What's in a Job Title?

A VP by Any Other Name Would Demand More Money

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Abstract

Three things appear on a business card: the employee's name, her employer, and her job title. One may wonder why a firm would send a signal of the employee's talents to the outside world. After all, if the signal is credible then a sexy job title increases the employee's outside options to the detriment of the employer. We argue that while internal organization of the firm and delivery of utility benefits to the worker are both valid justifications, there is also a more subtle use of job titles as a substitute for wages. We show that firms can establish reputations for hiring young workers and assigning good job titles to those who succeed. The firm loses good workers using this signal, but can pay workers less in exchange. We find in a general equilibrium setting that firms with reputations pay employees less at every level of tenure and earn economic profit.

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1 Introduction

A firm wishing to recruit a new employee is likely to filter potential hires, at least initially, by their current job titles. It may be that job titles are merely a succinct statement of an employee's role and status at her current employer, but if they increase her outside options then they must be conveying some information—most likely concerning the employee's ability— that is not otherwise observable. Why would employers wish to convey this information to other firms? That is, given that it improves an employee's outside options, why assign a prestigious job title when more mundane ones are available? We argue that while job titles can serve a variety of purposes, the very fact that a "good" title raises an employee's outside options, rather than harming the employer, can serve its long run interests.

We show that while many firms may use titles as shorthand for an employee's job description or level of tenure, others will establish reputations for using titles that reveal which employees are most talented. This allows other firms to hire away the most talented employees for higher wages. While the loss of older talent is costly, this carrot allows reputable firms to hire young employees at a lower cost than if they chose titles containing little incremental information.

Organizations in both the private and public sector employ titles in starkly different ways. One firm may call an employee heading a small division "vice president" while others use the term "senior manager" and still others "director." Closer to home for many academics, universities have many ways of naming positions that have the same responsibilities within the school. Some universities use the title of "dean" quite liberally: Brown University, for example, has over 100 deans, including a "Dean for Chemical Dependency." At another university, this dean's title may be "program administrator," a less prestigious term. The fact that organizations use titles in a large variety of ways should make clear that title assignment is either completely irrelevant—titles contain no information so firms are indifferent to the way they are assigned—or depends critically on the objective each firm wishes to achieve.

According to Mark Kolakowski, a former Vice President at Merrill Lynch and Consultant at Touche Ross,[1] "in a financial services firm, Vice President generally is an honorific earned by an individual [...] rather than a descriptive attached to a specific position in the firm. Thus, you might get promoted to Vice President while staying in place, retaining your current job and responsibilities." For example, the title of "VP-Investments [was] granted to financial advisors (brokers) who [...] had passed a certain level of production (revenue generation)." On the other hand, at AT&T, the "company had [...] unwritten, but widely recognized, cultural norms that linked advancement and eligibility for upgraded job titles to age and seniority. This was doubly important at AT&T because job titles had rigidly-enforced pay bands associated with them.[2] At Merrill Lynch (and Touche Ross), by contrast, such linkage was extremely loose. Thus, a Merrill Assistant VP in the right spot could earn more than a lot of VPs."

In the case of Merrill Lynch above, job titles were used to describe achievements of current employees as much as they were used to rank employees or describe job functions.[3] They were a public signal that employees bearing the titles were of high value. For AT&T, the job title contained little information except that the worker had been at the job for a long time. Titles were linked to pay and duties, but conveyed little orthogonal information to other firms potentially interested in hiring the employee. Why the difference?

We show in a general equilibrium, overlapping generations framework, that we should expect that some firms apply titles arbitrarily—or at least based on observable characteristics, like tenure at the firm—while others give titles only to high-ability individuals, knowing that this raises their outside options. The latter way of assigning titles allows the firm to pay less

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[1] Touche Ross has more recently become Deloitte and Touche.

[2] In this paper we do not focus on firms where title assignment does not reveal hidden information about an employee's ability. There are many potential reasons that the culture of title assignment has arisen as it has at AT&T or other firms. As Mr. Kolakowski points out, "AT&T's strong linkage between promotional opportunities and tenure/seniority/age in the management ranks undoubtedly was influenced by its being a heavily-unionized company. Additionally, its history as a highly-regulated utility probably meant that it absorbed similar influences from government bureaucracies, which also have similar personnel policies."

[3] Mr. Kolakowski's experience relates to his time at these firms and therefore is not current. Conversations the authors have had with current employees yield similar conclusions.

to young workers who know that future public statements of their ability make the initial lower pay worthwhile.[4] Firms with a reputation for assigning titles to high-ability individuals profit from that reputation via lower wage bills.

If worker abilities are publicly known, then a more efficient matching of workers to firms can take place. Having firms that hire young workers, learn the workers' abilities and publicly state those abilities therefore improves social welfare. In our model, reputable firms appropriate all of the social welfare gains and are thus more profitable than other firms of equal quality/productivity.

Before developing our theory more fully we should address what might be the two most obvious explanations for how job titles are assigned. The first explanation is that bureaucracies require both hierarchy and a variety of job roles in order to function properly. Job titles therefore must contain information as to what actions and responsibilities are assigned to each employee and the ranking of who reports to whom within the hierarchy. These are almost certainly the dominant functions of job titles at most firms but they are probably not the only explanations. First, job functions can be clearly spelled out when an employee applies for, is offered, or accepts a job. A "senior analyst" at one firm may well have the same function as an "associate" at another, and each term is, frankly, not particularly descriptive. Second, a hierarchy can be written on an organizational chart: anyone knowing the chain of command from her own position up to the CEO can glean no further information from titles. Using job titles to describe the internal organization of the firm or the role of an employee is therefore redundant and unnecessary.

The second explanation is that job titles deliver psychological or sociological benefits to the title holder or organization respectively. The literature on this explanation is discussed in Section 1.1, but it suffices to say here that there is evidence that assigned titles can, at least in the short run, affect the productivity, ductility and cooperativeness of workers. They

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[4]This means "pay less, *ceterus paribus*." In practice, young workers who choose to work for these firms are often of higher quality and work longer hours. Both of these facts increase annual pay. We ignore these nuances in the model we present.

can also substitute for wages, saving the firm money. These stories are clearly important but they fail to adequately describe the wide variety in corporate choices of title assignment.

The literature has not addressed the fact that assigning a prestigious title to a good employee entails a cost for the firm in the form of better outside options for the employee. The two classes of explanation above would probably state that while this is a cost, it must be weighed against the stated benefits. We argue that the cost of greater outside options can be—in and of itself—a benefit, and is therefore a driver of the use of job titles in some organizations. Workers choosing an employer should be wary of one that will hide their successes, as this implies that they will have fewer opportunities to advance their careers in the future. They therefore must demand more money now. This opens a door to firms that establish reputations for quickly promoting good workers and giving them prestigious job titles. While such a firm knows that it will lose many good workers as they move up the ranks, it also knows that its reputation will allow it to pay young workers less. We show that firms with reputations for giving prestigious titles to good workers—and only good workers— out-earn firms lacking such reputations. They can attract young workers at lower cost and earn rents in exchange for the implicit promise of a title as a reward for good work.

We show in a general equilibrium framework that (1) firms earning reputations for assigning prestigious titles based on ability cannot be the most productive firms in an economy; (2) there cannot be too many firms with such reputations; (3) these firms earn profits greater than firms with no reputation; and (4) wages are always lower at reputable firms for any employee tenure.

We analyze a general equilibrium model in which firms are infinitely lived and are of either high or low quality. Workers are two-period lived, are of either high or low quality, and exist in overlapping generations. Young workers are unaware of their ability, but both they and employers learn of that ability once a worker has worked at the firm. Importantly, firms that do not employ a particular employee cannot directly observe that employee's ability. There is a continuum of both firms and workers of all types, and all parties wish to maximize

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expected payoffs. Wages and the match of employer to employee are endogenous.

Worker and firm type are complementary in the production process so it is efficient to match good workers to good firms. This provides an opportunity for firms with low productivity to hire young workers, observe their abilities, and broadcast those abilities through cheap talk—a job title. This allows some more productive firms to focus on only hiring older workers that they know to be of high quality, which increases social welfare. The reward for low productivity firms who assign prestigious job titles to good workers is that young workers wish to work for them, in the hope that they may be promoted and earn higher wages at a better firm.

Firms with a reputation for assigning prestigious job titles also bear a cost, in that they lose good workers who move up and out of the firm. We show that, so long as there are not too many firms with such reputations, the benefit exceeds the cost and there is an equilibrium where reputations are maintained. When there are too many reputable firms, the number of promoted good workers exceeds the number of high quality firms that can hire them and bargaining power over wages (for good workers) shifts from worker to firm. This reduces wages for high ability employees and therefore reduces the value of job titles when young. Since job titles and wages are substitutes for workers at reputable firms, this increases the wages that reputable firms pay young workers and decreases the benefit of maintaining a reputation for giving promotions to deserving candidates. Therefore, the number of reputable firms is bounded above, and their job openings for young workers are always exceeded by the number of young employees who must find work. Empirically speaking, this means that for most firms a job title serves some purpose other than explicitly signaling a worker's ability, but for some firms good job titles and promotions are critical to a worker's decision to sign on.

The firm cannot commit to paying an older worker more than her outside option and, given that good workers are promoted, an un-promoted worker's outside options are quite limited. Since wages for un-promoted workers are low, a reputable firm faces a difficult decision: it can promote a good worker and draw a new worker from the pool, or it can

retain a good worker by not promoting her and earn abnormally high profit. Reputable firms will be tempted not to promote good workers. To maintain equilibrium in which good workers are promoted, reputable firms must be punished if workers are not promoted. We consider a trigger-strategy equilibrium in which a reputable firm is allowed N straight workers without a promotion, but if there are $N + 1$ straight un-promoted workers, it loses its reputation for some specified amount of time, perhaps forever. If the grace period is short enough and the punishment period long enough, then reputable firms will be incentivised to promote good workers. This means that firms gain and lose reputation on the equilibrium path.

Wages at each stage of an employee's tenure are lower than wages paid by firms with no reputation. They are lower initially because young workers hope to profit from being identified as good mid-career, thus earning more when old. Wages are lower for older workers because they are revealed to be of low quality (they are not promoted) while older workers at firms with no reputation are, on average, of average quality.

To sum up, firms assign good job titles to their workers at their peril: those titles may cause other firms to hire away the workers a firm would most like to keep. While previous work on titles has seen this as a cost to be balanced against psychological or sociological benefits, we see it as a benefit in itself. Firms known to assign good titles to good employees will attract young workers who hope to succeed and move on to bigger and better things, and these firms will pay lower wages and earn positive economic profit. Section 1.1 reviews the literature concerning reputation, names, and job titles, the latter in the fields of psychology and sociology. Section 2 presents the economic setting. Section 3 constructs a trigger-strategy equilibrium of the repeated game when only short-term wage contracts are allowed. It provides necessary and sufficient conditions for the existence of "promotional equilibria" and discusses their welfare implications. Section 4 studies the effects of a richer contractual environment and section 5 discusses an alternative equilibrium featuring firms that employ "up-or-out" promotional cultures. Section 6 concludes.

1.1 Literature review

In our paper, firms establish reputations for assigning prestigious job titles to workers who show high ability. The reputational element is key since, in practice, high ability would be unlikely to be contractible. Firms could always claim that a particular worker is of low ability, retain the worker, and earn rents accordingly. This behavior can only be prevented if the firm loses something by not promoting a worker, and the only practical candidate is its reputation. The paper touches on three areas of the literature.

First, we briefly discuss the literature on firm/agent reputation. There are many things for which firms can establish reputations—quality products, accurate credit ratings, dividend payment, etc.—and if the value of a reputation is sufficiently high, firms are willing to forgo short run profit to maintain one. Second, we discuss the economic theory of cheap talk and, more specifically, names. There have been a number of papers written on when names can carry value: firm names, product brand names, and even the names of members of the Board of Directors have been shown theoretically to be useful as signals of some unobservable trait. While the names themselves may be just words, they may carry value as signals. Third, we discuss the literature on job titles in particular. This literature, to our knowledge, has not entered the field of economics, but instead resides in the fields of psychology and sociology. Even there, the literature is quite limited.

The economics literature concerning building and maintaining reputation is enormous, and we will not do it justice here. We offer a brief review of some of the work done so far but exclude many important papers. Firms face reputational concerns in many aspects of their business, including repaying debt (Diamond, 1989), fighting new entrants (Milgrom and Roberts, 1982), not holding up suppliers (Banerjee and Duflo, 2000), meeting earnings targets (Fisher and Heinkel, 2008) and producing quality products (Cabral, 2000; Hörner, 2002). For reputation to be interesting, from an economist's viewpoint, the benefit of "cheating" (not repaying debt, for example) must be weighed against the cost of a lost reputation. This class

of papers shows that costs of reputation loss can be large enough to ensure good behavior on the part of firms.

Reputation is also known to matter for workers. The seminal "career concerns" papers by Fama (1980) and Holmström (1982) argue that career concerns could substitute for wages early in a worker's career, the latter showing that incentives from career concerns alone are too strong early in an employee's career and too weak later. Tadelis (2002) suggests that these weak end-of-career incentives need not arise if employees can trade names/sell their reputations. Gibbons and Murphy (1992) show that incentive contracts can complement career concerns to provide optimal incentives. A number of papers argue that employees with reputational problems when acting alone can form partnerships to solve these problems. Levin and Tadelis (2005), Bar-Isaac (2007) and Morrison and Wilhelm (2004) all tackle this issue, from somewhat different angles.

Whether a name or label, which is in a literal sense cheap talk, can carry information has been the subject of significant research in economics, particularly since Tadelis (1999). He shows that names themselves can have a reputation. Most other work on reputation assumes some hidden characteristic of the reputable entity which is revealed either by its actions or outcomes associated with those actions. The reputation, in the long run, matches the underlying characteristic. A name is just a word, however, and has no such characteristic. Tadelis (1999) allows firms to live one period within an infinite period setting and endows each firm with a product of quality known only to the firm. Firms may buy names at the start of the period or create new names, and may sell names at the end of each period. In between, consumers decide whether to buy the firm's product and evaluate its quality. He shows that names can have a reputation so that firms buying good names will sell more of their wares. On average, firms buying "good" names sell better products because a firm buying a good name and subsequently selling a bad product causes the reputation of the name to decrease and therefore is able to sell it for less.

Subsequent work by Mailath and Samuelson (2001) follows similar lines but features a firm

that rents out its name rather than the name being traded from period to period. Deutsch and Ross (2003) consider the case of start-up firms "buying a name" by hiring famous board members, though their story is standard money-burning.

We now turn to the literature on job titles specifically. So far as we know, the questions of why job titles are assigned in different ways at different firms and whether they can convey information have not been addressed in the economics literature. The explanations in the psychology and sociology literatures are important to understand, though they do not address the trade-off we analyze in this paper. Lucas (1999) argues that job titles must be assigned to high performing employees in order to reduce turnover. He shows in an experimental setting that people given prestigious job titles "displayed greater satisfaction, commitment, and performance and lower turnover intentions" than others given less prestigious titles, indicating that giving workers prestigious titles can be unambiguously good for a firm. Implicit in the conclusion is that there is a cost to other workers from assigning a good title—otherwise why not assign "prestigious" titles to everyone?—but this is not analyzed. In the psychology of groups, assigning status to one individual necessarily requires others to have lower status so it is not clear that assigning high performers titles improves group work.

Greenberg and Ornstein (1983) show that a fancy job title can substitute for pay by conferring direct utility benefits. Smith, Hornsby, Benson, and Wesolowski (1989) support this argument by showing that job evaluators (human resources professionals) may be biased in favor of higher pay for work functions assigned better titles.

The sociology literature on job titles focuses on why different organizations have more or fewer titles for the same general breadth of work. The seminal paper is Baron and Bielby (1986), who find that both technical and socioeconomic differences between firms are relevant. On the technical side, firms use more job titles when they are larger, more complex, and employ more firm-specific skills. On the social side, firms use more job titles when they have more men, more HR professionals, and are in industrial settings. The economic arguments on the technical side are clear, and we leave a discussion of the social factors to interested

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readers. Strang and Baron (1990) use cleaner empirical methods to show that within work roles, there is greater proliferation in job titles when there is greater diversity by sex and race, higher pay, more representation by industrial unions, and less representation by craft unions. Proliferation of titles is lower as a work role has more claim to professional status. Neo-Marxist theorists like Gordon (1972) and Edwards (1979) have argued that widely varied job titles are a way to co-opt workers, divide them (especially by sex and race), and weaken occupational groups.

These literatures focus primarily on the direct effects of job titles on either self-perception or public/social attitudes. The psychology literature offers some insights into short-run effects of title assignment on productivity, but seems to ignore the fact that titles are relative, and that improving the title of one member of a group, in the long run, can only have an effect by changing the assignee's status within the group. Psychological explanations also have some difficulty explaining the variation in title assignment across firms. The sociology literature provides explanations for the variation in the way firms use titles, but probably does not tell the entire story. Especially today, when diversity programs are so important in many firms' hiring and organizational decisions, it seems unlikely that explanations focused on discrimination offer a full explanation. Our explanation, like those from psychology and sociology, will only offer a partial answer to why firms assign job titles the way they do, but we believe it is an important one.

2   The Model

We analyze a general equilibrium model in which firms live for an infinite number of periods and are of either high or low quality. Firm quality is denoted by $\tau \in \{\tau^L, \tau^H\}$, where $\tau^H > \tau^L$. There is a continuum of firms of each type as well as free entry into the set of low-quality firms. That is, the technology that makes a firm high quality is not freely available, so high-quality firms are in limited supply while low-quality firms can be freely set up. Each

firm has at most one worker and each period firm profit is $\tau\theta - w$, where w is the wage paid to the worker and $\theta \in \{\theta^L, \theta^H\}$ denotes the worker's ability.

Workers live for two periods in overlapping generations. There is a continuum of workers of each type and the the fraction of high-ability workers is γ. All parties discount at rate $0 < \beta < 1$. For simplicity, we assume that a worker's utility is her discounted expected wage.

Firm quality is common knowledge while worker skill is unknown at birth. Employers of any given worker, as well as the worker herself, learn her skill in the period of employment. After working for a firm when young, a worker will acquire firm-specific human capital and her productivity—if she stays with the same firm—is θ^H regardless of whether she is a high or low type. If she leaves the firm her productivity is once again her type θ.

Each period workers are matched to firms. While we do not explicitly model the process by which workers move from one firm to another, we require that a match be stable (Gale and Shapley, 1962) in that, once workers are matched to firms and wages are agreed upon, no worker-firm pair could separate from its partners and agree upon a mutually beneficial wage. This requirement relieves us of equilibria that result from the particular order in which job offers are made and accepted. Each of the periods in our model represents a significant fraction of a person's life, so requiring a stable match seems plausible.

As will become clear later, the requirement of a stable match does not entirely pin down wages, though it does determine the match within the class of equilibria we study. Because workers acquire firm-specific skills, it is often the case that it is efficient for them to remain with their initial employer. The rent from the efficient relationship must be split. In order to stack the deck against finding equilibria in which skilled workers are promoted, we assume that firms have all the bargaining power, thus maximizing the temptation to hide a good employee's skill rather than promoting her. Clearly, when equilibria exist under this assumption, they will also exist when employees have more bargaining power. The comparative statics we perform would be qualitatively unchanged by other assumptions regarding bargaining.

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2.1 Discussion of Assumptions

Before studying equilibria of the infinite-horizon repeated game, we discuss the implications of the above assumptions. Our story is that some firms can acquire reputations for promoting talented workers, knowing full well that promoted workers have better outside options and will be hired away by competitors. A good reputation will allow the firm to underpay young workers. For this story to hold in general equilibrium, we need complementarity between labor and capital, so that the match of worker to firm is important. Our specification of firm profit is the simplest one that possesses complementarity. We also need career concerns to be relevant, so workers must live for at least two periods. For firms to care about a worker's past success, workers must vary in endowed ability, so we use a hidden information rather than hidden action set-up.

These assumptions seem rather innocuous. The more unusual assumption is that workers gain firm-specific human capital over time. Our story is only interesting if firms with reputations for promoting good workers face a tension between promoting (and losing) good workers and reneging on the implicit deal by retaining good workers. The difficulty is that in a simple model like the one above, the firm's decision to retain the worker after a non-promotion would clearly suggest to other firms that the worker is skilled. In reality, firms often retain workers who are not the best of the best, so a firm retaining a worker would not signal much. One reason to retain mediocre workers is that they acquire firm-specific skills during their tenure. We make the simplest possible modeling choices: (1) firm-specific skills equate the productivity of low- and high-ability workers to the high type's productivity without firm-specific skills, and (2) firm-specific skills are acquired with certainty. Neither of these assumptions is necessary, but they considerably simplify the analysis.

3   Equilibria with Simple Wage Contracts

In this section, we focus on simple one-period wage contracts that specify the fixed amount that a worker is to be paid if she works for a firm in a particular period. We discuss in greater detail the benefits and costs of alternative contractual forms in Section 4, but we exclude, for now, multi-period and incentive contracts. There may be implicit guarantees of promotion-for-success, but these are non-contractible (individual output being non-verifiable would naturally imply non-contractibility). We construct *promotional equilibria* in which:

 (i) high-quality firms hire young workers (and always retain them when they age) or old workers who have been promoted by reputable firms;

 (ii) low-quality firms lacking a reputation hire young workers and retain them when old; and

 (iii) low-quality firms with a reputation hire young workers and promote those who turn out to be of high ability. They retain without promotion low-ability workers.

Figure 1 shows the flow of workers through employers during their lives. In the proposed equilibrium, wages will be largely determined by the workers' and firms' outside options. Our requirement of a stable match in each period will pin down wages in many cases and our assumption of full bargaining power for the firm pins down wages in the remainder, making the analytical solution tractable.

Reputations are built by firms over time. Many reputation models feature firms that vary in their unobservable characteristics: reputation is built by repeated public or private observations of some noisy signal of those characteristics. Since firm quality is common knowledge here, our reputations are simply for "good behavior," where firms with a reputation prefer to take actions to maintain it, and firms without one prefer alternative actions. There are many types of equilibria that one could define and evaluate, but we choose the simplest one. Firms with reputations are expected to promote good workers, but since the ability of

a worker is not observable to outsiders, reputations must be built on whether a firm tends to promote people. Firms that do not promote workers must be punished with a loss of reputation, but non-promotion happens on the equilibrium path.

We look for equilibria in which a firm that retains (does not promote) N workers in a row enters a punishment phase, where it loses its reputation for X periods. Figure 2 shows the structure of this equilibrium. A firm is known to have refused to promote i workers since the last promoted worker. If it chooses to promote the next worker, then the counter resets to zero, but if it chooses not to promote the next worker, then it increases by one. If the counter reaches N, the firm is punished by a loss of its reputation for X periods, at which point the counter resets to zero.

In this set-up a firm could clearly keep from being punished by workers by promoting bad workers periodically. In fact, the firm must establish a reputation both with workers (for promoting good ones) and with high-quality firms (for only promoting good ones). We have chosen to focus on the former, but clearly the latter is equally important. We assume that if a low-ability worker is promoted and hired by another firm—which then observes the employee's ability—the hiring firm will make the deviation public and the promoting firm will lose its reputation with high-quality firms. We believe that this is a reasonable assumption: it seems likely in practice that hiring personnel at different firms in the same industry talk to each other and come to learn that certain firms are known to promote only good workers while others promote using other rules. The assumption that one incorrectly promoted worker triggers a complete loss of reputation for the promoting firm may be extreme, but the intuition is right.

An alternative assumption would be that if firm A hires a promoted worker from firm B who turns out to be bad, then firm A will refuse to hire workers from firm B in the future. In a model where there are a finite number of employers in a given industry, this assumption would be reasonable and yield interesting comparative statics, but in a model with a continuum of firms this would be no penalty for the falsely promoting firm and equilibrium would break

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down.

Our assumption has two advantages. First, it allows us to focus only on the reputation of the firm vis-a-vis workers. Second, it allows us to assume a continuum of firms of each type, which permits us to pin down wages and match firms to workers precisely and simply. With a finite number of firms and workers, many more stringent assumptions would be necessary to generate a tractable model.

An equilibrium is an allocation of workers to firms as described above along with a set of wages $\vec{w} = \left(w_1^{NR}, w_2^{NR}, w_1^{R}, w_2^{R}, w_1^{H}, w_2^{H}, w_2^{H,old} \right)$ that clear the market and allow the match to be stable. Superscripts NR, R, and H refer to the wage offered by the non-reputable, reputable, and high-quality firms, respectively, to workers who are young (subscript 1) or who worked for the firm when young and are now old (subscript 2). $w_2^{H,old}$ is the wage paid by high-quality firms that hire good, old workers who were given prestigious job titles at reputable firms when young. In a *promotional equilibrium*, these wages must satisfy the following constraints.

1. Indifference constraints for firms

   (a) Non-reputable firms must earn zero profit when hiring young workers since there is free entry:

   $$\tau^L \bar{\theta} + \beta \tau^L \theta^H = w_1^{NR} + \beta w_2^{NR} \equiv \bar{w} \tag{1}$$

   where $\bar{\theta} = \gamma \theta^H + (1 - \gamma)\theta^L$ is average worker ability.

   (b) High quality firms must be indifferent between their assigned actions: hiring young workers and hiring old workers known to be good. Let H denote the value of a high quality firm in need of a worker. The value of hiring an old worker who is known to be good is then:

   $$\tau^H \theta^H - w_2^{H,old} + \beta H \tag{2}$$

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and the value of hiring a young worker is:

$$\tau^H \bar{\theta} - w_1^H + \beta \left(\tau^H \theta^H - w_2^H \right) + \beta^2 H \tag{3}$$

For high-quality firms to be indifferent between the two, they must be equal, so we have:

$$H = \frac{\tau^H \theta^H - w_2^{H,old}}{1 - \beta} = \frac{\tau^H \bar{\theta} - w_1^H + \beta \left(\tau^H \theta^H - w_2^H \right)}{1 - \beta^2} \tag{4}$$

2. Preference constraints for firms

(a) A high-quality firm must prefer to hire a good old worker rather than an old worker of low or unknown ability. It could hire a low-ability worker by offering a wage w_2^R to an un-promoted worker at a reputable firm. In equilibrium, un-promoted workers are known to be of low ability and would be willing to switch at that wage. Thus, we must have:

$$\tau^H \theta^H - w_2^{H,old} \geq \tau^H \theta^L - w_2^R \tag{5}$$

It could hire a worker of unknown ability by offering w_2^{NR} to any old worker at a non-reputable firm. Since titles at non-reputable firms are unrelated to ability, there is no additional information that an outside firm has access to once a worker is old. This preference constraint requires that:

$$\tau^H \theta^H - w_2^{H,old} \geq \tau^H \bar{\theta} - w_2^{NR} \tag{6}$$

(b) A high-quality firm that has hired a young worker must prefer to keep her when she is old:

$$\tau^H \theta^H - w_2^H + \beta H \geq H \tag{7}$$

(c) Non-reputable firms must not be able to earn a positive profit by hiring old workers

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from reputable firms, other non-reputable firms, or high quality firms:

$$\tau^L \theta^L \leq w_2^R \tag{8}$$

$$\tau^L \bar{\theta} \leq w_2^{NR} \tag{9}$$

$$\tau^L \bar{\theta} \leq w_2^H \tag{10}$$

(d) Non-reputable firms must prefer to keep their workers when they are old:

$$\tau^L \theta^H \geq w_2^{NR} \tag{11}$$

(e) Reputable firms must prefer to promote high quality workers. Let $V(i)$ denote the value of a reputable firm that has not promoted i consecutive workers. If it promotes a high-ability worker, its counter resets and its value is $V(0)$. If it does not promote the worker, it receives a profit of $\tau^L \theta^H - w_2^R$, but its counter increases by one. Therefore, promotion is always preferable when:

$$V(0) \geq \tau^L \theta^H - w_2^R + \beta V(i+1), \qquad \text{for all } i \in \{0, \ldots, N-1\} \tag{12}$$

(f) Reputable firms must have positive value, thus ensuring that they prefer to pursue their assigned strategy rather than take an action that is assigned to or ruled out for a non-reputable firm:

$$V(0) \geq 0 \tag{13}$$

(g) Reputable firms must prefer to retain un-promoted workers rather than firing them:

$$\tau^L \theta^H - w_2^R + \beta V(i) \geq V(i) \tag{14}$$

3. Preference constraints for workers

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(a) Young workers must be indifferent between working for reputable firms, non-reputable firms, and high-quality firms. They earn $\bar{w}$ at non-reputable firms so we have:

$$w_1^R + \beta\left(\gamma w_2^{H,old} + (1-\gamma)w_2^R\right) = \bar{w} \tag{15}$$

$$w_1^H + \beta w_2^H = \bar{w} \tag{16}$$

(b) High-ability workers who are revealed as such when promoted by reputable firms must prefer to move to high-quality firms when old versus remain at their present employer:

$$w_2^{H,old} \geq w_2^R \tag{17}$$

The final step before we can solve for equilibrium wages—and determine whether an equilibrium exists—is to define the bargaining power between firms and workers. Fortunately, in many situations this is not an issue, since the above constraints alone pin down equilibrium wages. An exception are the wages of old workers who stay with their firms. If these workers are of low or unknown ability, their value to outside firms is lower than to the original employer. This means there is surplus that must be divided between the parties. Interestingly, the more surplus the worker gets when she is old, the easier it is to sustain an equilibrium in which reputable firms promote good workers and do not promote bad ones. This is because the value of retaining a good worker—and therefore the temptation for the firm to deviate from the equilibrium strategy—is decreasing in the worker's bargaining power. When the worker has full bargaining power, reputation becomes irrelevant since firing the worker is always optimal.

To stack the deck as much as possible against *promotional equilibria*, we assume that the firm possesses full bargaining power. This maximizes the temptation to retain good workers instead of promoting them. This assumption, combined with our constraints above,

is sufficient to solve for equilibrium wages $\vec{w}$. Since the firm has full bargaining power, wages of retained workers in period two equal each worker's outside option. Since young workers at non-reputable and high-quality firms are not identified *ex post* by job title, they are, on average, of average ability. Retained workers at reputable firms are identified through their titles as low ability and their outside options are accordingly limited. Equations (8) to (10) then imply that:

$$w_2^R = \tau^L \theta^L \tag{18}$$

$$w_2^{NR} = \tau^L \bar{\theta} \tag{19}$$

$$w_2^H = \tau^L \bar{\theta} \tag{20}$$

The above wages for old workers of low or unknown ability are the minimum wages such that non-reputable firms cannot earn a positive profit by hiring these types of worker (see the constraints in (8) to (10)). As we will see, this means that high-quality firms have no incentive to employ these workers either.

The wage of young workers hired by non-reputable firms is determined by the zero-profit condition in (1). Substituting equation (19) into this condition yields:

$$w_1^{NR} = \tau^L \bar{\theta} + \beta \tau^L \left(\theta^H - \bar{\theta} \right) \tag{21}$$

Non-reputable firms earn rents from old workers. Competition then forces them to pay young workers more than their expected productivity so that they do not earn economic profit.

The wage paid to a young worker by a high-quality firm can be found by combining equations (16) and (20):

$$w_1^H = \tau^L \bar{\theta} + \beta \tau^L (\theta^H - \bar{\theta}) \tag{22}$$

Since workers are indifferent between joining non-reputable firms and high-quality firms when young and since these two types of firms pay the same wage to old workers they retain, the

wage paid to young workers by these firms must also be the same.

High-quality firms may also hire old workers who have been promoted and are therefore known to be good. Their wage can be found by combining (4) with (20) and (22):

$$w_2^{H,old} = \tau^L \theta^H + \frac{1 - \gamma}{1 + \beta} \, \Delta\tau \, \Delta\theta, \tag{23}$$

where $\Delta\tau = \tau^H - \tau^L$ and $\Delta\theta = \theta^H - \theta^L$. This wage clearly exceeds the wage that old workers with high ability would earn at non-reputable firms, which is given by $\tau^L \theta^H$.

The final wage to be determined is that paid by reputable firms to young workers. Equations (15), (18), (21) and (23) yield:

$$w_1^R = w_1^{NR} - \frac{\beta}{1 - \beta} \, \gamma(1 - \gamma) \, \Delta\tau \, \Delta\theta \tag{24}$$

Comparing the wages paid by reputable and non-reputable firms, we have the following result.

Proposition 1. *When a promotional equilibrium exists, a firm with a reputation for promoting high-ability workers pays less to its workers at every level of tenure than a firm lacking such a reputation.*

Proof. Equations (18) and (19) immediately imply that firms with reputations pay less to old workers. That these firms pay less to young workers as well follows from equation (24), which states that $w_1^R < w_1^{NR}$. ∎

Proposition 1 shows that, compared to firms without a reputation for promoting skilled workers, firms that have such a reputation are able to pay less to workers at all levels of tenure. Reputable firms benefit by underpaying young workers because these workers are willing to accept lower wage in the short term in exchange for higher long-term wages if they get promoted. Reputable firms also benefit by paying lower wages to old workers that they retain, since other firms know that these workers are not generally skilled.

It is easily verified that the wages specified above satisfy all the constraints except the incentive constraints of reputable firms in (12) and (14), which state that reputable firms must prefer to promote high-ability workers and must prefer to retain old workers rather than fire them, respectively. The latter constraint essentially differentiates between equilibria in which reputable firms keep old workers and in which they have an "up-or-out" promotional culture. We discuss this in greater detail in Section 5. To determine whether these constraints hold, we must first determine the value of a reputable firm.

3.1 The Value of Reputable Firms

In this section, we show that the value of a reputable firm is proportional to its expected savings from underpaying workers compared to non-reputable firms of the same quality, which is given by:

$$
\begin{align}
\pi &= \tau^L \bar{\theta} - w_1^R + \beta(1 - \gamma)\left(\tau^L \theta^H - w_2^R\right) \tag{25} \\
&= \frac{\beta}{1 - \beta}\,\gamma(1 - \gamma)\,\Delta\tau\,\Delta\theta \tag{26}
\end{align}
$$

Proposition 2. *When a promotional equilibrium exists, the value of a reputable firm with i consecutive non-promotions is given by:*

$$
V(i) = \frac{1}{\zeta^i}\left(\frac{1 - \zeta^N - \left(1 - \zeta^i\right)\left(1 - \zeta^N \beta^X\right)}{(1 - \zeta)\left(1 - \zeta^N \beta^X\right) - \beta\gamma\left(1 - \zeta^N\right)}\right)\pi, \qquad \textit{for all } i \in \{0, \ldots, N\}, \tag{27}
$$

where $\zeta = \beta^2(1 - \gamma)$.

Proof. A young worker hired by a reputable firm is of high ability with probability γ. In this case, the worker is promoted after the first period and the counter resets to zero. With probability $1 - \gamma$, the worker is of low ability and will be retained when old. Thus, the value

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of a reputable firm with i consecutive non-promotions is given by:

$$V(i) = \tau^L \bar{\theta} - w_1^R + \beta \left(\gamma V(0) + (1 - \gamma) \left(\tau^L \theta^H - w_2^R + \beta V(i+1) \right) \right) \tag{28}$$

for all $i \in \{0, \ldots, N-1\}$. Substituting the equilibrium wages into this equation yields:

$$V(i) = \pi + \beta \gamma V(0) + \beta^2 (1 - \gamma) V(i+1) \tag{29}$$

This recursive equation can be written as:

$$V(0) = (\pi + \beta \gamma V(0)) \sum_{j=0}^{i-1} \zeta^j + \zeta^i V(i) \tag{30}$$

Thus, the value of a reputable firm $V(i)$ can be expressed in terms of $V(0)$ as:

$$V(i) = \frac{\left(1 - \zeta - \beta \gamma \left(1 - \zeta^i\right)\right) V(0) - \left(1 - \zeta^i\right) \pi}{(1 - \zeta) \zeta^i} \tag{31}$$

After N consecutive non-promotions, however, the firm is punished by losing its reputation for X periods, in which it has to pay the higher wages of a non-reputable firm to its workers and thus makes zero profit:

$$V(N) = \beta^X V(0) \tag{32}$$

Combining this boundary condition with the expression for $V(N)$ derived in (31) yields:

$$V(0) = \frac{1 - \zeta^N}{(1 - \zeta)\left(1 - \zeta^N \beta^X\right) - \beta \gamma \left(1 - \zeta^N\right)} \pi \tag{33}$$

Substituting this expression into equation (31), we find that:

$$V(i) = \frac{1}{\zeta^i} \left(\frac{1 - \zeta^N - \left(1 - \zeta^i\right)\left(1 - \zeta^N \beta^X\right)}{(1 - \zeta)\left(1 - \zeta^N \beta^X\right) - \beta \gamma \left(1 - \zeta^N\right)} \right) \pi \tag{34}$$

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for all $i \in \{0, \ldots, N\}$. ∎

The following corollary shows that the value of reputable firms is higher than that of non-reputable firms at all times.

Corollary 1. *When a promotional equilibrium exists, the value of a reputable firm is strictly positive.*

Proof. From the proof of Proposition 2, we know that:

$$V(0) = \frac{1 - \zeta^N}{(1 - \zeta)(1 - \zeta^N \beta^X) - \beta\gamma(1 - \zeta^N)} \pi \qquad (35)$$

Clearly, $\pi > 0$ and $\zeta^N < 1$ for any $N \geq 1$. The denominator of $V(0)$ is positive as well since:

$$
\begin{align}
(1 - \zeta)\left(1 - \zeta^N \beta^X\right) - \beta\gamma\left(1 - \zeta^N\right) &\geq (1 - \zeta)\left(1 - \zeta^N\right) - \beta\gamma\left(1 - \zeta^N\right) \qquad (36) \\
&= \left(1 - \zeta^N\right)\left(1 - \beta^2(1 - \gamma) - \beta\gamma\right) \qquad (37) \\
&> \left(1 - \zeta^N\right)(1 - \beta) \qquad (38) \\
&> 0 \qquad (39)
\end{align}
$$

∎

The following result shows that the value of a firm's reputation decreases in i, the number of consecutive workers that have not been promoted. This is not surprising: as the firm approaches a punishment phase it becomes less valuable.

Corollary 2. *When a promotional equilibrium exists, the value of a reputable firm is:*

(i) decreasing in the number of consecutive non-promotions i;

(ii) decreasing in the length of the punishment phase X; and

(iii) increasing in the length of the grace period N.

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Proof. The comparative static result in (i) follows immediately from the expression of $V(i)$ derived in Proposition 2. In order to prove the results in (ii) and (iii), note that $V(0)$ can be written as:

$$V(0) = \left((1-\zeta)\frac{1-\zeta^N \beta^X}{1-\zeta^N} - \beta\gamma \right)^{-1} \pi \tag{40}$$

This expression clearly shows that $V(0)$ is increasing in N and decreasing in X. Since $V(i)$ is linearly increasing in $V(0)$ according to equation (31), it then immediately follows that the value of a reputable firm has the same properties: $V(i)$ is increasing in N and decreasing in X for any i. ∎

3.2 Existence of Promotional Equilibria

Using the equilibrium wages derived above and the result that $V(i)$ is decreasing in i, the incentive constraint ensuring that reputable firms optimally choose to promote high-ability workers can be written as:

$$V(0) \geq \tau^L \Delta\theta + \beta V(1) \tag{41}$$

This constraint is not trivially satisfied. Equation (29) implies that:

$$V(0) = \frac{1}{1-\beta\gamma} \left(\pi + \beta^2(1-\gamma)V(1) \right) \tag{42}$$

which allows us to rewrite the above incentive constraint as:

$$V(0) \leq \frac{1}{1-\beta} \left(\pi - \beta(1-\gamma)\tau^L \Delta\theta \right) \tag{43}$$

Since the value of a reputable firm $V(0)$ is increasing in N and decreasing in X, a necessary and sufficient condition for an equilibrium to exist is that the above inequality holds for $N=1$ and $X \to \infty$:

$$\frac{\pi}{1-\beta\gamma} \leq \frac{1}{1-\beta} \left(\pi - \beta(1-\gamma)\tau^L \Delta\theta \right) \tag{44}$$

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which is equivalent to:

$$\frac{\tau^H}{\tau^L} \geq \frac{1 + \beta - \beta\gamma\,(\beta + \gamma)}{\beta\gamma(1 - \gamma)} \equiv \underline{r}_\tau(\beta, \gamma) \tag{45}$$

We must also assure that reputable firms retain employees that they do not promote. Substituting the equilibrium wage w_2^R into the incentive constraint in (14) yields:

$$V(i) \leq \frac{\tau^L \Delta\theta}{1 - \beta} \tag{46}$$

Since $V(i)$ is decreasing in i, reputable firms always prefer to keep old workers rather than fire them when:

$$V(0) \leq \frac{\tau^L \Delta\theta}{1 - \beta} \tag{47}$$

Using again the fact that the lowest possible value for $V(0)$ is achieved by setting N equal to 1 and letting X go to infinity, we find another necessary condition for a promotional equilibrium:

$$\frac{\pi}{1 - \beta\gamma} \leq \frac{\tau^L \Delta\theta}{1 - \beta} \tag{48}$$

which can be written as:

$$\frac{\tau^H}{\tau^L} \leq \frac{1 + \beta - \beta\gamma\,(2\beta + \gamma - \beta\gamma)}{\beta\gamma(1 - \beta)(1 - \gamma)} \equiv \bar{r}_\tau(\beta, \gamma) \tag{49}$$

This establishes the following result.

Proposition 3. *Promotional equilibria exist so long as the productivity of high-quality firms, compared to that of low-quality firms, is neither too high nor too low. For any choice of parameters, promotional equilibria exist for some value of $\frac{\tau^H}{\tau^L}$*

Proof. The above discussion shows that promotional equilibria exist if and only if $\underline{r}_\tau(\beta, \gamma) \leq \tau^H/\tau^L \leq \bar{r}_\tau(\beta, \gamma)$. Note that the upper bound on the productivity ratio always exceeds the

lower bound:

$$\bar{r}_\tau(\beta,\gamma) - \underline{r}_\tau(\beta,\gamma) = \frac{1 + \beta - \beta\gamma(2\beta + \gamma(1-\beta))}{\beta\gamma(1-\beta)(1-\gamma)} - \frac{1 + \beta - \beta\gamma(\beta+\gamma)}{\beta\gamma(1-\gamma)} \tag{50}$$

$$= \frac{1 + \beta + \beta(3-\beta)\gamma}{(1-\beta)\gamma(1-\gamma)} \tag{51}$$

$$> 0 \tag{52}$$

∎

The above result shows that promotional equilibria exist for intermediate values of the productivity ratio τ^H/τ^L. When this ratio is too low, workers receive little value from the prospect of working at a high quality firm when old, so they are willing to forgo little in terms of wages when young. This reduces the value of maintaining a reputation to a low enough point that it is outweighed by the value of retaining good workers. On the other hand, when the ratio is very high, workers can be underpaid so much when young that reputable firms never want to retain old workers, regardless of their ability. They are therefore happy to promote good workers (who are then hired away) and fire bad workers. These firms have an "up-or-out" promotional culture, though in practice even the promoted workers leave the firm. We discuss this further in Section 5.

We now turn to analyzing the set of equilibria of our model. Equilibria of interest are either "promotional" or "up-or-out." In both cases, reputable firms assign prestigious job titles to high-ability workers, but in the former case, firms retain low-ability workers and in the latter case they fire them. We first focus on the conditions that allow promotional equilibria, and discuss "up-or-out" equilibria in Section 5.

Lemma 1. *The minimum ratio of firm productivities τ^H/τ^L necessary for the existence of a promotional equilibrium is decreasing in β.*

Proof. This follows immediately from the derivative of the lower bound $\underline{r}_\tau(\beta,\gamma)$ with respect

to β, which is always negative:

$$\frac{d}{d\beta}\, \underline{r}_\tau(\beta, \gamma) = -\frac{\gamma(1-\gamma)}{(\beta\gamma(1-\gamma))^2}\left(1 + \beta^2\gamma\right) < 0 \tag{53}$$

∎

This should not be surprising. In line with standard results in the reputation literature, as actors that posses reputations become more patient, they are more willing to forgo current gains to maintain a reputation.

The effect of the fraction of talented workers in the population on the existence of promotional equilibria is more complicated. Because of the fact that we employ a general equilibrium framework, changes in parameters can be felt through multiple channels. Higher values of γ increase the wage paid by non-reputable firms because average worker quality is higher and the zero-profit condition thus implies higher wages:

$$w_1^{NR} = \tau^L\bar{\theta} + \beta\tau^L\left(\theta^H - \bar{\theta}\right) \tag{54}$$

$$= \tau^L(1-\beta)\left(\gamma\theta^H + (1-\gamma)\theta^L\right) + \beta\tau^L\theta^H \tag{55}$$

But these higher wages offered by non-reputable firms do not necessarily translate into higher wages paid by reputable firms. Since workers have a higher likelihood of being promoted and earning high pay late in life, reputable firms can afford to underpay young workers to a greater extent as γ increases. The derivative of w_1^R with respect to γ is given by:

$$\frac{d}{d\gamma}\, w_1^R = \tau^L(1-\beta)\Delta\theta - \frac{\beta}{1+\beta}\left(1 - 2\gamma\right)\Delta\tau\Delta\theta \tag{56}$$

For $\gamma > 1/2$, this expression is clearly positive; for small values of γ, however, it can be negative.

Given that the effect of γ on wages is ambiguous, it should not be surprising that the

effect on the existence of a promotional equilibrium is equally ambiguous.

Lemma 2. *The minimum ratio of firm productivities τ^H/τ^L necessary for the existence of a promotional equilibrium is decreasing in γ for low values of γ and increasing for high values.*

Proof. The numerator of lower bound $\underline{r}_\tau(\beta,\gamma)$ is given by $1+\beta-\beta\gamma(\beta+\gamma)$, which is decreasing in γ. The denominator is $\beta\gamma(1-\gamma)$, which is increasing in γ for values of γ below $1/2$ and decreasing for values above $1/2$. Thus, $\underline{r}_\tau(\beta,\gamma)$ is decreasing in γ up to some value above $1/2$. Since the limit of the numerator as γ goes to one is $(1+\beta)(1-\beta)$ whereas the limit of the denominator is zero, the lower bound $\underline{r}_\tau(\beta,\gamma)$ goes to infinity as γ converges to one. ∎

3.3 Set of Possible Equilibria

We have so far focused on parameter values that ensure the existence of a promotional equilibrium, but we can also ask what sort of equilibria are possible given any set of parameter values. There are two degrees of freedom in defining an equilibrium: the length of the grace period, N, and the length of the punishment phase, X. For any parameter values where an equilibrium exists, there are, in fact, infinitely many equilibria that could be in place. If an equilibrium exists, then for a given X and parameter set $P = \{\theta^L, \theta^H, \tau^L, \tau^H, \beta, \gamma\}$, there is a maximum length of the grace period $N^*(X, P)$ that is consistent with equilibrium behavior. Any grace period $N < N^*(X, P)$, paired with X, will also yield equilibrium behavior. Therefore, we can fully describe the set of equilibrium pairs (X, N) for any set of parameter values P by describing the function $N^*(X, P)$.

Proposition 4. *The maximum grace period consistent with a promotional equilibrium is weakly increasing in the length of the punishment phase.*

Proof. Since corollary 2 established that $V(i)$ is increasing in N and decreasing in X, the implicit function theorem immediately implies that $N^*(X, P)$ is increasing in X for all parameter values P. ∎

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Figure 3 shows the set of equilibria in the (X, N) space for the parameter values $\beta = 0.9$ and $\gamma = 0.5$. Note that, consistent with our discussion in Section 3.2, the maximum grace period increases in the productivity ratio τ^H/τ^L for any given punishment length.

3.4 Social Welfare

If social welfare is utilitarian—i.e., the social welfare function is equally weighted—then in this model social welfare equals total production. Since worker ability and firm productivity are complementary, welfare is maximized when as many reputable firms are in the grace period as possible.

If there are no reputable firms, then workers are assigned to high- and low-quality firms randomly when young, and they stay with their initial employers when old. This is a lower bound on social welfare. The existence of reputable firms allows high-quality firms to hire good workers more frequently than they otherwise could while low-quality firms, including reputable ones, would hire more young workers. When a reputable firm is in the punishment phase it is not serving its purpose of improving the allocational efficiency of labor, so total production is maximized when the number of reputable firms not in the punishment phase is maximized.

It is clearly optimal to choose values of N and X so that we are on the boundary of allowable equilibria shown in Figure 3, but so long as some high quality firms hire young workers, social welfare is not first-best.

4 Alternative Contracts and Equilibria

More sophisticated contracts could potentially result in maximum social welfare. We discuss these alternative contracts here, but note that their usefulness is typically not robust to various alternative assumptions about the information structure of the economy.

4.1 Screening/Incentive Contracts

One might imagine that screening contracts could induce good workers to self-select to high-quality firms. A high-quality firm could offer a contract to an old worker specifying higher pay for higher output. If workers learn their types when young, low-ability workers would value such offers less than high-ability workers. This is a standard screening result: sufficiently strong incentives can screen for more skilled workers. However, these contracts are also subject to the standard limitations on screening contracts; namely, they are useless when workers do not know their types (the screen must be a self-selection) or when output is not verifiable. This latter issue is critical for any contract whose payments depend on output. In many—if not most—contracting situations, output is not verifiable and therefore cannot be contracted upon. In our simple model output results from one worker working at one firm so output would probably be verifiable, but in practice, firms with many workers suffer from this problem.

4.2 Long-Term Contracts

Long-term contracts could also induce the first-best outcome. Firms could simply offer a contract guaranteeing lifetime employment that specifies a high wage when the worker is old. It would be incentive compatible for reputable firms (or any firms, for that matter) to promote good old workers since they would rather hire young workers anyway, given the contract.

In theory, long-term contracts could allow the economy to achieve a first-best outcome, but in practice there are difficulties. The largest concerns moral hazard: if we were to add even a small amount of moral hazard to the problem, then lifetime employment would cease to be a solution. The guarantee of both employment and a high wage when old could preclude the firm from offering proper incentive pay if output is verifiable. If output were not verifiable then firing would be the only available source of incentives, implying that a

long-term contract would clearly be suboptimal. There are many reasons we do not see many lifetime employment contracts and moral hazard is but one, but the idea that firms could commit to promote good workers because it is preferable to firing them seems like a stretch in any case.

5 "Up-or-Out" Promotional Cultures

In the preceding sections, we focused on promotional equilibria in which reputable firms promote workers with high ability and retain those with low ability. However, as the incentive constraint in (14) shows, firms may prefer to get rid of old workers regardless of their ability if the benefit from hiring young workers is sufficiently high. This would result in an "up-or-out" promotional culture in which strong performers are promoted and weak performers are fired. The flow of workers through employers in this case is shown in Figure 4. Promoted workers, of course, are lured away by high quality firms, so the resemblance to real-world firms with this culture requires some imagination!

"Up-or-out" cultures occur when $V(i) \geq \tau^L \Delta\theta/(1-\beta)$. Since $V(i)$ is declining in i, some firms may begin life as "up-or-out" firms, firing old workers who are not promoted. As they begin to lose their reputations (as i increases), they become promotional and retain lower quality workers. These intermediate firms are very difficult to evaluate and we ignore them here. Instead, we focus on the case where a firm always has the same culture.

The value of the firm in this case is quite easy to calculate. The firm *has no incentive not to promote a good worker* since it wishes to fire bad workers anyway and all types have the same firm-specific skills when old. There is therefore no value function to iteratively define: the firm simply earns $\tau^L \bar{\theta} - w_1^R$ in every period.[5] The value of a reputable firm is thus given

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[5]Note that w_1^R is the same as before. Since old workers are paid their outside option $\tau^L \theta^L$ whether at a promotional firm or an "up-or-out" firm, young workers are indifferent as to the culture.

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by:

$$V \quad = \quad \frac{\tau^L \bar{\theta} - w_1^R}{1 - \beta} \tag{57}$$

$$= \quad \frac{1}{1 - \beta} \left(\pi - \beta(1 - \gamma)\tau^L \Delta \theta \right) \tag{58}$$

We therefore have the following result.

Proposition 5. *Equilibria with an "up-or-out" corporate culture exist if:*

$$\frac{\tau^H}{\tau^L} \geq 1 + \frac{1 - \beta}{\gamma} \left(1 + \frac{1}{\beta(1 - \gamma)} \right) \tag{59}$$

6   Conclusion

Job titles are often simply succinct encapsulations of the required duties of the job holder and, perhaps, her tenure at the firm, her authority, etc. Such job titles convey no information that could not otherwise be gleaned from an employee's resume, recommendations or a personal interview. But job titles may also convey valuable information to outsiders regarding the employee's ability. Firms assigning informative job titles willingly endow their best workers with improved outside options and must either pay more to compensate or be satisfied to lose such employees. Given this cost, it may be surprising that prestigious titles could convey any incremental information at all.

We show that this cost of a job title can become a benefit: a firm with a reputation for promoting good workers is an appealing initial employer for a young worker hoping to advance her career quickly. She will accept a lower wage when young in the hope of earning a higher wage from a different firm when older. Our story fits within the career concerns literature in that employers can make use of career concerns to earn rents from young employees, but employs a different technology. Firms can act as "labelers," hiring young workers of unknown ability and publicly labeling their ability with an accurate job title. This improves the match

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of workers to firms and therefore increases social welfare. The labeling firm can appropriate some of this additional welfare—in our model, all of it.

The labeling firm may be tempted to retain good workers by labeling them as low ability, thus earning rents by getting good work for low pay. Therefore, they must be penalized for inaccurate labels. But how can the market know a label was inaccurate if the worker never leaves the firm? We show that a firm can be induced to always promote good workers via reputational costs. Employees who have not witnessed a promotion in a long time may believe that the firm has reneged on its implicit agreement to promote good workers and thus be unwilling to work for a formerly reputable firm unless paid a high salary. If social benefits from the proper matching of workers to firms are high enough, then reputational costs may be sufficient to induce firms to hold up their end of the implicit contract.

We also show that if the social benefit of proper matching is high enough, firms may adopt an "up-or-out" promotional culture in which workers who are not promoted are fired. In this case, firms earn such high rents by underpaying young workers seeking a stamp of approval that it is never in their interest to retain older workers.

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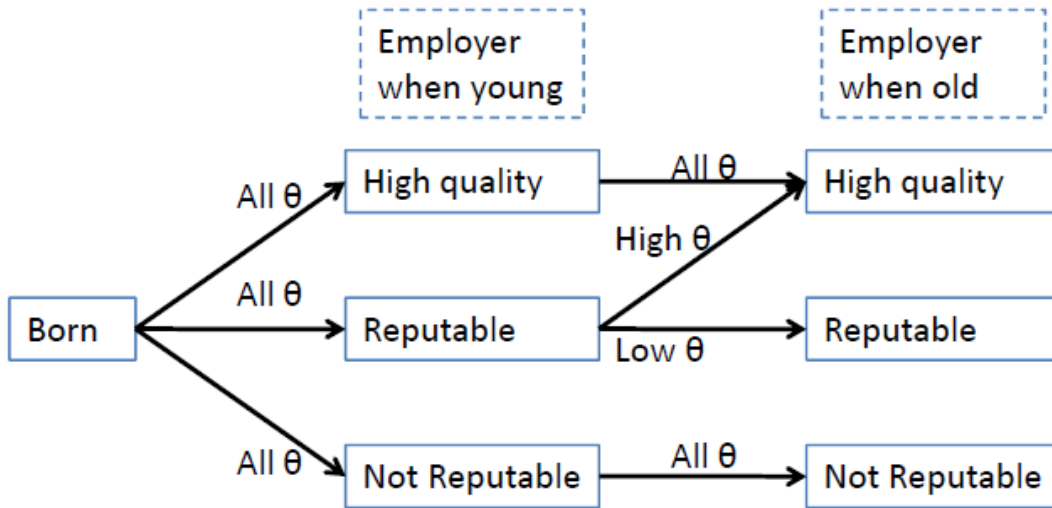
Figure 1: Workers are indifferent to their match when young and average worker quality at each firm is equal since worker type is unknown. Non-reputable and high-quality employers hide their good employees by assigning titles in an uninformative way and retain all old employees. Reputable firms promote good workers, who are then hired away by high-quality firms. Low-quality employees remain with the reputable firm.
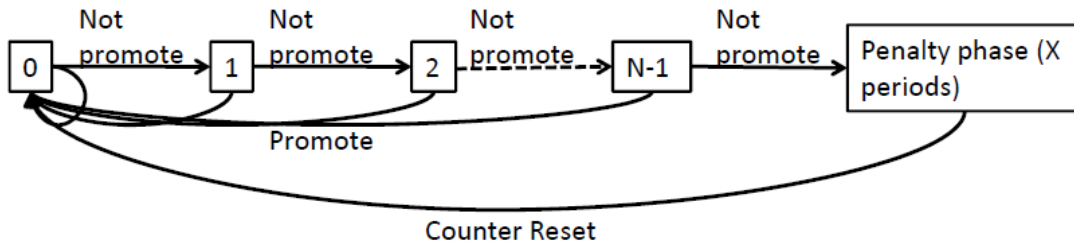

Figure 2: A firm with a reputation, at any given time, has retained i consecutive employees since last promoting—and losing—one. The firm may promote its next young employee, in which case the counter resets to zero, or may retain the employee by not promoting her. In this case, the counter increases by one. If the counter reaches N, then the firm is punished by potential young workers with a loss of its reputation for X periods, at the end of which the counter resets to 0.
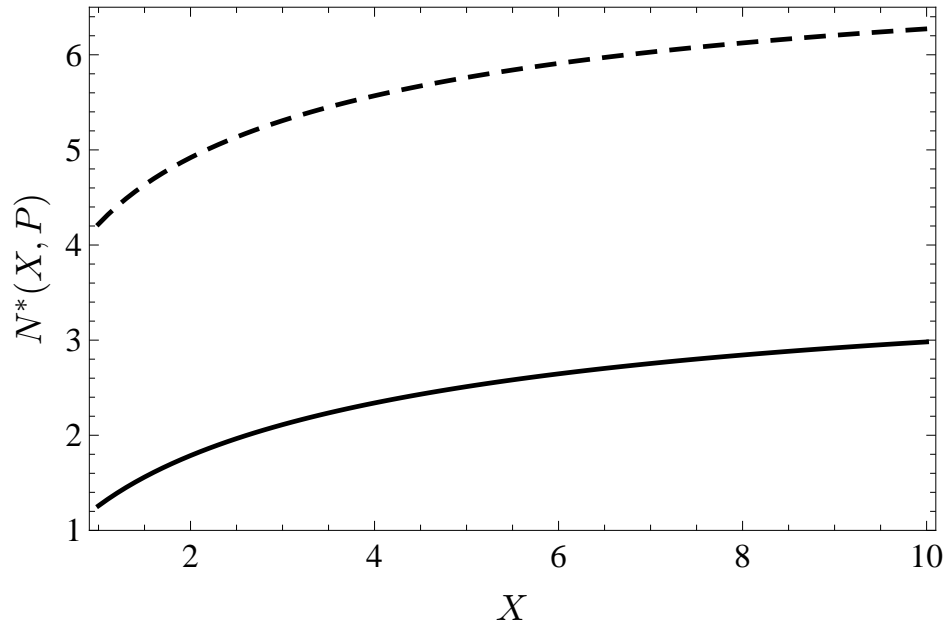
Figure 3: The maximum length of the grace period, $N^*(X, P)$, is increasing in the length of the punishment phase, X. As the ratio of firm productivities τ^H/τ^L increases, longer grace periods are possible in equilibrium. The parameter values used in the graph are $\beta = 0.9$, $\gamma = 0.5$, $\theta^L = 1$, $\theta^H = 2$, $\tau^L = 1$, and $\tau^H = 10$ (solid line), $\tau^H = 13$ (dashed line).
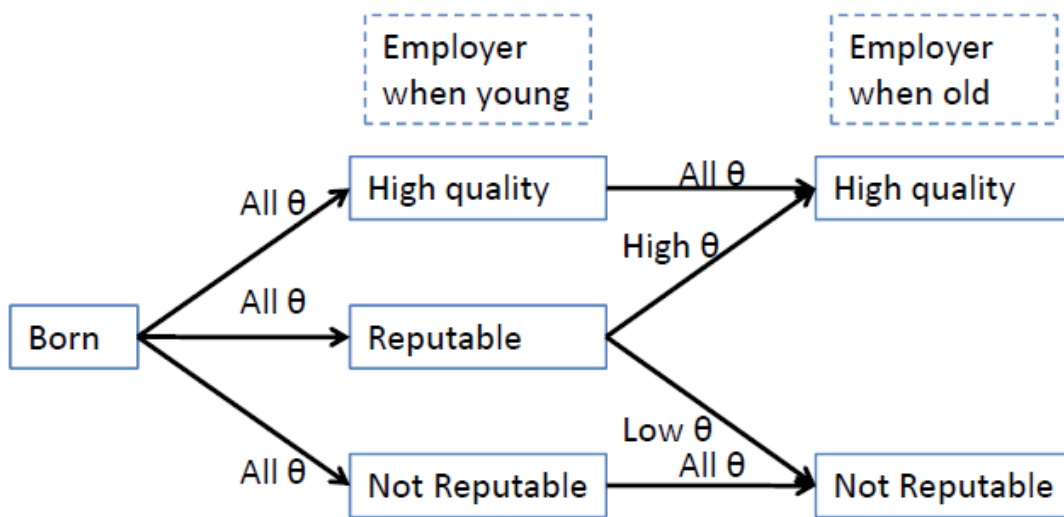
Figure 4: Workers are indifferent to their match when young and average worker quality at each firm is equal since worker type is unknown. Non-reputable and high-quality employers hide their good employees by assigning titles in an uninformative way and retain all old employees. Reputable firms promote good workers, who are then hired away by high-quality firms. Low-quality employees are fired and move to non-reputable firms.