w_1(U) - w_s(U))}{U' - u(q_l, w_1(U)) - u(q_0, \underline{w} + w_s(U))} = 0 \tag{A.39}$$

The second order condition for w_2 is given by:

$$\frac{u_{ww}(q_h, w_2)\,(R_l - w_1(U) - w_s(U))}{U - u(q_l, w_1(U)) - u(q_0, \underline{w} + w_s(U))} < 0. \tag{A.40}$$

Thus, the problem is strictly concave. Note that, if for a given U we have that

$$\lim_{w_2 \to \infty} -1 + \frac{u_w(q_h, w_2)\,(R_l - w_1(U) - w_s(U))}{U' - u(q_l, w_1(U)) - u(q_0, \underline{w} + w_s(U))} > 0, \tag{A.41}$$

then all firms would like to hire an arbitrarily large number of young workers, that is, $m_l(U) = \overline{m}_l$. But because $\overline{m}_l F > E$, in this case agents will be in short supply, and competition should drive up their utility to $U' > U$. Thus, we do not need to consider values of U such that (A.41) holds. That is, without loss of generality, we can restrict the analysis to those values of U for which it is possible to find at least one $w_2 \geq 0$ such that (A.39) holds. Uniqueness follows from (A.40).

PROOF OF PROPOSITION 5: First, we derive the threshold for the risky career path contract to dominate the safe career path contract. In the case where the labor market is slack, the optimal promotion probability is given by (14). From Lemma 5, $w_2(2\underline{u})$ is such that

$\frac{u_w(q_h,w_2(2\underline{u}))(R_l-w_1(2\underline{u})-w_s(2\underline{u}))}{2\underline{u}-u(q_l,w_1(2\underline{u}))-u(q_0,\underline{w}+w_s(2\underline{u}))} = 1$. We then have

$$\frac{\partial w_2}{\partial q_h} = -\frac{u_{wq}(q_h, w_2(2\underline{u}))}{u_{ww}(q_h, w_2(2\underline{u}))} > 0. \tag{A.42}$$

From (14), we see that p is decreasing in $w_2(2\underline{u})$, implying that p is also decreasing in q_h.

Now, define the set

$$Q \equiv \{q_h : u(q_h, w_2(2\underline{u})) + u(q_l, w_1(2\underline{u})) - 2\underline{u} > 0\}. \tag{A.43}$$

Q is the set of q_h for which the probability defined in (14) is strictly less then one. That is, Q is the set of q_h for which the risky career path contract strictly dominates the safe career path contract. Let $\overline{q} \equiv \inf Q$ (note that if $Q = \emptyset$, then $\inf Q = +\infty$). Because p is decreasing in q_h, the risky career path contract dominates the safe career path contract if and only if $q \geq \overline{q}$.

Consider now q' as defined in Proposition 3. If $q' \leq \overline{q}$, we then define $q'' = \overline{q}$. For $q_h \geq q''$, the risky career path contract dominates both the spot contract and the safe career path contract.

If instead $q' > \overline{q}$, we know that for any $q_h \geq q'$ the risky career path contract strictly dominates both the spot contract and the safe career path contract. If at $q_h = \overline{q}$ the risky career path contract dominates the spot contract, we then set $q'' = \overline{q}$. Thus, there must exist $q'' \in [\overline{q}, q')$ such that, for $q_h \geq q''$, the risky career path contract dominates both the spot contract and the safe career path contract.

PROOF OF COROLLARY 1: From the proof of Lemma 4, we know that $w_1(2\underline{u})$ is independent of q_h, that is $\frac{\partial w_1^c}{\partial q_h} = 0$. From (A.42), we know that $\frac{\partial w_2^c}{\partial q_h} > 0$. It therefore follows that difference $w_2^c - w_1^c$ increases with q_h, that is, firms with more prestigious jobs have steeper pay profiles.

The span of control is $\frac{m_l^c}{\overline{m}_h} = \frac{u(q_h,w_2^c)-u(q_0,\underline{w}+w_s^c)}{2\underline{u}-u(q_l,w_1^c)-u(q_0,\underline{w}+w_s^c)}$. Thus, $\frac{\partial \frac{m_l^c}{\overline{m}_h}}{\partial q_h} = \frac{u_{q_h}(q_h,w_2^c)+u_w(q_h,w_2^c)\frac{\partial w_2^c}{\partial q_h}}{2\underline{u}-u(q_l,w_1^c)-u(q_0,\underline{w}+w_s^c)} > 0$. Since $p^c = \frac{\overline{m}_h}{m_l^c}$, we have $\frac{\partial p^c}{\partial q_h} < 0$.

PROOF OF COROLLARY 2: The interior solutions for w_1^c, w_2^c and w_s^c are as in Lemma 4 and Lemma 5. We then have:

$$\frac{\partial w_1^c}{\partial q_l} = -\frac{u_{wq}(q_l,w_1^c) + \frac{u_q(q_l,w_1^c)}{R_l-w_1^c-w_s^c}}{u_{ww}(q_l,w_1^c)} > 0, \tag{A.44}$$

$$\frac{\partial w_s^c}{\partial q_l} = -\frac{\frac{u_q(q_l,w_1^c)}{R_l-w_1^c-w_s^c}}{u_{ww}(q_0,\underline{w}+w_s^c)} > 0, \tag{A.45}$$

$$\frac{\partial w_2^c}{\partial q_l} = -\frac{\frac{u_q(q_l,w_1^c)}{R_l-w_1^c-w_s^c}}{u_{ww}(q_h,w_2^c)} > 0. \tag{A.46}$$

It follows that all wages (w_1^c, w_2^c and w_s^c) are increasing in q_l. Similarly,

$$\frac{\partial w_1^c}{\partial R_l} = -\frac{2\underline{u} - u(q_l,w_1^c) - u(q_0,\underline{w}+w_s^c)}{u_{ww}(q_l,w_1^c)\left(R_l - w_1^c - w_s^c\right)^2} > 0 \tag{A.47}$$

$$\frac{\partial w_s^c}{\partial R_l} = -\frac{2\underline{u} - u(q_l,w_1^c) - u(q_0,\underline{w}+w_s^c)}{u_{ww}(q_0,\underline{w}+w_s^c)\left(R_l - w_1^c - w_s^c\right)^2} > 0 \tag{A.48}$$

$$\frac{\partial w_2^c}{\partial R_l} = -\frac{2\underline{u} - u(q_l,w_1^c) - u(q_0,\underline{w}+w_s^c)}{u_{ww}(q_h,w_2^c)(R_l - w_1^c - w_s^c)^2} > 0. \tag{A.49}$$

It follows that all wages (w_1^c, w_2^c and w_s^c) are increasing in R_l.

The probability of promotion is $p^c = \frac{2\underline{u} - u(q_l, w_1^c) - u(q_0, \underline{w} + w_s^c)}{u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)}$. We then have:

$$\frac{\partial p^c}{\partial q_l} = -\frac{u_q(q_l, w_1^c) + u_w(q_l, w_1^c)\frac{\partial w_1^c}{\partial q_l}}{u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)} - \frac{u_w(q_h, w_2^c)\frac{\partial w_2^c}{\partial q_l} + u_w(q_0, \underline{w} + w_s^c)\frac{\partial w_s^c}{\partial q_l}\left(u(q_h, w_2^c) + u(q_l, w_1^c) - 2\underline{u}\right)}{\left(u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)\right)^2} < 0,$$

$$\frac{\partial p^c}{\partial R_l} = -\frac{u_w(q_l, w_1^c)\frac{\partial w_1^c}{\partial R_l}}{u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)} - \frac{u_w(q_h, w_2^c)\frac{\partial w_2^c}{\partial R_l} + u_w(q_0, \underline{w} + w_s^c)\frac{\partial w_s^c}{\partial R_l}\left(u(q_h, w_2^c) + u(q_l, w_1^c) - 2\underline{u}\right)}{\left(u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)\right)^2} < 0. \tag{A.50}$$

It follows that p^c is strictly decreasing in both q_l and R_l. Because the span of control is the inverse of p^c, it is strictly increasing in both q_l and R_l.

PROOF OF COROLLARY 3:

$$\frac{\partial w_1^c}{\partial \underline{u}} = \frac{2}{u_{ww}(q_l, w_1^c)(R_l - w_1^c - w_s^c)} < 0, \tag{A.51}$$

$$\frac{\partial w_s^c}{\partial \underline{u}} = \frac{2}{u_{ww}(q_0, \underline{w} + w_s^c)(R_l - w_1^c - w_s^c)} < 0, \tag{A.52}$$

$$\frac{\partial w_2^c}{\partial \underline{u}} = \frac{2}{u_{ww}(q_h, w_2^c)(R_l - w_1^c - w_s^c)} < 0. \tag{A.53}$$

It follows that all wages (w_1^c, w_2^c and w_s^c) are decreasing in $\underline{u}$. Differentiating the probability of promotion with respect to $\underline{u}$ gives:

$$\frac{\partial p^c}{\partial \underline{u}} = \frac{2 - u_w(q_l, w_1^c)\frac{\partial w_1^c}{\partial \underline{u}}}{u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)} -$$

$$\frac{u_w(q_h, w_2^c)\frac{\partial w_2^c}{\partial \underline{u}} + u_w(q_0, \underline{w} + w_s^c)\frac{\partial w_s^c}{\partial \underline{u}}\left(u(q_h, w_2^c) + u(q_l, w_1^c) - 2\underline{u}\right)}{\left(u(q_h, w_2^c) - u(q_0, \underline{w} + w_s^c)\right)^2} > 0.$$

It follows that p^c is strictly increasing in $\underline{u}$. Because the span of control is the inverse of p^c, it is strictly decreasing in $\underline{u}$.

PROOF OF PROPOSITION 6: An equilibrium when labor market is tight is a vector $(U^d, m_l^d, w_1^d, w_2^d, w_s^d, p^d)$ such that $m_l^d = \frac{E}{F}$, $U^d = u(q_l, w_1^d) + p^d u(q_h, w_2^d) + (1-p^d)u(q_0, \underline{w} + w_s^d)$, and, given U^d, firms choose $(m_l^d, w_1^d, w_2^d, w_s^d)$ to maximize their period profits:

$$\max_{w_1 \geq 0, w_2 \geq 0, w_s \geq 0} \pi = \overline{m}_h \left[R_h - w_2 + (R_l - w_1 - w_s) \frac{u(q_h, w_2) - u(q_0, \underline{w} + w_s)}{U - u(q_l, w_1) - u(q_0, \underline{w} + w_s)} + w_s \right]. \tag{A.54}$$

The optimal $w_1(U)$, $w_2(U)$, and $w_s(U)$ are as defined in Lemmas 4 and 5. From Corollary 3, it follows that

$$\frac{\partial w_1^d}{\partial U} < 0, \frac{\partial w_s^d}{\partial U} < 0, \frac{\partial w_2^d}{\partial U} < 0. \tag{A.55}$$

Define the function $f(U, p)$ as

$$f(U,p) = u(q_l, w_1(U)) + u(q_0, \underline{w} + w_s(U)) + p(u(q_h, w_2(U)) - u(q_0, \underline{w} + w_s(U))). \tag{A.56}$$

If the labor market is tight, then $p^d = \frac{\overline{m}_h F}{E} > p^c$. In this case, $f(2\underline{u}, p^d) > f(2\underline{u}, p^c) = 2\underline{u}$. From (A.55), it follows that $f(U, p)$ is decreasing in U. Hence, a unique fixed point $U^d = f(U^d, \frac{\overline{m}_h F}{E}) > 2\underline{u}$ exists. Given U^d, we can find $(w_1^d = w_1(U^d), w_2^d = w_2(U^d), w_s^d = w_s(U^d))$.

From Corollary 1, we know that p^c decreases with q_h. As q_h increases, p^c will decrease until it reaches $p^d = \frac{\overline{m}_h F}{E}$. At this point, defined as $q_h = \widehat{q}$, where $\frac{2\underline{u} - u(q_l, w_1^c) - u(q_0, \underline{w} + w_s^c)}{u(\widehat{q}, w_2^c) - u(q_0, \underline{w} + w_s^c)} = \frac{\overline{m}_h F}{E}$, the labor market becomes tight. Thus, for all $q_h > \widehat{q}$, the labor market is tight.

PROOF OF COROLLARY 4: From $p^d = \frac{\overline{m}_h F}{E}$, it follows that p^d decreases with the relative supply of employees, $\frac{E}{\overline{m}_h F}$, thus the span of control widens with the relative supply of employees. Since (for given wages) U increases with p^d, and $\frac{\partial w_1^d}{\partial U} \leq 0$, $\frac{\partial w_s^d}{\partial U} \leq 0$ and $\frac{\partial w_2^d}{\partial U} \leq 0$, it follows that $\frac{\partial w_1^d}{\partial p^d} = \frac{\partial w_1^d}{\partial U}\frac{\partial U}{\partial p^d} \geq 0$, $\frac{\partial w_2^d}{\partial p^d} = \frac{\partial w_2^d}{\partial U}\frac{\partial U}{\partial p^d} \geq 0$ and $\frac{\partial w_s^d}{\partial p^d} = \frac{\partial w_s^d}{\partial U}\frac{\partial U}{\partial p^d} \geq 0$.

PROOF OF COROLLARY 5: If $q_h \leq \widehat{q}$, an employee's lifetime utility in equilibrium is equal to $2\underline{u}$ and thus independent of q_h. For $q_h > \widehat{q}$, an employee's lifetime utility is $U^d = f(U^d, p^d)$ and therefore

$$\frac{\partial U^d}{\partial q_h} = \frac{p^d u_q(q_h, w_2^d(U^d))}{1 - p^d u_w(q_h, w_2^d(U^d))\frac{\partial w_2^d}{\partial U^d}} > 0. \tag{A.57}$$

PROOF OF PROPOSITION 7: (i) From (17) and $\frac{\partial \overline{m}_h R_h(F,\rho)}{\partial F} < 0$, we see that if the entry cost ι increases, the mass of firms entering the sector F decreases. From Corollary 4, we know that in a tight labor market, $\frac{\partial w_1^d}{\partial\left(\frac{E}{\overline{m}_h F}\right)} \geq 0$ and $\frac{\partial w_2^d}{\partial\left(\frac{E}{\overline{m}_h F}\right)} \geq 0$. Thus, lower F implies higher career wages.

(ii) Since $\frac{\partial \overline{m}_h R_h(F,\rho)}{\partial \rho} < 0$, an increase in ρ reduces F; lower F again implies higher wages in both jobs.

PROOF OF PROPOSITION 8: We first consider a thought experiment in which a young agent moves from the primary sector to the outside sector, without replacement. The profit loss to the primary sector is $R_l - w_1 - w_s$. The outside sector experiences a gain of $R_0 + R_e - \underline{w}^* = R_e$. Similarly, the agent who moves across sectors experiences net utility change $\Delta u \equiv 2u(q_0, \underline{w}) - u(q_l, w_1) - pu(q_h, w_2) - (1-p)u(q_0, \underline{w} + w_s)$. If the labor market is slack, $\Delta u = 0$. If $R_e \geq R_l - w_1(2\underline{u}) - w_s(2\underline{u})$, then the gains to the outside sector are higher than the losses to the primary sector. The equilibrium with career paths is inefficient in the sense that a social planner could move a worker from the primary sector to the outside sector, increase the revenue in the outside sector, and (through properly designed taxes and subsidies) compensate the profit loss to the primary sector, thus generating a Pareto improvement.

Suppose instead that a social planner moves a (per firm) mass $\phi > 0$ of employees across sectors. This change increases the probability of promotion in each firm. Thus, either the employees who stay in the sector benefit or the firm benefits by reducing w_2. In either case, $R_e \geq R_l - w_1(2\underline{u}) - w_s(2\underline{u})$ is relaxed.

PROOF OF PROPOSITION 9: The derivative of the profit with respect to m_h is

$$\frac{\partial \pi}{\partial m_h} = R_h - w_2 + w_s^c + \frac{\left(R_l - w_1^c - w_s^c\right)\left(u(f(m_h), w_2) - u(q_0, \underline{w} + w_s^c) + m_h u_q(f(m_h), w_2) f_{m_h}\right)}{2\underline{u} - u(q_l, w_1^c) - u(q_0, \underline{w} + w_s^c)} \tag{A.58}$$

For an interior solution, the first order condition must hold with equality $\frac{\partial \pi(m_h^*)}{\partial m_h} = 0$, and the second order condition must also hold, that is $\frac{\partial^2 \pi(m_h^*)}{\partial m_h^2} < 0$. Thus, the effect of R_h on m_h^* is given by

$$\frac{\partial m_h^*}{\partial R_h} = -\frac{1}{\frac{\partial^2 \pi(m_h^*)}{\partial m_h^2}} > 0. \tag{A.59}$$

Higher m_h^* implies less prestige because $f_{m_h} < 0$. From (19) we find that higher m_h^* implies lower w_2^*. From (20) we find that the span of control (m_l^*/m_h^*) is decreasing in w_2^*.

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