Motivation Under Monopsony: The Effects of Labor Market Power on Incentives Within the Firm

James Stratton*

July 1, 2026

Abstract

How does imperfect labor market competition affect workers' behavior within the firm? I develop a model of career concerns under infrequent outside offers and dynamic wage renegotiation. In equilibrium, wages respond asymmetrically to performance: unexpectedly strong performance causes small wage gains, but unexpectedly poor performance triggers large wage cuts or separation. As a result, workers target acceptable rather than exceptional performance, and choose inefficiently safe projects when they have discretion over risk. These distortions affect different types of workers: workers who are "secure" in their jobs, in that their employers are far from credibly threatening renegotiation, exert too little effort but take nearly efficient risks; workers who are "insecure" exert high effort but inefficiently avoid risk. The mechanism links imperfect competition to empirical observations of concave wage-performance profiles, performance-targeting, and managerial conservatism.

*Email: jstratton@g.harvard.edu. I am grateful to have received comments from Sam Antill, John Campbell, Henrique Castro-Pires, Gonzalo Cisternas, Raj Chetty, Ed Glaeser, Sam Hanson, Larry Katz, Shengwu Li, Bentley MacLeod, Eric Maskin, Oliver Hart, Mandy Pallais, Jesse Shapiro, Kathy Spier, Nicolaj Thor, and participants at Harvard's Theory, Contract Theory, Labor, and Finance workshops, MIT's Organizational Economics Workshop, and the Pennsylvania Economic Association. I am also grateful to have received funding from the Bradley Foundation Fund and the Kenneth C. Griffin fund.

1. Introduction

There is now substantial evidence that labor markets are imperfectly competitive: workers face a limited set of employers; search frictions impede mobility; and outside options arrive infrequently.[1] As in any market, imperfect competition can cause misallocation and distort prices (wages) and quantities (employment). A distinguishing feature of the employment relationship, however, is that it typically leaves workers with substantial discretion (Simon 1951; Hart and Moore 1990): whether to exert effort; whether to take risks; and which projects to prioritize. Yet the effects of labor market power on behavior *within the firm* remain a "neglected topic" (Langella and Manning 2021, p. 2935).[2] How does labor market power shape workers' behavior on the job?

I study this question in a setting with three features common to many employment relationships. First, contracts are incomplete: many aspects of the worker's behavior and performance are non-contractible, perhaps because they are too complex to specify *ex ante* or too difficult to verify *ex post* (Williamson 1981; Gibbons 1998). Workers are therefore disciplined partly by career concerns (Holmström 1982/1999). Second, the labor market is imperfectly competitive: outside offers arrive only occasionally, as in the frictional search literature (Jovanovic 1979; Burdett and Mortensen 1998). Third, wages are renegotiated when either party has a credible threat to terminate employment; otherwise, the current wage remains in place (Malcomson 1999; Postel-Vinay and Robin 2002).

I show that these features have a distinctive joint implication for wage dynamics: workers receive *small* wage increases after performing unexpectedly well, but *large* wage reductions after performing unexpectedly poorly. This asymmetry has two behavioral consequences. First, it affects the *level* of output by generating *dynamic performance-targeting*: workers exert effort to avoid falling below "acceptable" performance, but have muted incentives to exceed it. Second, it affects the *variance* of output by generating *conservatism*: because workers bear more downside risk than upside gain, even risk-neutral workers at risk-neutral firms behave as if risk-averse. I argue that this mechanism provides a natural explanation for evidence from three settings: (1) the labor literature on concave wage responses to performance; (2) the organizational literature on performance targeting; and (3) the innovation literature on managerial conservatism. Labor market power thus shapes behavior *within the firm*, beyond its well-known effects on wages and employment, and a simple model of labor market power explains several patterns previously documented in empirical work, as well as generating novel predictions for the effect of competition on internal labor markets.

To see the intuition, consider a worker of uncertain ability whose current wage is equal to her current expected output, which is also her expected output in future periods (as for a stationary production technology). Suppose the worker's current output is informative about future output (in the sense of the monotone likelihood ratio property). As a result, strong current performance increases expected future output, and so, in a competitive labor market, outside employers bid the wage up. On the other hand, poor performance lowers expected future output, so the incumbent employer can credibly threaten termination to bargain the wage down. In standard career-concerns

[1] For recent reviews, see Manning (2021); Langella and Manning (2021); Card (2022); Ashenfelter et al. (2022); Azar and Marinescu (2024); Kline (2025); Caldwell et al. (2026a). For discussions of labor market power and misallocation, see, *e.g.*, Burdett and Mortensen (1998); Berger et al. (2022); Amodio et al. (2025); Bachmann et al. (2026); for wages and employment, see, *e.g.*, Robinson (1933); Manning (2003); Card et al. (2018); Lamadon et al. (2022); Yeh et al. (2022).

[2] Similarly, Caldwell et al. (2026a) write that "further research is needed to clarify the relationship between labor discipline and monopsony both theoretically and empirically" (p. 48). Hoffman and Stanton (2025) state that "few models… explicitly analyze how labor market competition influences… equilibrium incentive contracts" (p. 763).

models (Fama 1980; Holmström 1982/1999), these forces are symmetric: wages adjust one-for-one to both positive and negative revisions of expected future output.

Under imperfect competition, this symmetry breaks down. To fix ideas, consider the limiting case in which the worker expects no outside offers. Imperfect competition preserves the employer's ability to bargain wages *down*: if poor performance lowers expected future output, the firm still has a credible threat to terminate employment. But imperfect competition weakens the worker's ability to bargain wages *up*: without a credible outside option, strong performance may not translate into a higher wage. In models where wage renegotiation requires a credible threat (*e.g.*, Postel-Vinay and Robin 2002), the worker captures none of the surplus gain. If she *can* renegotiate, her wage rises only in proportion to her bargaining share. As a result, the worker's wage falls one-for-one with declines in expected output but rises less than one-for-one with increases.

I formalize this intuition in a model of career concerns under imperfect competition. A worker of initially unknown ability chooses an action, which, together with her ability, determines the drift of output. After observing output, the firm and the worker may renegotiate wages, if either has a credible threat to terminate employment. In a competitive labor market, the worker's continuation value is linear in expected future output. Under imperfect competition, this relationship becomes concave: poor performance reduces the continuation wage more than equally good performance raises it. I first show this result assuming wages are flexibly renegotiated in response to credible threats; I then extend it to allow for rent-sharing, downward wage rigidity, and wage posting.

This result rationalizes evidence that poor performance is often punished more than good performance is rewarded, from line employees (Trevor et al. 1997) to security analysts (Hong et al. 2000), fund managers (Chevalier and Ellison 1999; Ibert et al. 2018), and executives (Leone et al. 2006; Jenter and Lewellen 2021). Existing accounts impose this asymmetry exogenously, *e.g.*, by allowing termination but not raises (Hirshleifer and Thakor 1992; Zwiebel 1995), which raises the question of why firms can motivate workers "only through the use or threat of dismissal" (Aghion and Jackson 2016, p. 2). I show that labor market power generates such an asymmetry endogenously.

This asymmetric response of wages shapes workers' behavior within the firm. Suppose first that the worker can exert costly effort to affect expected output. When she is *insecure* in her job, in that her employer is close to credibly threatening termination, effort is strongly incentivized: better performance forestalls wage cuts and reduces the probability of separation. When she is *secure*, with the employer far from the termination threshold, incentives are weaker: strong performance is only partially capitalized into higher wages. Workers therefore exert effort to avoid falling below an acceptable threshold, but have muted incentives to push performance far above it.

This logic suggests a labor market foundation for performance targeting. A long literature in organizational economics documents targeting and satisficing in large organizations.[3] Existing accounts often emphasize explicit performance thresholds or discrete bonus schemes (Oyer 1998; Jensen 2003; Neal and Schanzenbach 2010). These accounts are incomplete: most jobs do not

[3] In organizational economics, see, for instance, Leibenstein (1966); Winter (1971); Bertrand and Mullainathan (2003); Ellison (2006). For a recent review, see Artinger et al. (2022). In organizational theory, see Simon (1947); March and Simon (1958); Cyert and March (1963); Nelson and Winter (1982); Gavetti et al. (2007); Argote and Greve (2007); Gavetti et al. (2012). For a recent review, see Hagen et al. (2023).

involve discrete targets or indeed any explicit incentive pay (Lemieux et al. 2009; Gittleman and Pierce 2013). I show that performance targeting arises naturally under imperfect competition, even without explicit incentive pay.

Now suppose the worker determines the *variance* of output by choosing safer or riskier projects. Under perfect competition, wages are linear in output: a risk-neutral worker maximizes expected output, regardless of variance. Under imperfect competition, the worker captures only a fraction of the upside from riskier actions, but bears the full wage risk. As a result, even a risk-neutral worker sacrifices expected output to avoid risk. "Secure" workers choose close to first-best risk levels but exert too little effort; highly "insecure" workers exert more effort, but are too risk-averse.

This logic speaks to a recent literature on innovation and managerial conservatism. In principle, large firms with well-diversified investors and easy access to capital should be close to risk-neutral (Nelson 1959; Arrow 1962; Kerr and Nanda 2015). Yet these firms often appear reluctant to take risks, and indeed appear to pass up valuable but risky investments.[4] This suggests a puzzle summarized by Lovallo et al. (2020): "Why are managers in large, hierarchical organizations so risk-averse?" A leading explanation attributes conservatism to managers' inherent risk-aversion (Amihud and Lev 1981; Holmström and Costa 1986; Parrino et al. 2005; Lewellen 2006). I show that imperfect competition encourages even risk-neutral managers to avoid risk.

In the final part of the paper, I allow for longer-term contracts. This extension highlights a tradeoff: arrangements that insulate workers from renegotiation improve incentives *ex ante* but limit the firm's ability to extract rents *ex post*. Under full commitment, first-best incentives can be restored; in practice, however, such commitment is limited, especially because contracts that bind workers not to leave are infeasible (MacLeod 2011). Under partial commitment, optimal contract design mitigates but does not eliminate the inefficiencies described above.

The results rely on three motivating assumptions: (i) incomplete employment contracts; (ii) imperfect labor market competition; and (iii) wage renegotiation after credible threats. First, if actions were contractible, the prescribed action would act as a non-wage amenity; as a result, under individual bargaining, it would be chosen to maximize joint surplus (Spence 1975; Viscusi 1980). Hence, under *complete* contracts, labor market power generally does *not* distort behavior within the firm, absent other frictions.[5] The distortions arise precisely because workers retain discretion over non-contractible actions; labor market power shapes the exercise of that discretion.

Second, in a competitive labor market, the analysis reduces to the canonical career concerns model: good and poor performance are rewarded symmetrically, and performance-targeting and conservatism disappear. I depart from the standard model by supposing that outside offers arrive infrequently. I show that this departure has substantive implications for workers' behavior within the firm. The infrequent arrival of outside offers may reflect search frictions, thin labor market, or the presence of non-compete agreements.[6] A further interpretation is asymmetric information

[4] See, *e.g.*, Parrino et al. (2005); John et al. (2008); Panousi and Papanikolaou (2012); Asker et al. (2015); Gormley and Matsa (2016); Krieger et al. (2022).

[5] A similar logic applies to contractible output: under my assumption that the worker is risk-neutral, the firm can ensure efficient actions by selling itself to the worker. Of course, if the firm bargains with a collective of workers, then the prescribed action may be inefficient (Spence 1975; Freeman and Medoff 1984).

[6] Around 46% of high-earning U.S. workers are subject to these agreements. They are especially common in finance

(Greenwald 1986; Gibbons and Katz 1991): I show that a model in which outside firms can always make offers, but only infrequently observe performance, delivers very similar results.

Third, a model of imperfect competition must specify how wages are renegotiated over the course of employment.[7] I allow for an arbitrary initial wage, but assume that subsequent wage changes are triggered by credible threats, as in standard models of implicit contracts and on-the-job bargaining (*e.g.*, MacLeod and Malcomson 1989; Baker et al. 2002; Postel-Vinay and Robin 2002). The conclusions are robust to downward wage rigidity, partial rent-sharing, and wage-posting. What is essential is that the current wage remains in place *absent* such a threat. If wages were instead renegotiated from scratch each period, imperfect competition would weaken effort incentives, but would not generally create performance-targeting or conservatism. I argue that a distinguishing feature of employment is that the parties do *not* renegotiate from scratch each period: instead, the current wage serves as an implicit continuation wage renegotiated only occasionally.

The paper contributes most directly to the literature on career concerns initiated by Holmström (1982/1999). That literature has largely been developed in competitive labor markets.[8] I also contribute to the literature on wage dynamics and renegotiation (Flinn 1986; Thomas and Worrall 1988; MacLeod and Malcomson 1989; Beaudry and DiNardo 1991; Postel-Vinay and Robin 2002). It is convenient to set parts of the analysis in continuous time, following a literature on continuous-time moral hazard (Sannikov 2008; Faingold and Sannikov 2011) and career concerns (Pei 2016; Cisternas 2018a,b; Halac and Kremer 2020; Hörner and Lambert 2021). More broadly, the paper relates to the literature on employer learning about worker performance (*e.g.*, Farber and Gibbons 1996; Altonji and Pierret 2001; Lange 2007; Aryal et al. 2022; Wu 2024).

Outline. Section 2 illustrates the main ideas in a two-period example. Section 3 introduces a general model, and section 4 shows some preliminary results. Section 5 examines incentives for effort to increase expected output. Section 6 studies incentives for risk-taking. Section 7 discusses longer-term contracts and alternative wage determination processes. Section 8 concludes with a discussion of the model's empirical content. Proofs are in the appendix.

2. An introductory example

I begin with a simple two-period example. I first describe a setting without action choice to show the asymmetric response of wages to performance. I then introduce action choice.

A worker lives for two periods ($t \in \{0, 1\}$) and may be employed by either of two identical firms. The worker's ability $\theta \sim \mathcal{N}(\bar{\theta}, \sigma_\theta^2)$ is initially unknown to all parties. Her period-t output is $y_t = \theta + \varepsilon_t$, for $\varepsilon_t \sim \mathcal{N}(0, \sigma_\varepsilon^2)$ an i.i.d. shock. All parties are risk-neutral, and there is no discounting.

Play proceeds as in Figure 1. In period 0, ability is realized (but unobserved). The worker is randomly matched to a firm, and they bargain over a period-0 employment contract. Output is non-verifiable

(Starr et al. 2021; Cici et al. 2021), where there is substantial evidence of a concave relationship between wages and performance (Chevalier and Ellison 1999; Ibert et al. 2018).

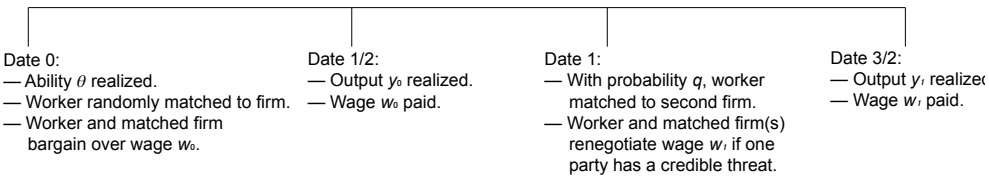
[7] This is because, under imperfect competition, there is a "zone of indeterminacy... [the] wage must exceed [the worker's] perceived best alternative and be less than his current marginal revenue product" (p. 367 Okun 1975).

[8] See, *e.g.*, Holmström and Costa (1986); Gibbons and Murphy (1992); Prendergast and Stole (1996); Dewatripont et al. (1999a,b); Meagher and Prasad (2016); Bonatti and Hörner (2017); Cisternas (2018a,b); Halac and Kremer (2020); Hörner and Lambert (2021); Ke et al. (2023).

(ruling out performance pay), and employment is at will (ruling out long-term contracts), so the contract specifies only the spot wage w_0. Output y_0 is then realized and publicly observed.

In period 1, with probability $q \in [0, 1]$, the worker encounters the second firm; call this event E, and its complement N. In both events, the wage is renegotiated only if one party can credibly threaten termination at w_0. If the firm can credibly reject continuation, the wage is renegotiated down to the firm's break-even wage; if the worker can credibly reject continuation, the wage is renegotiated up to her outside option. In event E, the worker's outside option is employment at the second firm, which is willing to pay up to her expected output; in event N, the worker's outside option is non-employment, and I assume the worker always prefers employment to non-employment.

FIGURE 1. Timing of introductory example



Period-1 beliefs. Given observed output y_0, expected period-1 output is $\mathbb{E}[y_1 \mid y_0] = \mathbb{E}[\theta \mid y_0] = \rho y_0 + (1 - \rho)\bar{\theta}$, for signal-to-noise ratio $\rho := \sigma_\theta^2/(\sigma_\theta^2 + \sigma_\varepsilon^2)$. Given these beliefs, denote by y_0^* the *retention threshold*—the output level at which the firm is just indifferent between separation and retention at the current wage: $\mathbb{E}[y_1 \mid y_0^*] = w_0 \iff y_0^* = [w_0 - (1 - \rho)\bar{\theta}]/\rho$.

Period-1 wages. In event E, the worker has offers from both firms; standard Bertrand competition implies $w_1^E = \mathbb{E}[y_1 \mid y_0] = \rho y_0 + (1 - \rho)\bar{\theta}$, shown in navy in Figure 2(a). Intuitively, if $y_0 < y_0^*$, the firm has a credible threat to terminate employment, so the wage is negotiated down. If $y_0 > y_0^*$, the worker has a credible threat to leave employment, since the outside firm is willing to pay up to her expected marginal product: as a result, her wage is negotiated up.

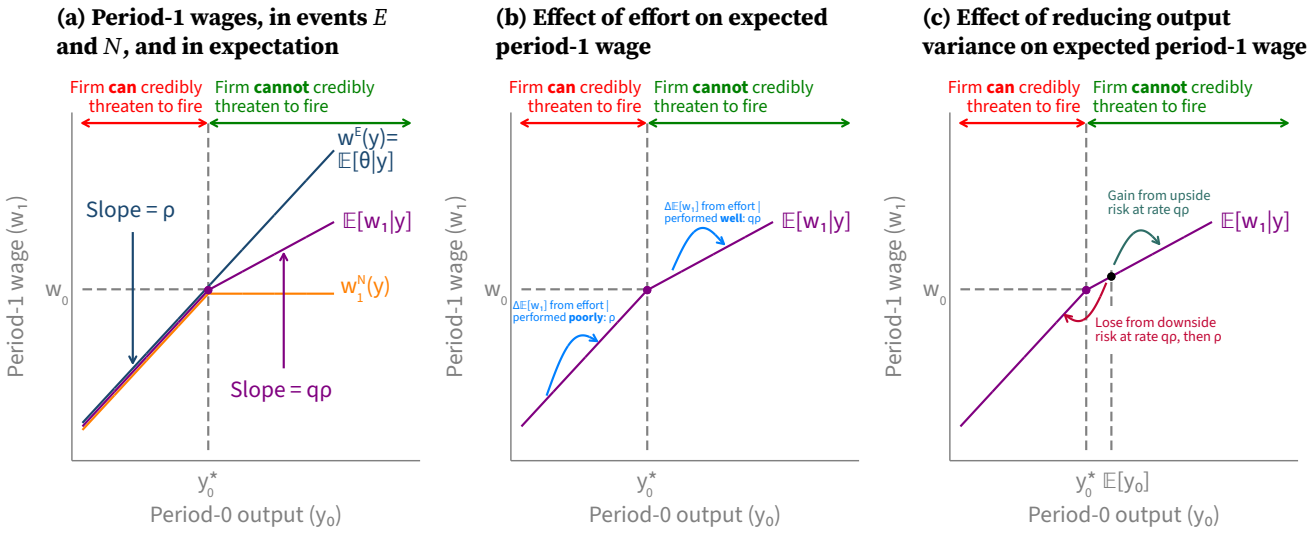
Now consider event N. If the worker performs poorly ($y_0 < y_0^*$), as before, the firm has a credible threat to terminate employment, and the wage is negotiated down to $\mathbb{E}[\theta \mid y_0]$. If the worker performs well ($y_0 \geq y_0^*$), the firm cannot credibly bargain her wage down. On the other hand, the worker cannot bargain her wage *up*: she has no credible threat to leave without an outside offer. Under our assumption that renegotiation occurs only in response to credible threats, the wage remains at w_0: strong performance raises expected output, but does not translate into a higher wage. Combining the two cases, $w_1^N(y_0) = \min\{\mathbb{E}[y_1 \mid y_0], w_0\}$, shown in orange.

Since the worker is risk-neutral, her continuation payoff is her expected period-1 wage, $\mathbb{E}[w_1 \mid y_0] = qw_1^E(y_0) + (1 - q)w_1^N(y_0)$, shown in purple in Figure 2(a). For low realizations of y_0, the expected wage falls one-for-one with expected output; since $\mathbb{E}[y_1 \mid y_0]$ has slope ρ, so does $\mathbb{E}[w_1 \mid y_0]$. For high realizations, the wage increases only in event E, so the expected wage has slope $q\rho$.

Observation 1. This discussion illustrates the first insight from the example: imperfect competition creates an asymmetry in the returns to good and bad performance. Poor performance is penalized at rate ρ, whereas good performance is rewarded at rate $q\rho$. Under perfect competition ($q = 1$), continuation pay is thus linear in period-0 performance. Under imperfect competition ($q < 1$), it is concave: bad performance is more costly than equally good performance is rewarding. Intuitively,

frictions to mobility preserve the firm's threat to fire the worker after poor performance, but weaken the worker's threat to leave the firm after good performance.

FIGURE 2. Period-1 wages in introductory example, with and without action choice



Note: *Panel (a) illustrates period-1 wages as a function of first-period output, after an outside offer (in navy), no outside offer (orange), and in expectation (purple). Panel (b) illustrates incentives for effort to increase the level of output. Panel (c) illustrates incentives for the variance of output.*

Action choice: manipulating the level of output. Now suppose that, in period 0, the worker receives an unexpected opportunity to "work hard", raising output by one unit at effort cost c. Suppose the employer does not anticipate or observe this opportunity, and continues to interpret output as before. Under perfect competition ($q = 1$), this additional unit raises continuation pay by exactly ρ, so the worker exerts effort for $\rho \geq c$. Because continuation pay is linear in output, this condition holds regardless of whether the worker chooses to work hard before or after observing $(\theta + \varepsilon_0)$.

Now consider imperfect competition ($q < 1$), illustrated in Figure 2(b). Below the retention threshold y_0^*, additional output raises continuation pay at rate ρ; above it, at rate $q\rho$. Imperfect competition therefore has two effects. First, if effort is chosen *ex ante*, before observing initial output, its expected return is lower than under competition. Second, suppose effort is chosen *ex interim*: the worker observes $(\theta + \varepsilon_0)$, then chooses whether to exert effort, and employers see only the final output. In that case, incentives are state-contingent: effort is strongly rewarded below the retention threshold, but weakly rewarded once it is surpassed.

Observation 2. Thus, the worker's incentive to attain acceptable output y_0^* is just as strong as under competition, but her incentive to exceed it is muted. Imperfect competition induces performance-targeting: the worker is strongly motivated to avoid unacceptable performance, but only weakly motivated to exceed it. This distortion becomes more severe as the labor market becomes less competitive, since a lower q further reduces the return to performance above y_0^*.

Action choice: manipulating the variance of output. Now suppose instead that the worker has an unexpected, hidden opportunity to reduce the *variance* of output: in particular, she can choose to produce a fixed output $\bar{y}_0$ with certainty, rather than the stochastic output $y_0 = \theta + \varepsilon_0$. Say $\bar{y}_0 < \mathbb{E}[y_0]$, so producing the fixed output is jointly inefficient (because all parties are risk-neutral). The question is whether the worker would nonetheless take this opportunity.

Under competition ($q = 1$), continuation pay is linear in y_0, so the worker never sacrifices expected output to reduce risk. Under imperfect competition ($q < 1$), continuation pay is concave in y_0. By Jensen's inequality, she strictly prefers a mean-preserving contraction of the output distribution, as illustrated in Figure 2(c): upside risk is rewarded at rate $q\rho$, whereas downside risk is punished at rate $q\rho$ and then ρ.[9] By continuity of her expected period-1 wage in y_0, she also prefers a small mean-reducing contraction: for $\bar{y}_0$ sufficiently close to $\mathbb{E}[y_0]$, the worker strictly prefers fixed output.

Observation 3. The example thus illustrates that labor market frictions can cause even a risk-neutral worker at a risk-neutral firm to behave *as though risk-averse*: the worker would sacrifice expected output to reduce the variance of output. Intuitively, she bears the full downside risk from stochastic performance, but only part of the upside. As q falls, the slope differential between the two segments of the wage-performance relationship widens, and the worker grows more conservative.

Bargaining process. We have taken a particular view of renegotiation, in which wages are revised only after credible threats. Do our conclusions persist under alternative bargaining assumptions?

Consider the alternatives in Figure 3. First, suppose that, even *without* an outside offer, the worker captures a share $\lambda \in (0, 1)$ of the increase in expected output after strong performance ($y_0 \geq y_0^*$), as in rent-sharing models (*e.g.* Blanchflower et al. 1996; Card et al. 2014; Kline et al. 2019) (Figure 3(a)). Then poor performance is penalized at rate ρ, while strong performance is rewarded at rate $q\rho + (1 - q)\lambda\rho < \rho$. If the worker has full bargaining power ($\lambda = 1$), we return to the competitive case; for less than full bargaining power ($\lambda < 1$), our conclusions remain as before.

Second, we have assumed the wage can be renegotiated down. Suppose instead the wage is downwardly rigid (Figure 3(b)). In event E, the worker has access to a competitive outside market, so her wage is again $w_1^E(y_0) = \mathbb{E}[y_1 \mid y_0]$: strong performance bids her wage above w_0; weak performance causes the worker to be fired, but employed elsewhere at her expected output. In event N, the worker has no outside offer. If $y_0 \geq y_0^*$, the firm is willing to retain her at w_0, while the worker has no credible threat to leave, so the wage remains w_0. If $y_0 < y_0^*$, expected output falls below the current wage; since the wage cannot be renegotiated down, the firm fires the worker, and her payoff falls discontinuously to the non-employment payoff. Thus downward rigidity replaces the smooth penalty for poor performance with a separation cliff. For a worker whose projected performance lies above the retention threshold, this strengthens the asymmetry between strong and poor performance: even modest underperformance risks separation. A worker who expects to fall just below y_0^* may instead prefer to "gamble for resurrection" (Downs and Rocke 1994), taking on risk in order to cross the retention threshold. I later show that, in the general model with continuous monitoring, the worker never reaches this latter region on the equilibrium path; as a result, downward rigidity makes workers still more prone to performance-targeting and conservatism.

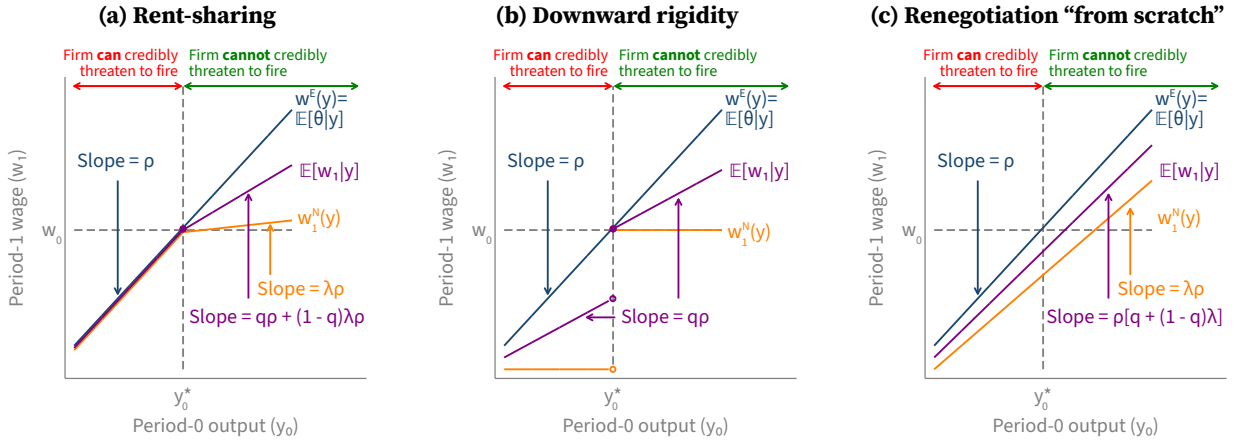
I later show that a similar logic applies to several other wage-setting protocols: for instance, our conclusions persist if wages are posted, rather than negotiated; if the firm retains some markdown even after a downward renegotiation; and if, even absent an outside offer, the firm and worker Nash-bargain over the wage at period 1, with the period-0 contract as the disagreement point.[10] To see the boundaries of our argument, it is worth considering a renegotiation protocol that does *not* support

[9] This illustration assumes w_0 is such that expected output $\mathbb{E}[y_0] \geq y_0^*$. The argument also holds if $\mathbb{E}[y_0] < y_0^*$: in that case, strong performance is rewarded at rate ρ, then $q\rho$, whereas poor performance is punished at rate ρ.

[10] For a discussion of each of these cases in the context of the example, see A.

our conclusions. We have assumed the period-0 wage remains the default absent a credible threat. Suppose instead that, absent an outside offer, the parties "tear up" the period-0 contract and bargain from scratch, with separation payoffs $(0, 0)$ and worker bargaining weight λ (Figure 3(c)). Then the worker's wage absent an outside offer is $\lambda\mathbb{E}[\theta \mid y_0]$, so her expected wage is linear in performance with slope $\rho[q + (1 - q)\lambda]$. Since the slope falls as q falls (for $\lambda < 1$), imperfect competition still weakens incentives for effort, but strong and poor performance are treated symmetrically, so the forces generating performance-targeting and conservatism disappear.

FIGURE 3. Effects of alternative wage renegotiation assumptions on period-1 wages in the introductory example



Note: *Each panel replicates Figure 2(a) under a different bargaining assumption: rent-sharing in panel (a); rigid wages in (b); and renegotiation from scratch in (c).*

Observation 4. This discussion highlights that the asymmetry between good *vs.* bad performance depends on the prior wage serving as the default continuation wage: if the parties renegotiate from scratch, there is no such asymmetry (though market power still weakens incentives for effort). I argue that a distinguishing feature of continuing employment relationships is that the parties do *not* renegotiate from scratch each period: instead, the current wage serves as an implicit continuation wage, as in models of implicit and relational contracts (MacLeod and Malcomson 1989; Baker et al. 2002) and on-the-job bargaining (Postel-Vinay and Robin 2002; Cahuc et al. 2006). I later present evidence, both from observed wage patterns and from legal and institutional features of wage-setting, consistent with the view that wages in ongoing employment relationships are revised relative to past wages rather than continuously reset.

Conclusions from example. Thus, at least when the current wage serves as a default for future periods, imperfect competition distorts behavior not merely on the employment margin, as in the standard monopsony model, but because it affects the returns to performance, and thus behavior within the firm. Of course, the example is deliberately stylized: the worker's opportunities to affect output arose out of equilibrium, and the restriction to two periods prevents us from analyzing the dynamics of wages. These limitations motivate the more general model of the next section.

3. A general model of the returns to performance under imperfect competition

I now set out a more general model. For tractability, I maintain the Gaussian structure of the introductory example, while extending it to a dynamic environment with endogenous action choice. In this section, I consider incentives for the *level* of output; I turn to incentives for risk later.

3.1. Primitives of the model

Time is continuous on $[0, \infty)$. A single worker interacts with a continuum of identical prospective employers F, with typical firm f. All parties are risk-neutral and share discount rate $r > 0$. I impose risk-neutrality to emphasize that conservatism can arise purely from wage dynamics.

The worker's ability at t is $\theta_t \in \Theta := \mathbb{R}$. Initial ability is $\theta_0 \sim \mathcal{N}(\bar{\theta}, \sigma_\theta^2)$, with $\sigma_\theta^2 > 0$. Ability $(\theta_t)_{t\geq 0}$ follows a standard Ornstein-Uhlenbeck process:

$$d\theta_t = -\kappa(\theta_t - \bar{\theta})dt + \gamma\, dZ_{\theta,t} \qquad t \geq 0, \tag{1}$$

where $\gamma > 0$ and $(Z_{\theta,t})_{t\geq 0}$ is a standard Brownian motion.[11] I set the mean-reversion term in (1) to $\kappa := \gamma^2/[2\sigma_\theta^2]$ so that the stationary variance of ability is σ_θ^2. Mean reversion ensures that the variance of ability remains finite; stationarity is a simplifying assumption that allows us to easily compute beliefs. Neither the worker nor firms observe ability, but they know the distribution of initial ability and the process for its evolution (1).

At time 0, the worker is matched to some firm f_0 at wage w_0. I treat w_0 as arbitrary and assume it is agreeable to both the worker and the firm. This allows, for instance, for the possibility that the wage is Nash bargained, or that it has been posted by the firm. To focus on wage dynamics, I suppress non-employment: the worker can leave an incumbent only to join another firm.[12] Meetings with outside firms arrive according to an independent Poisson process N_t with rate $q > 0$.[13] At each meeting, the worker draws a prospective employer from an atomless distribution over F.

At each instant t, play proceeds as follows. I write w_{t-} and f_{t-} for the worker's wage and employer just before any adjustment at t, and w_t and f_t for the worker's wage and employer just after adjustment.

Stage 1 (Production): The worker chooses an action a_t from $\mathcal{A} := [\underline{a}, \bar{a}]$. Cumulative output Y_t evolves according to

$$Y_0 = 0,\ dY_t = [m(a_t) + \theta_t]dt + s\, dZ_{Y,t} \qquad t \geq 0, \tag{2}$$

where $s > 0$, $Z_{Y,t}$ is a standard Brownian motion (independent of $Z_{\theta,t}$), and $m(a_t)$ is the effect of a_t on the drift of output.

Stage 2 (Flow payoffs): The worker receives flow utility $[w_{t-} - c(a_t)]dt$, where $c(a_t)$ is her flow effort cost. The incumbent employer f_{t-} receives flow profit $[dY_t - w_{t-}dt]$.

Stage 3 (Meeting): If $M_t := \Delta N_t = 1$, the worker meets an outside firm; otherwise, no outside offer is available. Let $\hat{f}_t \in (F \cup \{\varnothing\})$ denote the outside firm encountered at t, with $\hat{f}_t = \varnothing$ if no meeting occurs.

Stage 4 (Wage determination): Wages and employment are renegotiated to (w_t, f_t).

[11] As Cisternas (2018a, p. 159) notes, several empirical studies find support for the view that ability is well-approximated as a Gaussian AR(1) process (*e.g.*, Farber and Gibbons 1996; Altonji et al. 2013; Kahn and Lange 2014; Bagger et al. 2014; Friedrich et al. forthcoming). An Ornstein-Uhlenbeck process is the continuous-time analogue.

[12] Equivalently, the value of non-employment is low enough that it never binds on the state space considered.

[13] In the discrete-time example in the previous section, $q \in [0, 1]$ was the probability of meeting a firm in period t. In the general model, $q \in (0, \infty)$ is a Poisson *rate* at which meetings arrive.

Firms maximize expected discounted profits, and the worker maximizes expected discounted utility. The functions m and c are strictly increasing and twice continuously differentiable on $(\underline{a}, \bar{a})$, with m strictly concave, c strictly convex, and $\lim_{a\to\underline{a}} m'(a) = \lim_{a\to\bar{a}} c'(a) = \infty$, $\lim_{a\to\bar{a}} m'(a) = \lim_{a\to\underline{a}} c'(a) = 0$. Thus the unique first-best action $a_{FB} \in (\underline{a}, \bar{a})$ satisfies $m'(a_{FB}) = c'(a_{FB})$.

Output, employment, wages, and meetings are public to all firms, but actions are private. In particular, even non-incumbent firms observe output; I return to this later. Let h^{t-} denote the ***public history*** up to t: $h^{t-} := (Y_\tau, w_\tau, f_\tau, \hat{f}_\tau)_{\tau<t}$. When the worker's wage is renegotiated at t, the increment to output and any meeting with another firm has been realized: denote by $h_R^t := (h^{t-}, Y_t, \hat{f}_t)$ the ***public history at renegotiation*** at t. Finally, the ***post-renegotiation public history*** is $h^t := (h_t^R, w_t, f_t)$. Let $\mathbb{F} = (\mathcal{F}_t)_{t\geq 0}$ denote the public filtration generated by the post-renegotiation histories $(h^t)_{t\geq 0}$. The worker's corresponding private histories append her past actions; define the ***private history*** up to t as $\tilde{h}^{t-} := (h^{t-}, (a_\tau)_{\tau<t})$, and the ***private history at renegotiation*** $\tilde{h}_R^t$ and ***post-renegotiation private history*** $\tilde{h}^t$ similarly, with private filtration $\tilde{\mathbb{F}}$. Let $(\mathcal{H}^-, \mathcal{H}^R, \mathcal{H})$ denote the feasible public histories at these three stages, and $(\tilde{\mathcal{H}}^-, \tilde{\mathcal{H}}^R, \tilde{\mathcal{H}})$ denote the corresponding private histories.

3.2. Defining an assessment

I first define an assessment, then an equilibrium assessment.

Definition 1. An ***assessment*** $s = \langle \pi^F, \pi^W, a, \mathcal{W}\rangle$ consists of:

(1) ***firm beliefs***: a map $\pi^F : \mathcal{H}^- \to \Delta(\Theta)$; and
(2) ***worker beliefs***: a map $\pi^W : \tilde{\mathcal{H}}^- \to \Delta(\Theta)$;
(3) a pure-strategy ***action rule*** for the worker, $a : \tilde{\mathcal{H}}^- \to \mathcal{A}$, such that the induced process $a_t = a(\tilde{h}^{t-})$ is $\tilde{\mathbb{F}}$-predictable; and
(4) a ***renegotiation rule*** $\mathcal{W} : \mathcal{H}^R \to \mathbb{R} \times F$, whose output is the renegotiated wage and firm (w_t, f_t).

Given an assessment s, denote by $\mathbb{P}^s$ the probability law over ability, output, meetings, wages, employment transitions, and actions induced by s.

Discussion of Definition 1. Three aspects of the definition merit discussion. First, I restrict attention to pure-strategy action rules. This has an implication for the predictability of the worker's actions. Although the worker's action rule is formally a function of her private history, the private component of that history consists only of her past actions. Under a pure-strategy assessment, those actions are themselves determined recursively by the public history and the commonly known action rule. Thus, along the path induced by the assessment, firms can reconstruct the worker's past actions and predict her current action from the public history alone. Lemma 1 states this formally.[14]

Lemma 1. *In any assessment $s = \langle \pi^F, \pi^W, a, \mathcal{W}\rangle$, there exists an $\mathbb{F}$-predictable process $a_t^{F,s}$ such that $a_t^{F,s} = a(\tilde{h}^{t-})$, $\mathbb{P}^s \otimes \mathrm{d}t$-almost everywhere.*

As a result, given an assessment s, we can associate with every public history h^{t-} a corresponding conjectured action history $a^t(h^{t-} \mid s) = (a_\tau^{F,s})_{\tau<t}$. For any private history up to t, $\tilde{h}^{t-}$, denote by

[14] One way to see the intuition is to consider the discrete-time case. In the first period, the worker trivially has no private information, so her action is publicly predictable. In the second period, her private information is just her first-period action, which is publicly predictable, so her second-period action is publicly predictable, and so on. The argument fails if the worker could privately randomize over actions (and she observed the realization of this randomization).

$Y^t(\tilde{h}^{t-})$ the output history, and $a^t(\tilde{h}^{t-})$ the action history. Similarly, for any public history up to t, denote by $Y^t(h^{t-})$ the associated output history. Although the public history up to t does not include the action history, once we have fixed an assessment s, by Lemma 1, the action history is $\mathbb{F}$-predictable; hence, we can write $a^{F,s}(h^{t-}) := (a_\tau^{F,s})_{\tau<t}$ for the conjectured action history under s.

A second feature of Definition 1 is its reduced-form renegotiation rule. It is well-known that, under imperfect competition, the relationship between the worker and her firm involves bilateral monopoly, and the parties' participation constraints generally create a "zone of indeterminacy" (Okun 1975, p. 367)—a set of mutually-agreeable wages, rather than a unique wage. Selecting an outcome from this set therefore requires an additional assumption about bargaining. Rather than incorporate a particular bargaining game into the equilibrium definition, I specify its outcome directly through a renegotiation rule. This approach keeps the equilibrium analysis tractable and avoids tying the results to any single bargaining protocol. I show later that my preferred renegotiation rule—renegotiation "by mutual consent"—admits several microfoundations.

Third, I define beliefs about ability only at pre-action histories. When parties renegotiate at t, they have access to two further pieces of information relative to the pre-action history: whether the worker met a firm at t; and the output increment at t. For this reason, one could also define beliefs about ability at every history at renegotiation. In practice, this additional notation would not add anything: meetings are independent of ability, and the output process is continuous.

3.3. Defining the equilibrium concept

Some additional notation is helpful to define an equilibrium. For each t, let $K_t(\cdot \mid (Y_\tau, a_\tau)_{\tau<t})$ denote the Bayesian posterior for θ_t and the laws of motion (1) and (2), conditional on the realized output and action history $(Y_\tau, a_\tau)_{\tau<t}$. In an assessment $s = \langle \pi^F, \pi^W, a, \mathcal{W} \rangle$, firm beliefs π^F are ***public-history Bayes-consistent*** if $\pi^F(h^{t-}) = K_t(\cdot \mid Y^t(h^{t-}), a^{F,s}(h^{t-}))$ for every feasible h^{t-}. Worker beliefs π^W are ***private-history Bayes-consistent*** if $\pi^W(\tilde{h}^{t-}) = K_t(\cdot \mid Y^t(\tilde{h}^{t-}), a(\tilde{h}^{t-}))$ for every feasible $\tilde{h}^{t-}$. Thus, firms condition on the action history implied by the assessment, whereas the worker conditions on her realized action history, including any deviations.

Given an assessment s and a public history to t, h^{t-}, denote by $J^R(w_t, h^{t-})$ the continuation value to a firm from employing the worker at the renegotiated wage w_t after a meeting at t. Define $\bar{w}(h^{t-})$ as the highest wage such that this continuation value is non-negative: $\bar{w}(h^{t-}) := \sup\{w : J(w, h^{t-}) \geq 0\}$. The renegotiation rule $\mathcal{W}$ is ***renegotiation by mutual consent*** if it satisfies

$$\mathcal{W}(h_R^t) = \begin{cases} (w_{t-}, f_{t-}), & \text{if } M_t = 0 \text{ and } J(w_{t-}, h^{t-}) \geq 0, \\ (\bar{w}(h^{t-}), f_{t-}), & \text{if } M_t = 0 \text{ and } J(w_{t-}, h^{t-}) < 0, \\ (\bar{w}(h^t), f_t), & \text{if } M_t = 1, \text{ where } f_t \in \{f_{t-}, \hat{f}_t\}. \end{cases} \tag{3}$$

This protocol is common in the literature on on-the-job bargaining, where it was first developed by Postel-Vinay and Robin (2002).[15] To see why the protocol is described as renegotiation by mutual

[15] For examples in the context of labor search, see Dey and Flinn (2005); Cahuc et al. (2006); Postel-Vinay and Turon (2010); Robin (2011); Bagger et al. (2014); Lise and Robin (2017); Engbom et al. (2019); Bagger and Lentz (2019); Lise and Postel-Vinay (2020); Taber and Vejlin (2020); Bilal et al. (2021, 2022); Elsby and Gottfries (2022); Lindenlaub and Postel-Vinay (2023); Jarosch (2023); Shi (2023); Berger et al. (2024); Flinn et al. (2025). More generally, see Shaked and Sutton (1984); Hart and Moore (1988); MacLeod and Malcomson (1993).

consent in those literatures, consider each case in turn. Without an outside offer, if the firm's continuation value at the current wage is non-negative, no change is mutually acceptable: the worker would reject any wage cut, while the firm would reject any wage increase. If the firm's continuation value is negative, the wage *can* be renegotiated down with mutual consent: the worker anticipates that, without a downward renegotiation, the firm would dissolve employment, so the worker would agree to negotiate the wage down to $\bar{w}(h^{t-})$, at which the firm is just indifferent to employment, but no further. When an outside firm arrives, the worker can credibly threaten to leave, and competition raises her wage to $\bar{w}$, allowing her to capture the full surplus.

Finally, given an assessment $s = \langle \pi^F, \pi^W, a, \mathcal{W} \rangle$ in which the renegotiation rule is renegotiation by mutual consent, I will say that the action rule a is a ***Markov action rule*** if there is a measurable function $\alpha \colon \mathbb{R} \times \Delta(\Theta) \times \Delta(\Theta) \to \mathcal{A}$ such that, for every private history $\tilde{h}^{t-}$ with associated public history h^{t-} and wage w_{t-}, we have $a(\tilde{h}^{t-}) = \alpha(w_{t-}, \pi^F(h^{t-}), \pi^W(\tilde{h}^{t-}))$.

Definition 2. An assessment $\hat{s} = \langle \hat{\pi}^F, \hat{\pi}^W, \hat{a}, \hat{\mathcal{W}} \rangle$ is a ***Markov equilibrium with renegotiation by mutual consent*** if:

(1) the firms' beliefs are public-history Bayes-consistent;
(2) the worker's beliefs are private-history Bayes-consistent;
(3) the worker's action rule is sequentially optimal: for every bounded $\tilde{\mathbb{F}}$-stopping time τ, the continuation action rule induced by $\hat{a}$ maximizes the worker's expected discounted continuation payoff, given the worker's beliefs, the firm's beliefs, and the renegotiation rule;
(4) the action rule is Markov; and
(5) the renegotiation rule is renegotiation by mutual consent.

For concision, I will generally call such an assessment an ***equilibrium***.

Several aspects of Definition 2 deserve comment. Requirement (1) is the standard requirement for beliefs in a perfect Bayesian equilibrium (PBE). Since output has full-support Brownian noise and actions are unobserved, (1) fully pins down firms' beliefs. Requirement (2) is more stringent than the standard PBE requirement, since it restricts the worker's beliefs off-path. To see this, suppose the worker deviates from the prescribed action rule. The standard PBE requirement would not restrict beliefs. This is unreasonable: intuitively, since the worker knows her action, and hence fully knows the generating process for output, her beliefs should be disciplined by Bayes' rule even after a deviation. Requirement (2) imposes such a restriction. Finally, the Markov restriction in (4) is standard in career concerns models, though often implicit (Hörner and Lambert 2021).

3.4. Discussion of main assumptions

I now discuss the main assumptions. First, the labor market is imperfectly competitive, in the sense that the worker encounters outside firms only intermittently. One interpretation is that there are search frictions in the spirit of the Diamond-Mortensen-Pissarides (DMP) framework. Similarly, if there is a thin market of employers for the worker's skills and location, then credible outside options may arrive only infrequently. Alternatively, these frictions may arise from imperfect information. Appendix O.A describes an alternative model in which the worker can always contact outside firms,

but her performance is only intermittently observable to them.[16] I show that equilibrium behavior in this "private performance" model is very similar to the baseline model in which performance is public, but meetings occur infrequently. Intuitively, when performance is not publicly observed, outside firms anticipate that transitions are adversely selected (Gibbons and Katz 1991), and so will not make competitive offers. The worker is therefore in a position to renegotiate only with her incumbent employer, just as if she had no outside contact at all. Thus, one can interchangeably think of the imperfect competition in the model as arising from search or information frictions.

Second, the model considers a single worker. Suppose instead that the labor market consists of many workers, but their abilities are independent, and total output is the sum of individual workers' outputs. In that case, a firm's interaction with each worker can be analyzed separately; we can interpret the model as a reduced-form representation of that more general setting. Similarly, I have treated the meeting rate q as exogenous; in the many-worker setting, one could instead allow q to be determined by firms' vacancy-posting, as in the standard DMP model.

Third, the model excludes long-term contracts: the firm and worker cannot agree on a contract which guarantees future employment or wages. This reflects typical employment contracts, which specify current terms, but not future employment or wages (Devereux and Hart 2007; Hallock 2009; Hall and Krueger 2012). In addition, several assumptions are made for tractability. The Gaussian structure allows us to compute beliefs simply. Working in continuous time simplifies the wage renegotiation process. As Holmstrom and Milgrom (1987) point out, the continuous-time setting can be viewed as an approximation to a discrete-time multinomial model with many periods. Ability is exogenous: there is no human capital accumulation. I also abstract from direct costs of switching employers, firing costs, and match-specific investments in order to focus on imperfect competition.

3.5. Foundations for renegotiation by mutual consent

Finally, I assume wages are renegotiated by "mutual consent", following the standard assumption in the literature on on-the-job search. This renegotiation rule treats the current wage as the default, which is revised only when one party has a credible threat to terminate employment; in that event, the wage adjusts just enough to preserve the relationship. Appendix O.A gives a detailed example of wage dynamics under the protocol.

This view of wage setting reflects the fact wages are typically renegotiated only infrequently. If employment consisted of a sequence of spot contracts—for instance, as for contingent or temporary workers— then it would be natural to imagine wages being reset continuously. In most long-term employment relationships, however, the employment contract is continuing. As a result, the current wage serves as a reference point for contractual revision (Hart and Moore 2008): it remains in force unless both parties agree to change it, or unless one party has a credible threat to terminate the relationship.[17] Three facts support this view of employment. First, wages in ongoing jobs are substantially less cyclical than wages in new matches (Beaudry and DiNardo 1991; Pissarides

[16] This recalls the literature on asymmetric information about worker productivity, with key contributions including Waldman (1984); Greenwald (1986); Milgrom and Oster (1987); Gibbons and Katz (1991); Pinkston (2009); DeVaro and Waldman (2012); Kahn (2013). This literature typically does not allow for the worker to choose her behavior on the job.

[17] Halonen-Akatwijuka and Hart (2020) write that "employment contracts are the leading case of 'continuing contracts', in which each party can often terminate the transaction at will, but... they usually do not... the current contract is a reference point for contractual revision" (pp. 284–286). See Hallock (2009, p. 69) for a similar discussion.

2009; Grigsby et al. 2021), which is consistent with renegotiation relative to inherited wages rather than continuous bargaining from scratch. Second, the assumption reflects legal and institutional features of employment contracts: in many settings, wages are contractual terms that can be revised only with both parties' consent (see Malcomson (1997) for a discussion in the UK and Holden (2004) for Europe).[18] Third, renegotiation by mutual consent is standard in structural work on on-the-job search, where it helps account for within-job wage growth, job-to-job mobility, and wage dispersion. This suggests that the protocol captures empirically relevant wage dynamics, whatever its microfoundation. By contrast, bargaining "from scratch" has counterintuitive implications when outside offers arrive intermittently: a worker paid below marginal product would receive a raise when an outside offer arrives, but lose it once the offer expires. In continuous time, where outside offers arrive and disappear instantaneously, outside offers would have almost no value to the worker. This is implausible. Under mutual consent, by contrast, an outside offer bids up the wage, and that higher wage serves as the default continuation wage after the offer disappears.

The protocol also has formal foundations. First, it can be derived from a simple non-cooperative renegotiation game between the worker and the incumbent firm. At each instant, either party may propose a new wage. If a proposed wage is accepted, the relationship continues at that wage; if no proposal is accepted, both parties decide whether to continue at the current wage, and employment continues only if both agree. Appendix O.A shows that the unique equilibrium of this game implements the mutual-consent rule. Earlier work has described several other non-cooperative foundations of the same renegotiation rule.[19] Second, Appendix O.A presents an axiomatic foundation. It is the unique renegotiation rule satisfying three properties: employment continues whenever joint surplus is positive; wage revisions occur only when both parties prefer them to the relevant disagreement outcome; and wages do not fall when joint surplus rises.

For these reasons, I consider wage renegotiation by mutual consent as a leading case. In section 7, I turn to the implications of several other bargaining protocols, which allow for either *more* flexibility in renegotiation—as in the case of continuous wage adjustment—or *less* flexibility—as in the case of downward wage rigidities or wage posting models.

[18] Malcomson (1997) states that, under English law, terms of employment "can be varied only by mutual agreement, so they continue to apply until either there is mutual agreement to alter them… If one party tries to change the current wage terms, the other party makes clear that the change is not acceptable, and yet employment nevertheless continues, then the current wage terms must continue to be honored" (p. 1920). Thus a worker can reject a proposed wage cut absent a credible threat to terminate, and a firm can reject a proposed raise absent a credible threat to quit. Postel-Vinay and Turon (2010) write that, "In the United States, although the employment-at-will doctrine would in principle leave scope for more responsiveness of wages to productivity shocks… wage changes occur much less frequently than would be consistent with a strict application of the employment-at-will rule, suggesting that mutual consent, although not an explicit legal provision in the United States, may nonetheless be common practice."

[19] Hart and Moore (1988) propose a message game leading to a similar conclusion. MacLeod and Malcomson (1993) propose a non-cooperative game in which parties can ask to renegotiate, but, in doing so, they lose their bargaining power in subsequent renegotiations. Thomas and Worrall (1988) show that the same rule can arise out of an implicit contract between a risk-neutral firm and a risk-averse worker. Elsby et al. (2024) show that a similar protocol can arise under costly renegotiation.

4. Preliminaries: beliefs, evolution of value functions, and equilibrium existence

I begin by establishing a few preliminary results, concluding with equilibrium existence. First, fixing an equilibrium $\hat{s}$, beliefs are pinned down by the Kalman-Bucy filter.

Lemma 2. *Fix an equilibrium s and a private history $\tilde{h}^{t-}$, with associated public history h^{t-}. The worker's and firms' beliefs are Gaussian with common deterministic posterior variance Σ_t satisfying*

$$\Sigma_0 = \sigma_\theta^2, \;\; \mathrm{d}\Sigma_t = \dot{\Sigma}_t := \left[-2\kappa\Sigma_t + \gamma^2 - \frac{\Sigma_t^2}{s^2}\right]\mathrm{d}t. \tag{4}$$

The posterior mean of agent $i \in \{W, F\}$, $\hat{\mu}^i$, satisfies:

$$\hat{\mu}_0^i = \bar{\theta}, \;\; \mathrm{d}\hat{\mu}_t^i = \kappa\big(\bar{\theta} - \hat{\mu}_t^i\big)\mathrm{d}t + \frac{\Sigma_t}{s^2}\mathrm{d}\hat{\nu}_t^i, \tag{5}$$

$$\textit{where the innovation process for firms is } \mathrm{d}\hat{\nu}_t^F = \mathrm{d}Y_t - [m(\hat{a}_t(h^t)) + \hat{\mu}_t]\mathrm{d}t, \tag{6}$$

$$\textit{whereas the innovation process for the worker is } \mathrm{d}\hat{\nu}_t^W = \mathrm{d}Y_t - [m(a_t) + \hat{\mu}_t]\mathrm{d}t. \tag{7}$$

To see the intuition, consider first the posterior variance in (4). As is standard, the posterior variance depends on calendar time and the model parameters, but not the realized history. Hence, Σ_t is deterministic, and converges to the steady-state variance $\Sigma^* := \gamma^2/(\kappa + \sqrt{\kappa^2 + \gamma^2/s^2}) > 0$.

On the other hand, the posterior mean for ability is stochastic, and itself follows an Itô process. Beliefs are Bayesian and hence, if there were no mean-reversion in the ability process, $\hat{\mu}_t^i$ would be a Martingale with no drift. Under mean reversion at rate κ towards $\bar{\theta}$, the drift is $\kappa(\bar{\theta} - \hat{\mu}_t^i)$. On the other hand, the diffusion term reflects the change in posterior mean generated by observing output. Given that the worker has chosen action a_t, her expected increment to output at t is $[m(a_t) + \hat{\mu}_t]$. The increment to the innovation process $\mathrm{d}\hat{\nu}_t^W$ is the realized increment to output $\mathrm{d}Y_t$ less this expected increment. The only difference between worker and firm beliefs is that firms use the conjectured action history to compute this expected increment, whereas the worker uses the realized action history. Hence, for a private history $\tilde{h}^{t-}$ that is on-path, the posterior means coincide, and can be written $\hat{\mu}_t(h^{t-}) := \hat{\mu}_t^W(\tilde{h}^{t-}) = \hat{\mu}_t^F(h^{t-})$, where h^{t-} is the associated public history.

We previously wrote the action rule as a function of the incumbent wage and beliefs: $\alpha(w_{t-}, \pi^W, \pi^F)$. In light of the Gaussian structure of beliefs in Lemma 2, beliefs are fully characterized by their mean and (common) variance, and so we can instead write the action rule as $\alpha(w_{t-}, \mu^W, \mu^F, \Sigma)$.

Given an equilibrium $\hat{s}$, and a history up to t, denote by $J(h^{t-})$ ***the incumbent employer's continuation value*** from t. It is simple to see that this continuation value inherits the Markov form of the equilibrium, and hence can be written $J(w, \mu^F, \Sigma)$. Similarly, ***the worker's continuation value*** is $W(w, \mu^W, \mu^F, \Sigma)$. These value functions can be written compactly in HJB form.

Lemma 3. *Fixing an equilibrium $\hat{s}$, the worker and incumbent employer value functions are defined*

recursively by:

(8)
$$rW(w,\mu^W,\mu^F,\Sigma)=\max_{a\in\mathcal{A}}\left\{\underbrace{w-c(a)}_{\text{Flow payoff}}+\underbrace{\mathcal{L}_W^a W(w,\mu^W,\mu^F,\Sigma)}_{\substack{\text{Contrib. of change}\\ \text{in cont. value from}\\ \text{no outside offer}}}+\underbrace{q\Big[W(\bar{w}(\mu^F,\Sigma),\mu^W,\mu^F,\Sigma)-W(w,\mu^W,\mu^F,\Sigma)\Big]}_{\substack{\text{Contrib. of change in cont. value}\\ \text{from outside offer}}}\right\}$$

(9)
$$rJ(w,\mu^F,\Sigma)=\underbrace{m(\hat{a}^F(w,\mu^F,\Sigma))+\mu^F-w}_{\text{Flow payoff}}+\underbrace{\mathcal{L}_F J(w,\mu^F,\Sigma)}_{\substack{\text{Contrib. of change}\\ \text{in cont. value from}\\ \text{no outside offer}}}\ \underbrace{-qJ(w,\mu^F,\Sigma)}_{\substack{\text{Contrib. of change in}\\ \text{cont. value from}\\ \text{outside offer}}},$$

where $\mathcal{L}_W^a$ and $\mathcal{L}_F$ are the generators for the value functions absent an outside offer, defined by

$$\mathcal{L}_W^a W(w,\mu^W,\mu^F,\Sigma)=\dot{\Sigma}W_\Sigma+\kappa(\bar{\theta}-\mu^F)+\frac{\Sigma}{s^2}[\mu^W-\mu^F+m(a)-m(\hat{a}^F(w,\mu^F,\Sigma))]W_{\mu^F}+\frac{\Sigma^2}{2s^2}\Big[W_{\mu^F,\mu^F}+2W_{\mu^F,\mu^W}+W_{\mu^W,\mu^W}\Big], \tag{10}$$

$$\mathcal{L}_F J(w,\mu^F,\Sigma)=\dot{\Sigma}J_\Sigma(w,\mu^F,\Sigma)+\kappa(\bar{\theta}-\mu^F)J_\mu(w,\mu^F,\Sigma)+\frac{\Sigma^2}{2s^2}J_{\mu^F\mu^F}(w,\mu^F,\Sigma). \tag{11}$$

Recall that Lemma 2, the worker and firms share beliefs on the equilibrium path; define the ***worker's continuation value on the equilibrium path*** as $W^*(w,\mu,\Sigma):=W(w,\mu,\mu,\Sigma)$, and likewise the ***incumbent employer's continuation value on the equilibrium path*** by $J^*(w,\mu,\Sigma)$.

These expressions also clarify how the worker's action affects continuation payoffs. Consider choosing an action a to solve the maximization problem in (8). The cost of a marginally higher action is the flow effort cost $c'(a)$. The benefit of a marginally higher action is in its effect on the change in the firm's posterior mean for ability μ^F; inspecting equation (10) shows that the increase in the firm's posterior mean for ability is $m'(a)[\Sigma/s^2]$, and that the value of a marginal increase in the firm's posterior mean for ability is W_{μ^W}. As a result, heuristically, the worker's optimal action satisfies $c'(a)=m'(a)[\Sigma/s^2]W_{\mu^F}$. Lemma 4 puts this formally.

Lemma 4. *Fix an equilibrium s and a feasible worker belief μ_W, firm belief μ_F, posterior variance Σ, and incumbent wage w. The worker's action given this wage and beliefs, $a=\alpha(w,\mu^W,\mu^F,\Sigma)$, is then implicitly pinned down as the unique action that satisfies:*

$$c'(a)=\frac{\Sigma}{s^2}m'(a)W_{\mu^F}(w,\mu^W,\mu^F,\Sigma). \tag{12}$$

Hence, given any candidate action rule, we can compute the worker's value function through (8); given a candidate value function, we can find the corresponding action rule through (12). An equilibrium is a fixed point of this problem. Proposition 1 states that such a fixed point exists.

Proposition 1. *There is an equilibrium to the game described above.*

5. The effects of imperfect competition on effort towards the level of output

How does imperfect labor market competition affect incentives for the level of output? I address this question in three steps. I begin with some benchmark cases. I then derive some properties of the worker's value function, and finally consider implications for the worker's actions.

5.1. Benchmarks: effort under contractible output/actions and perfect competition

I begin with three benchmarks. First, in the ***verifiable-output case***, I amend the model above to allow the contract to condition the worker's wage on her output. Second, in the ***verifiable-action case***, I amend the model to allow the contract to condition on the worker's chosen action. I describe these benchmark cases formally in Appendix O.A.

Lemma 5. *In the verifiable-output or verifiable-action case, the worker's equilibrium value function is linear in the posterior mean for ability. The worker's equilibrium action at each t is $a_t = a_{FB}$.*

In the verifiable-action case, the parties directly contract on the first-best action. In the verifiable-output case, since both parties are risk-neutral, "selling the firm" implements the first-best action.

Third, suppose that the worker's output and action are *not* verifiable, but amend the model such that the labor market is ***competitive***, in the sense that the worker receives an outside offer at each instant, rather than infrequently. In that case, the setting becomes a continuous-time version of Holmström (1982/1999), and is very similar to the setting of Cisternas (2018a, Section II.B).

Lemma 6. *In the competition case, there is a unique equilibrium value function and action rule.*

(i) The worker's equilibrium value function W^{C} is linear in the posterior mean for ability. Moreover, her wage at each time t is her expected output at t.

(ii) The worker's action depends on calendar time, but not otherwise on the history. In particular, the action a_t^{C} is implicitly defined by $c'(a_t^{\mathrm{C}}) = \psi_t m'(a_t^{\mathrm{C}})$, where

$$\psi_t := \left[\frac{\Sigma_t}{s^2}\int_{\tau=t}^{\infty} \exp\left\{-\int_t^{\tau}\left(r+\kappa+\frac{\Sigma_u}{s^2}\right)du\right\}d\tau\right].$$

The action converges to the steady-state action a^{C} implicitly defined by $c'(a^{\mathrm{C}}) = \psi^* m'(a^{\mathrm{C}})$, for $\psi^* := \lim_{t\to\infty}\psi_t = \Sigma^*/[rs^2 + \kappa s^2 + \Sigma^*]$.

(iii) At each t, the worker's equilibrium a_t^{C} is strictly below the first-best action a_{FB}.

The worker's actions fall below the first-best actions for two reasons. First, exerting more effort in the current instant increases future compensation, not current compensation: to the extent that the worker is impatient ($r > 0$), she is deterred from effort. Second, exerting more effort does not permanently increase the market's view of the worker's ability, since ability is partly mean-reverting ($\kappa > 0$). As in Holmström (1982/1999), we recover the first-best case as the worker becomes patient ($r \to 0$) and the ability process approaches Brownian motion ($\kappa \to 0$).

Cisternas (2018a) also demonstrates that this is an equilibrium. The technical contribution of Lemma 6 is to show uniqueness. Substantively, this is of interest because I will later show that imperfect competition generates history-dependence. Since the unique competitive equilibrium is history-independent, we can conclude that any history-dependence is due to imperfect competition.

5.2. The worker's continuation value under imperfect competition

I now turn to the case of interest, in which actions and output are non-contractible, and there is imperfect competition. I begin with the worker's equilibrium continuation value, $W^*(w, \mu, \Sigma)$.

Proposition 2. *The worker's equilibrium value function is concave in the posterior mean for ability.*

Thus, although the worker is risk-neutral over consumption, she is risk-averse over reputation. To see the intuition, fix some feasible (w, Σ), and denote by $\underline{\mu}(\mu, \Sigma)$ the lowest posterior mean at which the incumbent firm is willing to continue the employment relationship at wage w: $\underline{\mu}(\mu, \Sigma) := \inf\{\mu : J^*(w, \mu, \Sigma) \geq 0\}$. On the equilibrium path, $\mu \geq \underline{\mu}$: otherwise, the firm would already have renegotiated wages down. Think of the difference between the worker's current posterior and the posterior that would cause renegotiation, $B(w, \mu, \Sigma) := \mu - \underline{\mu}(w, \Sigma)$, as the worker's "reputational buffer". When this buffer is small, the worker is close to a downward wage renegotiation, so her continuation value is highly sensitive to performance. When the buffer is large, the worker does not anticipate immediate renegotiation, and hence her payoff is less sensitive to performance.

The intuition resembles buffer-stock models of saving (Deaton 1991; Carroll 1997, 2001). In those models, wealth insures against adverse shocks, so its marginal value is high near the liquidity constraint but falls once the household has a sufficient buffer. Here, the relevant buffer is reputation, and the worker fears reaching the renegotiation threshold rather than the liquidity constraint.

Figure 4(a) illustrates Proposition 2 graphically by depicting the worker's equilibrium value function $W^*(w, \mu, \Sigma)$, holding fixed (w, Σ) and varying the posterior mean μ. To construct the figure, I solve for equilibrium numerically under particular parameter values; since the purpose of the figure is to highlight qualitative features, I leave the details to Appendix O.A. In the competitive case (in navy), the worker's continuation value is linear in μ (Lemma 6); in the imperfectly competitive case (in purple) it is concave (Proposition 2).[20] In the two-period model in section 2, the worker's value function was kinked; here, the kink is "smoothed". Intuitively, in the two-period model, once the worker is marginally above the second-period renegotiation threshold, she can no longer face a wage cut. In the dynamic model, by contrast, a worker just above the threshold is protected from a wage cut today, but still faces the risk of crossing the threshold in the future. Figure 5(a) also shows expressions for the slopes of the value functions, which I return to at the end of this subsection.

To see the intuition, note that changes in reputation are only capitalized into wages after a renegotiation. Given an on-path state (w, μ, Σ), denote by $R(w, \mu, \Sigma)$ the expected time until the next renegotiation. Fix (w, Σ), and consider how $R(w, \mu, \Sigma)$ varies with μ. Under competition, wages are continuously reset to expected output. Since the posterior mean follows the diffusion process in (5), expected output is continuously changing, so $R(w, \mu, \Sigma) = 0$, as in the navy line in Figure 4(b).

Under imperfect competition, the wage is reset only when the firm's participation constraint binds or an outside offer arrives. The former event occurs when μ hits the renegotiation threshold $\underline{\mu}(w, \Sigma)$; the latter arrives at Poisson rate q. As μ approaches $\underline{\mu}(w, \Sigma)$ from above, the worker is arbitrarily

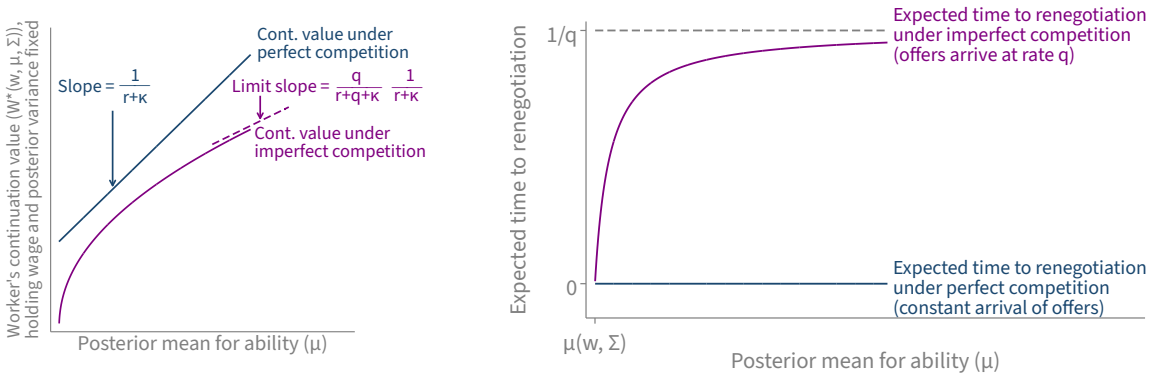
[20] The continuation value in the competitive case is also shifted above the continuation value in the imperfectly competitive case. This reflects both that firms can extract some rent in the imperfectly competitive case, and that joint surplus is smaller in the imperfectly competitive case.

close to the firm's participation constraint, the expected time to renegotiation approaches zero. As μ becomes large, the firm's participation constraint is increasingly unlikely to bind before the next outside offer, so the expected time to renegotiation approaches the expected waiting time for an outside offer, $1/q$. Generally, the expected time to renegotiation is zero in the competitive case, but increasing in reputation under imperfect competition (purple curve in Figure 4(b)).[21]

As a result, when μ is close to $\underline{\mu}(w, \Sigma)$, a marginal increase in the posterior mean is valuable because it substantially reduces the probability of an imminent wage cut. When μ is far above the threshold, however, an additional unit of reputation is less valuable: the worker is already unlikely to face a downward renegotiation soon, and further good news is capitalized into higher wages only when an outside offer arrives. Thus the marginal value of reputation is high near the renegotiation threshold and lower when the worker is already secure, generating the concave shape of $W^*(w, \mu, \Sigma)$.

FIGURE 4. The worker's equilibrium continuation value and action policy

(a) The worker's equilibrium continuation value **(b) Expected time to renegotiation**



Note: *Panel (a) illustrates the worker's equilibrium continuation value $W^*(w, \mu, \Sigma)$, holding fixed (w, Σ) and varying μ, in the case of perfect competition (navy) and imperfect competition (purple). Panel (b) depicts the expected time to renegotiation $R(w, \mu, \Sigma)$, holding fixed (w, Σ) and varying μ, in the same cases as panel (a).*

The concavity of the worker's continuation value is closely related to empirical work on concave pay-performance profiles discussed in the introduction. To see this, consider a worker on the equilibrium path at time t with wage w and posterior for ability (μ, Σ), and consider output over a short interval $[t, t + \Delta]$. To first order, expected output over this interval is $\bar{y}_\Delta := [m(\alpha(w, \mu, \Sigma)) + \mu]\Delta$. Let $z_\Delta := [Y_{t+\Delta} - Y_t] - \bar{y}_\Delta$ denote unexpected performance. By the Kalman-Bucy filter in Lemma 2, $\mu_{t+\Delta} = \mu + \kappa(\bar{\theta} - \mu)\Delta + \frac{\Sigma}{s^2} z_\Delta + o_p(\Delta)$. Thus, conditional on the current state, the posterior mean μ is linear in unexpected performance. Since $W^*(w, \mu, \Sigma)$ is concave in μ, the worker's continuation value is concave in unexpected performance.

Finally, Figure 5(a) shows that, in the competitive case, the slope of the value function is $1/[r + \kappa]$. To see the intuition, note that in the competitive case, the worker is paid her expected output; since her action is constant in her posterior mean (Lemma 6), up to a constant, the worker's wage is equal to the posterior mean for ability. Since ability is mean-reverting at rate κ, an increase in

[21] Appendix Lemma A2 makes these statements formal.

the posterior mean for ability at t increases the expected wage τ periods ahead by $\exp(-\kappa\tau)$; since the worker discounts the future at rate r, she values the increase in her wage τ periods ahead at $\exp(-r\tau)$. Hence, the slope of her continuation value is $\int_{\tau=0}^{\infty} \exp(-\kappa\tau)\exp(-r\tau)d\tau = \frac{1}{\kappa+r}$.

In the imperfectly competitive case, the value function has limiting slope $\lim_{\mu\to\infty} W_\mu^*(w,\mu,\Sigma) = \frac{q}{r+q+\kappa}\frac{1}{r+\kappa}$, which converges to the competitive slope from below as $q \to \infty$.[22] To see the intuition, consider a worker whose reputation is far above the renegotiation threshold, so that the firm's participation constraint is unlikely to bind. A marginal increase in the posterior mean then affects wages only once the worker receives an outside offer. At horizon τ, the effect of a one-unit increase in the current posterior mean on expected ability has depreciated to $\exp(-\kappa\tau)$. The probability that this reputation gain has been capitalized into wages by horizon τ is $1 - \exp(-q\tau)$, since outside offers arrive at rate q. Discounting at rate r, the limiting slope of the worker's continuation value is therefore $\int_{\tau=0}^{\infty} \exp(-r\tau)\exp(-\kappa\tau)[1-\exp(-q\tau)]d\tau = q/[(r+\kappa)(r+\kappa+q)]$.

These slopes suggest a simple quantitative illustration of the magnitude of the effect of imperfect competition on the returns to performance. Under either perfect or imperfect competition, an unexpected one-unit innovation in output at t increases the posterior mean for ability by $[\Sigma_t/s^2]$ (Lemma 2). In the competitive case, this then increases the worker's continuation value by $[\Sigma_t/s^2]/[\kappa+r]$. In the imperfectly competitive case, for a worker whose reputation is sufficiently far above the renegotiation threshold, the same output innovation increases the worker's continuation value by by $[\Sigma_t/s^2]q/[(r+\kappa)(r+\kappa+q)]$. Thus, imperfect competition attenuates the returns to stronger performance for a high-performing worker by a share $[r+\kappa]/[r+\kappa+q]$ relative to the competitive benchmark. Appendix Table A1 presents various estimates of the discount rate r, arrival rate of outside offers q, and mean-reversion rate κ.[23] Standard existing estimates would suggest that, for the highest-performing workers, the returns to stronger performance are discounted by about 20% due to imperfect competition. This rough calibration therefore suggests that the effects of imperfect competition on the returns to performance can be reasonably large, though of course many details are stylized, and the calculation only applies to workers with strong existing reputations relative to their wage.

5.3. The worker's action choices under imperfect competition

I now turn to the worker's effort. In the introductory example, the worker had weaker incentives to exert effort when her reputation was strong. Does the same logic apply to the general model?

Fix an equilibrium, and recall that $\alpha(w,\mu,\Sigma)$ denotes the worker's equilibrium effort given state (w,μ,Σ). I will call the worker's effort ***performance-independent*** if $\alpha(w,\mu,\Sigma)$ is constant in μ, and say it ***targets acceptable performance*** if $\alpha(w,\mu,\Sigma)$ is strictly decreasing in μ.[24] Figure 5(a) illustrates these definitions with two sample paths of cumulative output, which coincide on $[0,t_1]$ and diverge on $[t_1,t_2]$. By the output process (2), this divergence could reflect differences in ability,

[22] Appendix Lemma A3 makes these statements formal.

[23] The model supposes the worker is infinitely-lived. For this calibration, I assume that the worker has a constant Poisson retirement rate δ. The effective discount rate is then $r = \rho + \delta$, where $\tilde{\rho}$ is the worker's subjective discount rate.

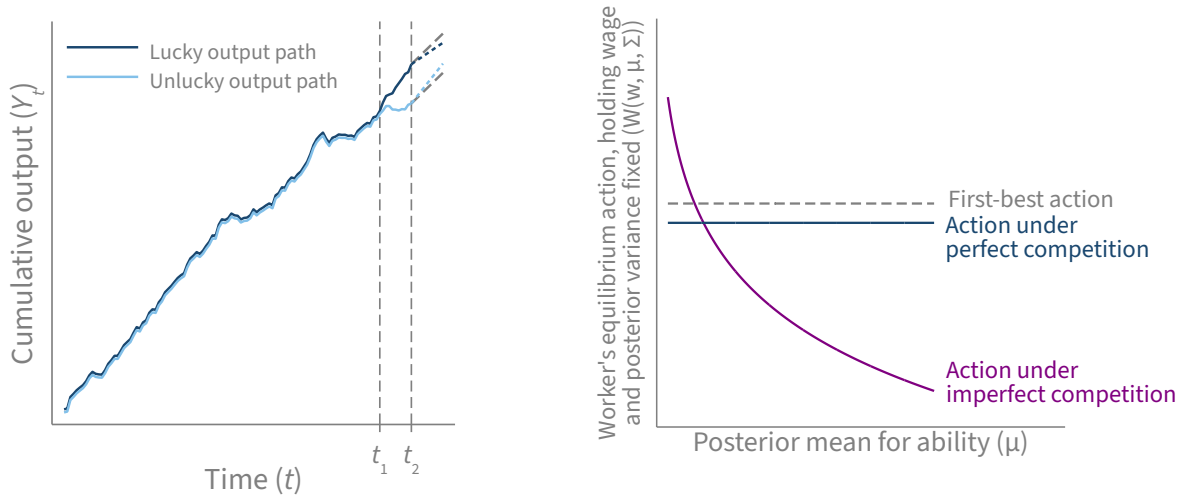
[24] These possibilities are mutually exclusive, but not exhaustive: for instance, workers with stronger reputations could exert *more* effort.

actions, or noise. To isolate the mechanism, suppose it arises only from noise: the worker on the navy path is "lucky," in the sense that she receives more favorable output shocks than the worker on the light-blue path. The belief dynamics (5) then imply the posterior mean at t_2 is higher on the navy path. Suppose also that there are no wage renegotiations between t_1 and t_2, so the two histories have the same wage and posterior variance at t_2 but different posterior means.

The dashed lines show possible values for the drift of output at t_2. If effort is performance-independent, then the drift of output is the same after both paths, as indicated by the dashed parallel lines in gray. If the worker targets acceptable performance, the worse-performing worker exerts more effort, and hence her drift (dashed light blue) is higher than the drift of the better-performing worker (dashed navy). In this sense, targeting acceptable performance generates "catch-up", and both workers drift towards an "intermediate" level of performance.

FIGURE 5. The role of performance-targeting

(a) Intuition for definition of performance-targeting **(b) Equilibrium action policy under perfect and imperfect competition**



Note: *Panel (a) illustrates the definition of performance-targeting through two sample paths of output (see text for details). Panel (b) depicts the equilibrium action policy under perfect and imperfect competition.*

Lemma 6 showed that, in the competitive benchmark, the worker's action at time t is independent of her history. Thus competitive effort is performance-independent: the worker does not target acceptable performance, as in the dashed gray lines.

The case of interest is imperfect competition. Lemma 4 showed that the worker's incentive to exert effort is to bolster her reputation, and Proposition 2 implies that the marginal value of reputation is decreasing. These two results jointly suggest that the worker will have weaker incentives to exert effort when her reputation is already strong. This intuition is imprecise because the equilibrium continuation value $W^*(w, \mu, \Sigma)$ uses the *shared* posterior mean for ability on the equilibrium path. A hidden effort deviation changes firms' posterior belief about ability, but not the worker's own posterior belief. Hence, the relevant object is the curvature of the worker's continuation value including events *off* the equilibrium path, $W(w, \mu^W, \mu^F, \Sigma)$. Lemma 7 shows that the worker's

value to a better reputation *in the firm's eyes* are also decreasing in her current reputation.

Lemma 7. *Fix an equilibrium. Then $W_{\mu^F}(w, \mu, \mu, \Sigma)$ is declining in μ.*

The intuition for Lemma 7 is that an increase in reputation *on the equilibrium path* improves both the worker's own posterior mean and firms' posterior mean:

$$W^*_\mu(w, \mu, \Sigma) = \underbrace{W_{\mu^W}(w, \mu, \mu, \Sigma)}_{\text{Return to improving own view of ability}} + \underbrace{W_{\mu^F}(w, \mu, \mu, \Sigma)}_{\text{Return to improving own view of ability}}. \tag{13}$$

Proposition 2 concerns the sum of these two effects. Lemma 7 isolates the second effect, which is the one affected by hidden effort deviations. Intuitively, improving firms' beliefs is most valuable when the worker is close to the renegotiation threshold, because a small improvement in reputation substantially reduces the risk of a wage cut. When the worker is already far above the threshold, an additional increase in firms' posterior mean provides less protection, and is capitalized into higher wages only when an outside offer arrives. Thus the marginal value of improving firms' beliefs falls with the worker's reputation.

Proposition 3. *(i) In the competitive case, the worker never targets acceptable performance. Under imperfect competition, in every equilibrium, the worker targets acceptable performance.*

(ii) Fix an equilibrium, and some wage w and posterior variance Σ that can be attained on the equilibrium path. Under imperfect competition, there exists a value for the posterior mean μ^* such that, if $\mu > \mu^*$, then the worker's action at (w, μ, Σ) is strictly below the perfectly competitive action, whereas if $\mu < \mu^*$, then the worker's action at (w, μ, Σ) is strictly above the perfectly competitive action.

Part (i) is illustrated graphically in Figure 5(b). The navy line, corresponding to perfect competition, is flat: the worker's action is history-independent and hence independent of the posterior mean. The purple curve, corresponding to imperfect competition, is downward-sloping. When the posterior mean is low, the worker is close to the renegotiation threshold, so better performance substantially reduces the risk of a wage cut. When the posterior mean is high, the current wage is relatively secure, but further good news raises wages only when an outside offer arrives. The marginal value of reputation is therefore smaller after good performance than after bad performance. The model therefore predicts that "secure" workers slack off, while "insecure" workers exert more effort.

This result gives a dynamic interpretation of performance targeting. Existing work attributes performance targeting to sales quotas (Oyer 1998, 2000; Larkin 2014), lump-sum bonuses (Steenburgh 2008; Anderson et al. 2010; Chung et al. 2014), budget or earnings targets (Myers et al. 2007; Jensen 2003; Bennett et al. 2017), or accountability thresholds (Kelman and Friedman 2009; Neal and Schanzenbach 2010). Each of these settings features explicit targets. Here, targeting arises without any explicit target: the worker responds to the threat of future renegotiation. Since this threat looms larger for workers whose position is less secure, these workers exert more effort, consistent with an empirical literature finding larger effort among workers with worse job security (Engellandt and Riphahn 2005).

Part (ii) describes the *level* of effort under imperfect competition. Workers with sufficiently strong reputations exert effort below the competitive level; workers with sufficiently weak reputations exert effort above it. The intuition for the former result is similar to the introductory example: under imperfect competition, a high-performing worker anticipates that higher expected future output will not be fully capitalized into higher wages, and hence her incentives for effort are muted.

The intuition for the latter result is somewhat more complicated. Consider a worker whose current reputation is at the renegotiation threshold: (w, μ, Σ) are such that $\mu = \underline{\mu}(w, \Sigma)$. At the renegotiation threshold, changes in reputation are immediately capitalized into wages, as under competition. But an additional force strengthens effort incentives: in the competitive case, a decline in the wage from temporarily poor performance can be alleviated by subsequent strong performance; in the imperfectly competitive case, a decline in the wage from temporarily poor performance may persist *even after strong performance* in the absence of an outside offer. This creates a precautionary motive for effort that increases the worker's effort relative to the competitive case.

Figure 5(b) suggests an even stronger possibility: for sufficiently low reputation, the worker's effort may be above not only the competitive level, but also the first-best level.

Lemma 8. *If the arrival rate of outside offers q is sufficiently high, then, on the equilibrium path, the worker's action is strictly below the first-best effort level. If the arrival rate is sufficiently low, then, on the equilibrium path, the worker's action is strictly above the first-best effort level if the posterior mean for ability μ is sufficiently low, fixing her wage w and posterior variance Σ.*

Intuitively, as the arrival rate of outside offers increases, we approach the competitive benchmark in which outside offers arrive continuously; effort converges to the competitive level, which is below the first-best level (Lemma 6). On the other hand, when outside offers arrive only infrequently (q small), the worker anticipates that, if she fails to perform well when the firm is close to its renegotiation constraint, any downward wage renegotiation is likely to be highly persistent: the worker is unlikely to receive an outside offer in the near future. As a result, the worker can have a stronger incentive for effort than even in the first-best case.

This result recalls an earlier literature which documents that effort in career concerns models can be inefficiently high (Akerlof 1976; Holmström 1982/1999; Landers et al. 1996). The intuition is quite different. In those papers, effort is inefficiently high because the employer learns a great deal about the worker's ability early in the relationship, so the worker has an incentive to frontload effort. Here, the generating process for output is stationary, and the incentives to exceed first-best effort instead come from the worker's desire to protect herself from renegotiation.

Finally, I noted in the last subsection that, as the worker's reputation grows strong relative to her wage, there is a simple expression for the effect of imperfect competition on the returns to her performance. In particular, I showed that imperfect competition attenuates the returns to stronger performance for a high-performing worker by a share $[r + \kappa]/[r + \kappa + q]$, relative to the competitive benchmark. This simple expression also extends to the worker's choices of actions, if we are willing to parameterize the effect of the worker's action on drift $m(\cdot)$ and her cost of effort $c(\cdot)$. One simple case is to assume that the action has a linear effect on drift ($m(a) = \beta a$ for some $\beta > 0$) and quadratic cost ($c(a) = \chi a^2$, for some $\chi > 0$).[25] In that case, imperfect competition

[25] I use this case as a simplifying example, even though it does not satisfy some of the limiting conditions on the drift

reduces the worker's effort by the same share $[r+\kappa]/[r+\kappa+q] \approx 20\%$. Appendix O.A describes this quantitative illustration in more detail.

6. The effects of imperfect competition on attitudes towards risk

The last section studied the worker's willingness to exert costly effort towards increasing output. In practice, the worker chooses not just whether to exert effort, but also where to direct it: whether to prioritize safer or riskier projects. How does imperfect competition affect these choices? In this section, I show that workers who are *secure* in their jobs—in the sense that the posterior mean for their ability is far from the level at which the employer could demand renegotiation—choose close to first-best risk levels, whereas workers who are *insecure* in their jobs behave as though risk-averse. Thus, job security creates a tradeoff: secure workers have weak incentives to work hard, but stronger incentives to take efficient risks; insecure workers work hard, but play it safe.

6.1. Extension of model to allow for choices over risk

Amending the model to allow for this possibility requires some care.[26] I will assume that the worker's instantaneous output $\mathrm{d}Y_t$ depends also on project quality x_t:

$$\mathrm{d}Y_t = [\theta_t + m(a_t) + \zeta x_t]\mathrm{d}t + s\,\mathrm{d}Z_{Y,t}, \tag{14}$$

where $\zeta \geq 0$ is a constant reflecting the weight on project quality, and the project quality process is

$$x_0 = 0,\ \mathrm{d}x_t = [g(r_t) - \kappa x_t]\mathrm{d}t + \tau(r_t)\mathrm{d}Z_{x,t}, \quad t \geq 0, \tag{15}$$

where $r_t \in \mathcal{R} := [\underline{r}, \bar{r}]$ is the worker's choice of risk at time t, and $Z_{x,t}$ is a standard Brownian motion (independent of $(Z_{Y,t}, Z_{\theta,t})$). I interpret x_t as the latent quality of the worker's line of work, which is portable across employers in the sense that it affects the worker's future output regardless of which firm employs her. The risk choice r_t affects the drift and diffusion of project quality through the twice-differentiable functions g and τ. I assume τ is strictly increasing, so higher r_t raises variance. I also assume that g is strictly concave with an interior maximum. Because both parties are risk-neutral, this maximum is the first-best risk level, denoted $r_{FB} := \arg\max_{r\in\mathcal{R}} g(r)$.

The timing is as in Section 3, except that at the production stage the worker also chooses an unobserved risk level r_t. Neither the worker nor employers observe x_t. The baseline model is nested by $\zeta = 0$ (or $\mathcal{R}$ is degenerate). I define equilibrium analogously to Definition 2, extending beliefs to include the pair (θ_t, x_t), and permitting the worker to choose both effort and risk. Since

and cost functions described in section 3.

[26] One possibility is to directly modify the output-generating process to allow the diffusion term s to depend on the agent's chosen risk level $\mathrm{d}Y_t = [m(a_t) + \theta_t]\mathrm{d}t + s(r_t)\,\mathrm{d}Z_{Y,t}$. To see why this seemingly natural possibility is unreasonable, recall that a single sample path of an Itô process reveals its diffusion through quadratic variation. As a result, under this formulation, firms would infer $s(r_t)$ at each point in time t. Hence, if s was strictly increasing, firms would fully infer r, thereby eliminating moral hazard. This is a well-known issue in continuous-time contracting models with controllable volatility; see, *e.g.*, Sung (1995); Cvitanić et al. (2017), who note that when output is observed continuously, its instantaneous diffusion is recovered from the quadratic variation of any single sample path (Karatzas and Shreve 1991; Dixit 1993), so a one-dimensional volatility control would be perfectly inferable.

these definitions mostly repeat the earlier notation, I leave the details to Appendix O.C.

Discussion of main assumptions. I emphasize several assumptions. First, the worker does not directly observe project quality x_t. One way to interpret this assumption is that the worker learns about her success only by observing the outcome, just like the firm. If the worker instead observed x_t, the model would introduce private information about future output in addition to moral hazard. Second, the worker's choice of risk involves no direct effort cost. One interpretation is that the worker has personal preferences over *how hard* to work, as captured by the cost of effort $c(a_t)$, but is indifferent to working on *different projects*. This focuses the analysis on the trade-off between increasing expected output and reducing its variance. It would be simple to extend the analysis to allow for the possibility that different risk levels impose different effort costs on the worker.

Third, mean reversion in x_t plays the same role as mean-reversion in ability: it keeps the variance of project quality bounded and yields stationary beliefs. Project quality is mean-reverting at rate κ, the same rate at which ability mean-reverts; this allows us to simplify the filtering problem by summarizing the worker's payoff-relevant ability by $\phi_t := \theta_t + \zeta x_t$, which I call the worker's ***productivity***, rather than separately tracking two components. I will denote by π_t the posterior mean for productivity at time t, and by ξ_t the posterior variance at time t; as in the case of choices of effort, one can show that the worker and firms share a posterior mean and variance on the equilibrium path. As a result, in a Markov equilibrium, the worker's choices of effort and risk can be written $a_t(\tilde{h}^{t-}) = \alpha(w, \pi, \xi)$ and $r_t(\tilde{h}^{t-}) = \rho(w, \pi, \xi)$.

Finally, an alternative way to introduce risk-taking would be to suppose that the worker chooses the extent to which her ability influences the drift of output. In this formulation, the weight on ability θ_t in output would depend on the worker's chosen risk level; riskier projects would put a higher weight on ability. Though interesting, this formulation introduces new motivations for exploration *vs.* exploitation which complicate the analysis even in the first-best case. I omit these details in order to focus the analysis on willingness to take on risk.

6.2. Benchmarks: risk-taking under contractible output/actions and perfect competition

As before, I begin by assessing three benchmark cases.

Lemma 9. *Suppose that either (i) actions are contractible, or (ii) output is contractible, or (iii) the labor market is perfectly competitive. Then the worker chooses the first-best risk level r_{FB} at each instant.*

Parts (i) and (ii) follow the same logic as Lemma 5. With contractible actions, the parties contract directly on r_{FB}. With contractible output, the worker can be made the residual claimant on dY_t, which aligns her incentives with joint surplus. Note that contractibility of output is enough even though x_t is unobservable: under risk-neutrality, the worker internalizes the expected output consequences of her risk choice, and the residual variance generated by $\tau(r_t)$ is socially irrelevant.

The intuition for (iii) is that, under perfect competition, the worker captures her full expected output at each instant (Lemma 6), so her continuation value is the expected present value of output. This is linear in the posterior mean and, because the parties are risk-neutral, independent of the

variance of project quality; moreover, there is no private cost to taking risk. The worker therefore maximizes the drift of output by choosing r_{FB}.

6.3. The worker's risk-taking under imperfect competition

I now turn to the case of substantive interest: behavior under imperfect competition.

Proposition 4. *Under imperfect competition, on the equilibrium path, the worker always takes on inefficiently little risk:* $\rho(w, \pi, \xi) < r_{FB}$ *for every feasible* (w, π, ξ).

The intuition is closely related to the discussion of Proposition 2. Higher risk raises the variance of project quality and hence of future output. Since the worker's continuation value is concave in beliefs about the worker's future output, the worker is averse to risk. Intuitively, the worker anticipates that poor performance may trigger renegotiation, whereas, under imperfect competition, there is no guarantee that strong performance will be capitalized into higher wages.

Proposition 5. *On the equilibrium path, the worker's chosen risk at instant t is strictly increasing in the posterior mean for the worker's productivity:* $\rho(w, \pi, \xi)$ *is increasing in* π. *Moreover, fixing the worker's wage, as the posterior mean for the worker's ability grows arbitrarily large, her chosen risk level approaches the first-best:* $\lim_{\pi \to \infty} \rho(w, \pi, \xi) = r_{FB}$.

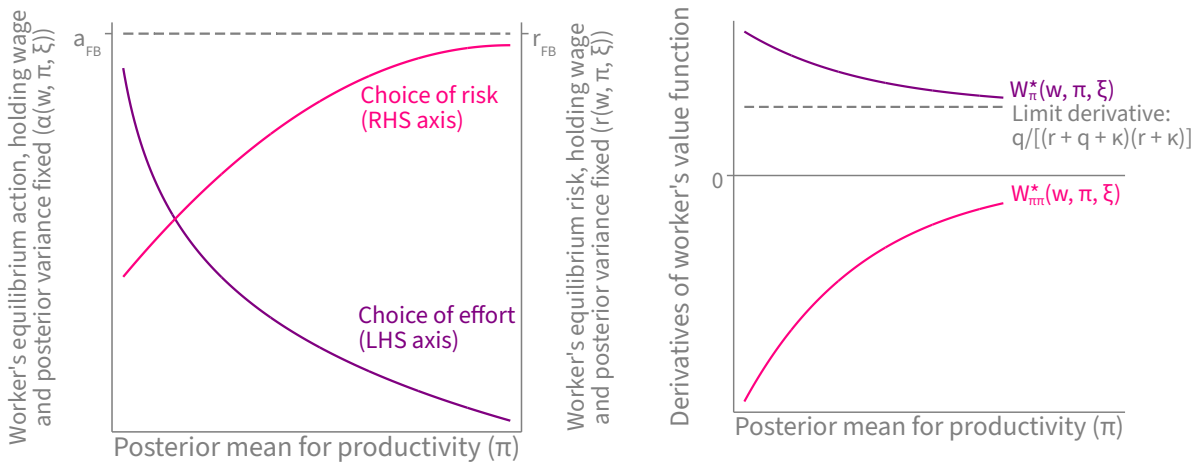
Proposition 5, together with Proposition 3, gives a mixed picture of the relationship between job security and the incentives facing workers, summarized graphically in Figure 6(a):[27] workers who are *insecure* in their jobs work hard, but take too little risk; workers who are *secure* take the right amount of risk, but slack off.

[27] Formally, Proposition 3 applies to a model without choices of risk. Appendix Lemma A4 extends the results of Proposition 3 to an environment with risk.

FIGURE 6. Effort and risk-taking at different levels of job security

(a) Effects of job security on effort and risk-taking

(b) First and second derivatives of worker's continuation value w.r.t. posterior mean for productivity



Note: *Panel (a) depicts the worker's equilibrium action and risk-taking rules,* $\alpha(w, \mu, \Sigma)$ *and* $\rho(w, \mu, \Sigma)$*, holding* (w, Σ) *fixed and varying* μ*. The purple curve shows the worker's effort choice (left axis). The pink curve shows the worker's risk choice (right axis). I assume that the arrival rate of outside offers* q *is sufficiently high that the worker's choice of effort is always below the first-best level (Lemma 8). Panel (b) depicts the first and second derivatives of the worker's equilibrium value function* $W^*(w, \pi, \Sigma)$ *with respect to the posterior mean for productivity* π*.*

To see the intuition, note that the worker's incentives for effort depend on the *first derivative* of the value function with respect to the posterior mean for ability, whereas her incentives for risk depend on the *second derivative* of the value function. These derivatives are presented in Figure 6(b). The first derivative of the worker's value function is steeper when the worker is less secure in her job. Intuitively, as the worker's reputation grows stronger, she becomes less likely to face a downwards renegotiation, and the marginal value of a stronger reputation falls. In particular, the marginal value of a stronger reputation asymptotically approaches the limit slope $q/[(r + q + \kappa)(r + \kappa)]$ discussed in section 5. As a result, the second derivative converges to 0 from below. Since this second derivative is what determines the worker's attitude towards risk, the worker becomes closer to risk-neutral as she grows more secure.

There is some empirical evidence in favor of this point. Worker protections appear to reduce effort and increase absenteeism (Ichino and Riphahn 2005; Jacob 2010), while also tending to increase willingness to take risks (Azoulay et al. 2011; Tian and Wang 2014; Acharya et al. 2013, 2014). Similarly, managers with greater protection against dismissal appear more likely to take on risks (Acharya et al. 2014; Cain and McKeon 2016; Gormley and Matsa 2016; Cabral et al. 2021; Hsu et al. 2024). For a familiar example, consider the tenure process. Brogaard et al. (2018) find that, after being granted tenure, academic economists reduce their quantity of publications—consistent with a reduction in effort—but shift their composition of work towards higher-risk projects. Tripodi et al. (2025) report a similar pattern across other disciplines. The model gives a simple interpretation: workers at the beginning of their career are more likely to be insecure, and hence are incentivized

to work hard, but avoid risk; more secure workers may take on risk, but at the cost of weaker incentives for effort.

7. Extensions: contract design under partial commitment, rent-sharing, and wage-posting

I have shown that, if wages are renegotiated in response to credible threats, then two types of inefficiency arise under imperfect competition: workers engage in dynamic performance-targeting, rather than exerting first-best effort; and workers avoid risk, even when preferences are risk-neutral. This prompts a natural question: are our conclusions robust to alternative assumptions about when wages are renegotiated? And moreover, even if wages are generally renegotiated in response to credible threats, can workers and firms resolve inefficiencies through long-term contracts that commit them not to renegotiate?

I consider three possibilities. First, I introduce long-term contracts that commit the parties not to renegotiate. Second, I consider alternative views of renegotiation. Finally, I describe a model in which wages are posted rather than negotiated.

7.1. Long-term contracts

Suppose that, renegotiation in general occurs in response to credible threats, as before, but say that workers and firms can commit to a long-term contract specifying a wage schedule that cannot be renegotiated. I will say that the contract involves ***two-sided commitment*** if both the worker and the firm can commit never to renegotiate the contract, or leave the relationship, and that it involves ***one-sided commitment*** if the firm can commit never to renegotiate the contract or leave the relationship. If the parties have committed not to renegotiate the contract, there is a sense in which outside offers are irrelevant: neither party can credibly threaten to leave employment. Nonetheless, one possibility is that the employment contract ***can condition on outside offers***. The relevance of outside offers is that, under our maintained assumption that the worker's output is itself non-verifiable, the outside offers received by the worker may be the best signal of her performance.

Extension result 1. *Under two-sided commitment, and contracts that can condition on outside offers, there is a contract that implements the first-best effort and risk levels. Under one-sided commitment, or under two-sided commitment without the ability to condition on outside offers, there is no contract that implements the first-best effort and risk levels.*

To see the intuition, consider the two-period model described in section 2. Recall that, with probability q, the worker receives an offer from an outside firm, and that an increase in period-0 output increases the value of this outside offer by ρ. That is, if we regard *not* receiving an outside offer as though the worker has received an outside offer of zero, an increase in current output increases the outside offer by $q\rho$ in expectation. Now suppose that the worker's employment contract requires that, in the event that the worker receives an outside offer of the amount s in period 1, then her period-1 wage must increase by the amount $s/[q\rho]$. In that case, an increase in the worker's output

by 1 unit increases her wage by 1 unit, in expectation: the worker has again become the residual claimant on her output. As a result, the worker is fully incentivized to choose first-best actions.

The feasibility of this contract is clearly dependent on two substantive assumptions.[28] First, the worker's salary must be conditioned on the value of her outside offer: otherwise, the firm cannot incentivize effort, since the worker's output and action are non-verifiable. In practice, it is rare for employment contracts to explicitly condition salaries on workers' outside options: perhaps because doing so would induce moral hazard problems by causing workers to search excessively for outside offers (Postel-Vinay and Robin 2004; Kiraly 2007); perhaps because outside firms will be unwilling to make outside offers to a worker who is bound not to accept them (Walker 1999; Kahan et al. 2012); or perhaps because the value of the outside offer is itself non-verifiable (Burdett and Coles 2003), especially to the extent that there are important and subjective non-wage terms of the contract (Kahan et al. 2012). Second, it must be possible for both parties to commit. In practice, generally workers cannot commit to supply labor due to anti-slavery provisions in employment law (Harris and Holmström 1982; Thomas and Worrall 1988; Sterk 1993; Hart and Moore 1994; Balke and Lamadon 2022). As a result, I view the contracts attaining efficiency as an interesting theoretical possibility, rather than the leading case in practice.

7.2. Alternative views of renegotiation

Now suppose that we rule out long-term contracts, but vary the process of wage renegotiation within the employment relationship. I consider two alternative bargaining assumptions in A; for simplicity, I consider each assumption in the context of a two-period model. First, I consider a ***partial rent-sharing model*** in which, even absent an outside offer, a worker receives a share $\lambda \in (0, 1)$ of unanticipated increases in her expected output. The rent-sharing view can be motivated by bargaining even without an outside offer (Stole and Zwiebel 1996; Cahuc et al. 2006; Kline et al. 2019; Garin and Silvério 2024), fairness norms (Akerlof and Yellen 1990), or efficiency wage concerns (Shapiro and Stiglitz 1984; Katz 1986). Second, I consider a ***downward-rigid model*** in which the worker's wage cannot be adjusted downward within the employment relationship.[29] The assumption of rigid wages can be motivated by a model of implicit contracts (Harris and Holmström 1982; Beaudry and DiNardo 1991), or by the negative effects of pay cuts on morale or separations (Bewley 1999; Card et al. 2012; Breza et al. 2018; Dube et al. 2019).

Extension result 2. *The results in Propositions 2–5 also apply in a two-period partial rent-sharing model or rigid wage model.*

As a result, our conclusions are robust to alternative views of wage renegotiation. With downward wage rigidity, bad news is not reflected in lower within-match wages, but it increases the probability of inefficient separation. As a result, downside risk remains privately costly even though wages are rigid within continuing matches.

[28] As the intuition of the last paragraph makes clear, these contracts also rely on our maintained assumption of risk neutrality.

[29] There is ongoing debate about the prevalence of wage cuts: see, for instance, Elsby and Solon (2019).

7.3. Wage-posting models

Even these alternative views assume that wages are negotiated. This seems an appropriate description of many high-wage labor markets (Hall and Krueger 2012). In the U.S., somewhere between half and two-thirds of workers engage in wage bargaining (Hall and Krueger 2012), and in surveys most German firms indicate a willingness to entertain individual bargaining (Caldwell et al. 2026b). Nonetheless, in some segments of the labor market, particularly for low-skill or entry-level workers, most wages appear to be posted rather than negotiated. How does wage-posting affect our conclusions?

In A, I extend the two-period model to allow for wage-posting in the spirit of Moen (1997); Acemoglu and Shimer (1999). Rather than wages being negotiated, firms post wages. I suppose that firms post wages without knowing the worker's productivity; this can be interpreted either as firms being subject to imperfect information, or as firms interacting with a population of workers, and posting a single wage that will apply to all new hires. The worker is offered the job if her productivity exceeds the posted wage; otherwise, the posting firm is unwilling to hire the worker. The worker accepts the job if the posted wage exceeds her current wage; there is no wage negotiation within an employment relationship. The worker draws ν vacancies. As ν becomes arbitrarily large, we return to the perfectly-competitive case; as ν becomes small, we return to the monopsony case. I call this the ***wage-posting model***. In the wage-posting model, workers of any reputed ability draw ν vacancies; however, since workers with stronger reputations are more likely to be accepted into a vacancy, the wage-posting model effectively endogenizes the arrival of outside offers as a function of the worker's performance.

Extension result 3. *The results in Propositions 2–5 also apply in a two-period wage-posting model.*

To see the intuition, recall that, in the wage-bargaining case, a worker anticipates that she will receive a limited share of the upside from good performance, but the full downside. These forces are only strengthened in the case of posted wages. On the one hand, it is even more difficult for workers to negotiate wages up; on the other hand, workers are subject to greater risk of separations after even modest underperformance. As a result, the main conclusions also apply to wage-posting environments more typical of low-wage labor markets.

8. Discussion

I have argued that imperfect competition in the labor market has substantial effects on workers' behavior *within the firm*, in addition to its well-known effects on wages and employment. Frictions to job search reduce workers' ability to threaten to leave the firm, but preserve firms' ability to threaten to fire workers. As a result, bad performance news is capitalized into lower wages or greater separation risk, while good performance news is only partially capitalized into higher compensation. In consequence, workers target acceptable performance: workers with weaker reputations exert more effort than in the competitive case, and workers with stronger reputations exert less effort. In addition, imperfect competition distorts risk incentives: workers, especially worse-performing workers, are discouraged from taking on risk even when both workers and firms

are risk-neutral. Labor-market competition therefore matters not only for wages and employment, but also for effort, experimentation, and the organization of production inside firms.

My analysis omits much of the complexity of the employment relationship. In the model, workers face simple choices over exertion and risk-taking. Moreover, the worker's performance is entirely non-contractible. Each of these assumptions could be relaxed in a richer model. In many settings of interest, parts of the worker's performance may be contractible and hence amenable to formal incentive contracts. In these cases, it seems plausible that firms would use tournaments, stock options, or other convex incentive schemes to partially offset the tendency towards conservatism created by reputational incentives.[30] But these instruments are necessarily incomplete when the relevant dimensions of performance are subjective, multidimensional, or realized only over a time horizon too long to incentivize performance.

Although stylized, my account of the effects of imperfect competition organizes several insights from empirical evidence: first, the concave response of wages to performance; second, the tendency towards performance-targeting, or satisficing, behavior; and, third, the bias towards conservatism, even in risk-neutral firms. The model also suggests that increased labor market competition will affect not just wages and employment at a firm, but the behavior of the workers within the firm. Indeed, Cici et al. (2021) find that the imposition of non-compete agreements among financial executives tends to reduce risk-taking, which is consistent with the model.[31] The model also gives rise to a negatively-skewed distribution of wage changes, in line with recent evidence (Guvenen et al. 2014, 2021; Arellano et al. 2017; De Nardi et al. 2021; Halvorsen et al. 2024; Sarpietro et al. 2026). Moreover, the model suggests that negative performance news (or exogenous increases in wages) should tend to increase workers' effort while reducing their risk-taking, and should have the largest effects for workers close to the threshold for wage renegotiation. Each of these predictions seems a natural direction for empirical work.

[30] In this sense, the paper is connected to the literature on convex incentive schemes (Lazear and Rosen 1981; Green and Stokey 1983; Hall and Murphy 2003; Coles et al. 2006) and contractual responses to career concerns (Gibbons and Murphy 1992).

[31] Similarly, Kini et al. (2021) finds that firms respond to the arrival of non-compete agreements by increasing explicit bonuses in executives' contracts. One interpretation is that stronger explicit incentives for performance are needed because a reduction in competition weakens implicit incentives for performance. I focus on workers whose performance is non-verifiable; for these workers, it is less plausible that firms can counteract any effects of imperfect competition through explicit pay for performance.

References

Acemoglu, Daron and Robert Shimer, "Holdups and efficiency with search frictions," *International Economic Review*, 1999, *40* (4), 827–849.

Acharya, Viral V, Ramin P Baghai, and Krishnamurthy V Subramanian, "Labor laws and innovation," *The Journal of Law and Economics*, 2013, *56* (4), 997–1037.

___, ___, and ___, "Wrongful discharge laws and innovation," *The Review of Financial Studies*, 2014, *27* (1), 301–346.

Aghion, Philippe and Matthew O Jackson, "Inducing leaders to take risky decisions: dismissal, tenure, and term limits," *American Economic Journal: Microeconomics*, 2016, *8* (3), 1–38.

Akerlof, George, "The economics of caste and of the rat race and other woeful tales," *The Quarterly Journal of Economics*, 1976, *90* (4), 599–617.

Akerlof, George A and Janet L Yellen, "The fair wage-effort hypothesis and unemployment," *The Quarterly Journal of Economics*, 1990, *105* (2), 255–283.

Altonji, Joseph G and Charles R Pierret, "Employer learning and statistical discrimination," *The Quarterly Journal of Economics*, 2001, *116* (1), 313–350.

___, Anthony A Smith Jr, and Ivan Vidangos, "Modeling earnings dynamics," *Econometrica*, 2013, *81* (4), 1395–1454.

Amihud, Yakov and Baruch Lev, "Risk reduction as a managerial motive for conglomerate mergers," *The bell journal of economics*, 1981, pp. 605–617.

Amodio, Francesco, Pamela Medina, and Monica Morlacco, "Labor market power, self-employment, and development," *American Economic Review*, 2025, *115* (9), 3014–3057.

Anderson, Shannon W, Henri C Dekker, and Karen L Sedatole, "An empirical examination of goals and performance-to-goal following the introduction of an incentive bonus plan with participative goal setting," *Management Science*, 2010, *56* (1), 90–109.

Arellano, Manuel, Richard Blundell, and Stéphane Bonhomme, "Earnings and consumption dynamics: a nonlinear panel data framework," *Econometrica*, 2017, *85* (3), 693–734.

Argote, Linda and Henrich R Greve, "A behavioral theory of the firm—40 years and counting: Introduction and impact," *Organization science*, 2007, *18* (3), 337–349.

Arrow, Kenneth Joseph, "Economic welfare and the allocation of resources for invention," in "Readings in industrial economics: Volume two: Private enterprise and state intervention," Springer, 1962, pp. 219–236.

Artinger, Florian M, Gerd Gigerenzer, and Perke Jacobs, "Satisficing: Integrating two traditions," *Journal of Economic Literature*, 2022, *60* (2), 598–635.

Aryal, Gaurab, Manudeep Bhuller, and Fabian Lange, "Signaling and employer learning with instruments," *American Economic Review*, 2022, *112* (5), 1669–1702.

Ashenfelter, Orley, David Card, Henry Farber, and Michael R Ransom, "Monopsony in the labor market: New empirical results and new public policies," *Journal of Human Resources*, 2022, *57* (S), S1–S10.

Asker, John, Joan Farre-Mensa, and Alexander Ljungqvist, "Corporate investment and stock market listing: A puzzle?," *The Review of Financial Studies*, 2015, *28* (2), 342–390.

Azar, José and Ioana Marinescu, "Monopsony power in the labor market: From theory to policy," *Annual Review of Economics*, 2024, *16* (1), 491–518.

Azoulay, Pierre, Joshua S Graff Zivin, and Gustavo Manso, "Incentives and creativity: evidence from the academic life sciences," *The RAND Journal of Economics*, 2011, *42* (3), 527–554.

Bachmann, Rüdiger, Christian Bayer, Heiko Stüber, and Felix Wellschmied, "Monopsony makes firms not only small but also unproductive: Why East Germany has not converged," *Review of Economic Studies*, 2026, p. rdag033.

Bagger, Jesper and Rasmus Lentz, "An empirical model of wage dispersion with sorting," *The Review of Economic Studies*, 2019, *86* (1), 153–190.

___, François Fontaine, Fabien Postel-Vinay, and Jean-Marc Robin, "Tenure, experience, human capital,

and wages: A tractable equilibrium search model of wage dynamics," *American Economic Review*, 2014, *104* (6), 1551–1596.

Baker, George, Robert Gibbons, and Kevin J Murphy, "Relational Contracts and the Theory of the Firm," *The Quarterly journal of economics*, 2002, *117* (1), 39–84.

Balke, Neele and Thibaut Lamadon, "Productivity shocks, long-term contracts, and earnings dynamics," *American Economic Review*, 2022, *112* (7), 2139–2177.

Beaudry, Paul and John DiNardo, "The effect of implicit contracts on the movement of wages over the business cycle: Evidence from micro data," *Journal of political Economy*, 1991, *99* (4), 665–688.

Bennett, Benjamin, J Carr Bettis, Radhakrishnan Gopalan, and Todd Milbourn, "Compensation goals and firm performance," *Journal of Financial Economics*, 2017, *124* (2), 307–330.

Berger, David, Kyle Herkenhoff, and Simon Mongey, "Labor market power," *American Economic Review*, 2022, *112* (4), 1147–1193.

___, ___, Andreas R Kostøl, and Simon Mongey, "An anatomy of monopsony: Search frictions, amenities, and bargaining in concentrated markets," *NBER Macroeconomics Annual*, 2024, *38* (1), 1–47.

Bertrand, Marianne and Sendhil Mullainathan, "Enjoying the quiet life? Corporate governance and managerial preferences," *Journal of political Economy*, 2003, *111* (5), 1043–1075.

Bewley, Truman F, *Why wages don't fall during a recession*, Harvard university press, 1999.

Bilal, Adrien, Niklas Engbom, Simon Mongey, and Giovanni L Violante, "Labor market dynamics when ideas are harder to find," National Bureau of Economic Research 2021.

___, ___, ___, and ___, "Firm and worker dynamics in a frictional labor market," *Econometrica*, 2022, *90* (4), 1425–1462.

Blanchflower, David G, Andrew J Oswald, and Peter Sanfey, "Wages, profits, and rent-sharing," *The Quarterly Journal of Economics*, 1996, *111* (1), 227–251.

Bonatti, Alessandro and Johannes Hörner, "Career concerns with exponential learning," *Theoretical Economics*, 2017, *12* (1), 425–475.

Breza, Emily, Supreet Kaur, and Yogita Shamdasani, "The morale effects of pay inequality," *The Quarterly Journal of Economics*, 2018, *133* (2), 611–663.

Brogaard, Jonathan, Joseph Engelberg, and Edward Van Wesep, "Do economists swing for the fences after tenure?," *Journal of Economic Perspectives*, 2018, *32* (1), 179–194.

Burdett, Kenneth and Dale T Mortensen, "Wage differentials, employer size, and unemployment," *International economic review*, 1998, pp. 257–273.

___ and Melvyn Coles, "Equilibrium wage-tenure contracts," *Econometrica*, 2003, *71* (5), 1377–1404.

Cabral, Joseph J, Bill B Francis, and MV Shyam Kumar, "The impact of managerial job security on corporate entrepreneurship: Evidence from corporate venture capital programs," *Strategic Entrepreneurship Journal*, 2021, *15* (1), 28–48.

Cahuc, Pierre, Fabien Postel-Vinay, and Jean-Marc Robin, "Wage bargaining with on-the-job search: Theory and evidence," *Econometrica*, 2006, *74* (2), 323–364.

Cain, Matthew D and Stephen B McKeon, "CEO personal risk-taking and corporate policies," *Journal of Financial and Quantitative Analysis*, 2016, *51* (1), 139–164.

Caldwell, Sydnee, Arindrajit Dube, and Suresh Naidu, "Monopsony Makes it Big," Working Paper, University of California, Berkeley 2026.

___, Ingrid Haegele, and Jörg Heining, "Bargaining and inequality in the labor market," *The Quarterly Journal of Economics*, 2026, *141* (1), 315–371.

Card, David, "Who set your wage?," *American Economic Review*, 2022, *112* (4), 1075–1090.

___, Alexandre Mas, Enrico Moretti, and Emmanuel Saez, "Inequality at work: The effect of peer salaries on job satisfaction," *American Economic Review*, 2012, *102* (6), 2981–3003.

___, Ana Rute Cardoso, Joerg Heining, and Patrick Kline, "Firms and labor market inequality: Evidence and some theory," *Journal of Labor Economics*, 2018, *36* (S1), S13–S70.

___, Francesco Devicienti, and Agata Maida, "Rent-sharing, holdup, and wages: Evidence from matched

panel data," *Review of Economic Studies*, 2014, *81* (1), 84–111.

Carroll, Christopher D, "Buffer-stock saving and the life cycle/permanent income hypothesis," *The Quarterly journal of economics*, 1997, *112* (1), 1–55.

___ , "A theory of the consumption function, with and without liquidity constraints," *Journal of Economic perspectives*, 2001, *15* (3), 23–45.

Chevalier, Judith and Glenn Ellison, "Career concerns of mutual fund managers," *The Quarterly Journal of Economics*, 1999, *114* (2), 389–432.

Chung, Doug J, Thomas Steenburgh, and K Sudhir, "Do bonuses enhance sales productivity? A dynamic structural analysis of bonus-based compensation plans," *Marketing Science*, 2014, *33* (2), 165–187.

Cici, Gjergji, Mario Hendriock, and Alexander Kempf, "The impact of labor mobility restrictions on managerial actions: Evidence from the mutual fund industry," *Journal of Banking & Finance*, 2021, *122*, 105994.

Cisternas, Gonzalo, "Career concerns and the nature of skills," *American Economic Journal: Microeconomics*, 2018, *10* (2), 152–189.

___ , "Two-sided learning and the ratchet principle," *The Review of Economic Studies*, 2018, *85* (1), 307–351.

Coles, Jeffrey L, Naveen D Daniel, and Lalitha Naveen, "Managerial incentives and risk-taking," *Journal of Financial Economics*, 2006, *79* (2), 431–468.

Cvitanić, Jakša, Dylan Possamaï, and Nizar Touzi, "Moral hazard in dynamic risk management," *Management Science*, 2017, *63* (10), 3328–3346.

Cyert, Richard M. and James G. March, *A Behavioral Theory of the Firm*, Englewood Cliffs, NJ: Prentice-Hall, 1963.

Deaton, Angus, "Saving and Liquidity Constraints," *Econometrica*, 1991, *59* (5), 1221–1248.

DeVaro, Jed and Michael Waldman, "The signaling role of promotions: Further theory and empirical evidence," *Journal of Labor Economics*, 2012, *30* (1), 91–147.

Devereux, Paul J and Robert A Hart, "The spot market matters: evidence on implicit contracts from Britain," *Scottish Journal of Political Economy*, 2007, *54* (5), 661–683.

Dewatripont, Mathias, Ian Jewitt, and Jean Tirole, "The economics of career concerns, part I: Comparing information structures," *The Review of Economic Studies*, 1999, *66* (1), 183–198.

___ , ___ , and ___ , "The economics of career concerns, part II: Application to missions and accountability of government agencies," *The Review of Economic Studies*, 1999, *66* (1), 199–217.

Dey, Matthew S and Christopher J Flinn, "An equilibrium model of health insurance provision and wage determination," *Econometrica*, 2005, *73* (2), 571–627.

Dixit, Avinash K., *The Art of Smooth Pasting*, Vol. 55 of *Fundamentals of Pure and Applied Economics*, Chur, Switzerland: Harwood Academic Publishers, 1993.

Downs, George W and David M Rocke, "Conflict, agency, and gambling for resurrection: The principal-agent problem goes to war," *American journal of political science*, 1994, pp. 362–380.

Dube, Arindrajit, Laura Giuliano, and Jonathan Leonard, "Fairness and frictions: The impact of unequal raises on quit behavior," *American Economic Review*, 2019, *109* (2), 620–663.

Ellison, Glenn, "Bounded rationality in industrial organization," *Econometric Society Monographs*, 2006, *42*, 142.

Elsby, Michael WL and Axel Gottfries, "Firm dynamics, on-the-job search, and labor market fluctuations," *The Review of Economic Studies*, 2022, *89* (3), 1370–1419.

___ and Gary Solon, "How prevalent is downward rigidity in nominal wages? International evidence from payroll records and pay slips," *Journal of Economic Perspectives*, 2019, *33* (3), 185–201.

___ , Axel Gottfries, Pawel M Krolikowski, and Gary Solon, "Wage Adjustment in Efficient Long-Term Employment Relationships," National Bureau of Economic Research 2024.

Engbom, Niklas et al., "Firm and worker dynamics in an aging labor market," Federal Reserve Bank of Minneapolis Minneapolis, MN 2019.

Engellandt, Axel and Regina T Riphahn, "Temporary contracts and employee effort," *Labour economics*,

2005, *12* (3), 281–299.

Faingold, Eduardo and Yuliy Sannikov, "Reputation in continuous-time games," *Econometrica*, 2011, *79* (3), 773–876.

Fama, Eugene F, "Agency problems and the theory of the firm," *Journal of political economy*, 1980, *88* (2), 288–307.

Farber, Henry S and Robert Gibbons, "Learning and wage dynamics," *The Quarterly Journal of Economics*, 1996, *111* (4), 1007–1047.

Flinn, Christopher J, "Wages and job mobility of young workers," *Journal of Political Economy*, 1986, *94* (3, Part 2), S88–S110.

___ **, Petra E Todd, and Weilong Zhang**, "Labor market returns to personality: A job search approach to understanding gender gaps," *Journal of Political Economy*, 2025, *133* (4), 1169–1234.

Freeman, Richard B. and James L. Medoff, *What Do Unions Do?*, New York: Basic Books, 1984.

Friedrich, Benjamin, Lisa Laun, Costas Meghir, and Luigi Pistaferri, "Earnings dynamics and firm-level shocks," *Journal of Labor Economics*, forthcoming.

Garin, Andrew and Filipe Silvério, "How responsive are wages to firm-specific changes in labour demand? Evidence from idiosyncratic export demand shocks," *Review of Economic Studies*, 2024, *91* (3), 1671–1710.

Gavetti, Giovanni, Daniel Levinthal, and William Ocasio, "Perspective—Neo-Carnegie: The Carnegie school's past, present, and reconstructing for the future," *Organization Science*, 2007, *18* (3), 523–536.

___ **, Henrich R Greve, Daniel A Levinthal, and William Ocasio**, "The behavioral theory of the firm: Assessment and prospects," *Academy of Management Annals*, 2012, *6* (1), 1–40.

Gibbons, Robert, "Incentives in organizations," *Journal of economic perspectives*, 1998, *12* (4), 115–132.

___ **and Kevin J Murphy**, "Optimal incentive contracts in the presence of career concerns: Theory and evidence," *Journal of political Economy*, 1992, *100* (3), 468–505.

___ **and Lawrence F Katz**, "Layoffs and lemons," *Journal of labor Economics*, 1991, *9* (4), 351–380.

Gittleman, Maury and Brooks Pierce, "How prevalent is performance-related pay in the United States? Current incidence and recent trends," *National Institute Economic Review*, 2013, *226* (1), R4–R16.

Gormley, Todd A and David A Matsa, "Playing it safe? Managerial preferences, risk, and agency conflicts," *Journal of Financial Economics*, 2016, *122* (3), 431–455.

Green, Jerry R and Nancy L Stokey, "A comparison of tournaments and contracts," *Journal of Political Economy*, 1983, *91* (3), 349–364.

Greenwald, Bruce C., "Adverse Selection in the Labour Market," *The Review of Economic Studies*, 1986, *53* (3), 325–347.

Grigsby, John, Erik Hurst, and Ahu Yildirmaz, "Aggregate nominal wage adjustments: New evidence from administrative payroll data," *American Economic Review*, 2021, *111* (2), 428–471.

Guvenen, Fatih, Fatih Karahan, Serdar Ozkan, and Jae Song, "What do data on millions of US workers reveal about lifecycle earnings dynamics?," *Econometrica*, 2021, *89* (5), 2303–2339.

___ **, Serdar Ozkan, and Jae Song**, "The nature of countercyclical income risk," *Journal of Political Economy*, 2014, *122* (3), 621–660.

Hagen, Moritz, Wenjia Su, and Sebastian Junge, "60th birthday of 'A Behavioral Theory of the Firm': a review of the relational concepts and recommendations for future research," *Management Review Quarterly*, 2023, pp. 1–46.

Halac, Marina and Ilan Kremer, "Experimenting with career concerns," *American Economic Journal: Microeconomics*, 2020, *12* (1), 260–288.

Hall, Brian J and Kevin J Murphy, "The trouble with stock options," *Journal of Economic Perspectives*, 2003, *17* (3), 49–70.

Hall, Robert E and Alan B Krueger, "Evidence on the incidence of wage posting, wage bargaining, and on-the-job search," *American Economic Journal: Macroeconomics*, 2012, *4* (4), 56–67.

Hallock, Kevin F, "Job loss and the fraying of the implicit employment contract," *Journal of Economic Perspectives*, 2009, *23* (4), 69–93.

Halonen-Akatwijuka, Maija and Oliver Hart, "Continuing contracts," *The Journal of Law, Economics, and Organization*, 2020, *36* (2), 284–313.

Halvorsen, Elin, Hans A Holter, Serdar Ozkan, and Kjetil Storesletten, "Dissecting idiosyncratic earnings risk," *Journal of the European Economic Association*, 2024, *22* (2), 617–668.

Harris, Milton and Bengt Holmström, "A theory of wage dynamics," *The Review of Economic Studies*, 1982, *49* (3), 315–333.

Hart, Oliver and John Moore, "Incomplete contracts and renegotiation," *Econometrica: Journal of the Econometric Society*, 1988, pp. 755–785.

___ **and** ___ , "Property Rights and the Nature of the Firm," *Journal of political economy*, 1990, *98* (6), 1119–1158.

___ **and** ___ , "A theory of debt based on the inalienability of human capital," *The Quarterly Journal of Economics*, 1994, *109* (4), 841–879.

___ **and** ___ , "Contracts as reference points," *The Quarterly journal of economics*, 2008, *123* (1), 1–48.

Hirshleifer, David and Anjan V Thakor, "Managerial conservatism, project choice, and debt," *The Review of Financial Studies*, 1992, *5* (3), 437–470.

Hoffman, Mitchell and Christopher T Stanton, "People, practices, and productivity: A review of new advances in personnel economics," *Handbook of Labor Economics*, 2025, *6*, 729–818.

Holden, Steinar, "The costs of price stability: Downward nominal wage rigidity in Europe," *Economica*, 2004, *71* (282), 183–208.

Holmström, Bengt, "Managerial incentive problems: A dynamic perspective," *The review of Economic studies*, 1982/1999, *66* (1), 169–182.

___ **and Joan Ricart I Costa**, "Managerial incentives and capital management," *The Quarterly Journal of Economics*, 1986, *101* (4), 835–860.

Holmstrom, Bengt and Paul Milgrom, "Aggregation and linearity in the provision of intertemporal incentives," *Econometrica: Journal of the Econometric Society*, 1987, pp. 303–328.

Hong, Harrison, Jeffrey D Kubik, and Amit Solomon, "Security analysts' career concerns and herding of earnings forecasts," *The Rand Journal of Economics*, 2000, pp. 121–144.

Hörner, Johannes and Nicolas S Lambert, "Motivational ratings," *The Review of Economic Studies*, 2021, *88* (4), 1892–1935.

Hsu, Po-Hsuan, Yiqing Lü, Hong Wu, and Yuhai Xuan, "Director job security and corporate innovation," *Journal of Financial and Quantitative Analysis*, 2024, *59* (2), 652–689.

Ibert, Markus, Ron Kaniel, Stijn Van Nieuwerburgh, and Roine Vestman, "Are mutual fund managers paid for investment skill?," *The Review of Financial Studies*, 2018, *31* (2), 715–772.

Ichino, Andrea and Regina T Riphahn, "The effect of employment protection on worker effort: Absenteeism during and after probation," *Journal of the European Economic Association*, 2005, *3* (1), 120–143.

Jacob, Brian A, "The effect of employment protection on worker effort: Evidence from public schooling," National Bureau of Economic Research 2010.

Jarosch, Gregor, "Searching for job security and the consequences of job loss," *Econometrica*, 2023, *91* (3), 903–942.

Jensen, Michael C, "Paying people to lie: The truth about the budgeting process," *European financial management*, 2003, *9* (3), 379–406.

Jenter, Dirk and Katharina Lewellen, "Performance-induced CEO turnover," *The Review of Financial Studies*, 2021, *34* (2), 569–617.

John, Kose, Lubomir Litov, and Bernard Yeung, "Corporate governance and risk-taking," *The journal of finance*, 2008, *63* (4), 1679–1728.

Jovanovic, Boyan, "Job matching and the theory of turnover," *Journal of political economy*, 1979, *87* (5, Part 1), 972–990.

Kahan, Marcel, Shmuel Leshem, and Rangarajan K Sundaram, "First-Purchase Rights: Rights of First Refusal and Rights of First Offer," *American Law and Economics Review*, 2012, *14* (2), 331–371.

Kahn, Lisa B, "Asymmetric information between employers," *American Economic Journal: Applied Economics*,

2013, *5* (4), 165–205.

___ **and Fabian Lange**, "Employer learning, productivity, and the earnings distribution: Evidence from performance measures," *The Review of Economic Studies*, 2014, *81* (4), 1575–1613.

Karatzas, Ioannis and Steven E. Shreve, *Brownian Motion and Stochastic Calculus*, 2 ed., Vol. 113 of *Graduate Texts in Mathematics*, New York: Springer, 1991.

Katz, Lawrence F, "Efficiency wage theories: A partial evaluation," *NBER macroeconomics annual*, 1986, *1*, 235–276.

Ke, T Tony, Christopher Li, and Mikhail Safronov, "Learning by choosing: Career concerns with observable actions," *American Economic Journal: Microeconomics*, 2023, *15* (2), 536–567.

Kelman, Steven and John N Friedman, "Performance improvement and performance dysfunction: an empirical examination of distortionary impacts of the emergency room wait-time target in the English National Health Service," *Journal of public administration research and theory*, 2009, *19* (4), 917–946.

Kerr, William R and Ramana Nanda, "Financing innovation," *Annual Review of Financial Economics*, 2015, *7* (1), 445–462.

Kini, Omesh, Ryan Williams, and Sirui Yin, "CEO noncompete agreements, job risk, and compensation," *The Review of Financial Studies*, 2021, *34* (10), 4701–4744.

Kiraly, Francis, "On Employment Contracts With Endogenous On-The-Job Search," *Scottish Journal of Political Economy*, 2007, *54* (5), 731–749.

Kline, Patrick, "Labor market monopsony: Fundamentals and frontiers," *Handbook of Labor Economics*, 2025, *6*, 655–728.

___ **, Neviana Petkova, Heidi Williams, and Owen Zidar**, "Who profits from patents? rent-sharing at innovative firms," *The Quarterly Journal of Economics*, 2019, *134* (3), 1343–1404.

Krieger, Joshua, Danielle Li, and Dimitris Papanikolaou, "Missing novelty in drug development," *The Review of Financial Studies*, 2022, *35* (2), 636–679.

Lamadon, Thibaut, Magne Mogstad, and Bradley Setzler, "Imperfect competition, compensating differentials, and rent sharing in the US labor market," *American Economic Review*, 2022, *112* (1), 169–212.

Landers, Renee M, James B Rebitzer, and Lowell J Taylor, "Rat race redux: Adverse selection in the determination of work hours in law firms," *The American Economic Review*, 1996, pp. 329–348.

Lange, Fabian, "The speed of employer learning," *Journal of Labor Economics*, 2007, *25* (1), 1–35.

Langella, Monica and Alan Manning, "Marshall Lecture 2020: The Measure of Monopsony," *Journal of the European Economic Association*, 2021, *19* (6), 2929–2957.

Larkin, Ian, "The cost of high-powered incentives: Employee gaming in enterprise software sales," *Journal of Labor Economics*, 2014, *32* (2), 199–227.

Lazear, Edward P and Sherwin Rosen, "Rank-order tournaments as optimum labor contracts," *Journal of political Economy*, 1981, *89* (5), 841–864.

Leibenstein, Harvey, "Allocative efficiency vs." X-efficiency"," *The American economic review*, 1966, *56* (3), 392–415.

Lemieux, Thomas, W Bentley MacLeod, and Daniel Parent, "Performance pay and wage inequality," *The Quarterly Journal of Economics*, 2009, *124* (1), 1–49.

Leone, Andrew J, Joanna Shuang Wu, and Jerold L Zimmerman, "Asymmetric sensitivity of CEO cash compensation to stock returns," *Journal of Accounting and Economics*, 2006, *42* (1-2), 167–192.

Lewellen, Katharina, "Financing decisions when managers are risk averse," *Journal of Financial Economics*, 2006, *82* (3), 551–589.

Lindenlaub, Ilse and Fabien Postel-Vinay, "Multidimensional sorting under random search," *Journal of political Economy*, 2023, *131* (12), 3497–3539.

Liptser, Robert S. and Albert N. Shiryaev, *Statistics of random processes: General theory*, Vol. 394, Springer, 1977.

Lise, Jeremy and Fabien Postel-Vinay, "Multidimensional skills, sorting, and human capital accumulation," *American Economic Review*, 2020, *110* (8), 2328–2376.

___ **and Jean-Marc Robin**, "The macrodynamics of sorting between workers and firms," *American Economic Review*, 2017, *107* (4), 1104–1135.

Lovallo, Dan, Tim Koller, Robert Uhlaner, and Daniel Kahneman, "Your company is too risk-averse," *Harvard Business Review*, 2020, *98* (2), 104–111.

MacLeod, W. Bentley, "Chapter 18 - Great Expectations: Law, Employment Contracts, and Labor Market Performance," in David Card and Orley Ashenfelter, eds., *Handbook of Labor Economics*, Vol. 4 of *Handbook of Labor Economics*, Elsevier, 2011, pp. 1591–1696.

MacLeod, W Bentley and James M Malcomson, "Implicit contracts, incentive compatibility, and involuntary unemployment," *Econometrica*, 1989, pp. 447–480.

___ **and** ___ , "Investments, holdup, and the form of market contracts," *The American Economic Review*, 1993, pp. 811–837.

Malcomson, James M, "Contracts, hold-up, and labor markets," *Journal of Economic Literature*, 1997, *35* (4), 1916–1957.

___ , "Individual employment contracts," *Handbook of labor economics*, 1999, *3*, 2291–2372.

Manning, Alan, *Monopsony in Motion: Imperfect Competition in Labor Markets*, Princeton, NJ: Princeton University Press, 2003.

___ , "Monopsony in labor markets: A review," *ILR Review*, 2021, *74* (1), 3–26.

March, James G. and Herbert A. Simon, *Organizations*, New York: Wiley, 1958.

Meagher, Kieron and Suraj Prasad, "Career concerns and team talent," *Journal of Economic Behavior & Organization*, 2016, *129*, 1–17.

Milgrom, Paul and Sharon Oster, "Job discrimination, market forces, and the invisibility hypothesis," *The Quarterly Journal of Economics*, 1987, *102* (3), 453–476.

Moen, Espen R, "Competitive search equilibrium," *Journal of political Economy*, 1997, *105* (2), 385–411.

Myers, James N, Linda A Myers, and Douglas J Skinner, "Earnings momentum and earnings management," *Journal of Accounting, Auditing & Finance*, 2007, *22* (2), 249–284.

Nardi, Mariacristina De, Giulio Fella, Marike Knoef, Gonzalo Paz-Pardo, and Raun Van Ooijen, "Family and government insurance: Wage, earnings, and income risks in the Netherlands and the US," *Journal of Public Economics*, 2021, *193*, 104327.

Neal, Derek and Diane Whitmore Schanzenbach, "Left behind by design: Proficiency counts and test-based accountability," *The Review of Economics and Statistics*, 2010, *92* (2), 263–283.

Nelson, Richard R, "The simple economics of basic scientific research," *Journal of political economy*, 1959, *67* (3), 297–306.

___ **and Sidney G Winter**, *An evolutionary theory of economic change*, Harvard University Press, 1982.

Okun, Arthur M, "Inflation: Its mechanics and welfare costs," *Brookings Papers on Economic Activity*, 1975, *1975* (2), 351–390.

Oyer, Paul, "Fiscal year ends and nonlinear incentive contracts: The effect on business seasonality," *The Quarterly Journal of Economics*, 1998, *113* (1), 149–185.

___ , "A theory of sales quotas with limited liability and rent sharing," *Journal of Labor Economics*, 2000, *18* (3), 405–426.

Panousi, Vasia and Dimitris Papanikolaou, "Investment, idiosyncratic risk, and ownership," *The Journal of Finance*, 2012, *67* (3), 1113–1148.

Parrino, Robert, Allen M Poteshman, and Michael S Weisbach, "Measuring investment distortions when risk-averse managers decide whether to undertake risky projects," *Financial Management*, 2005, *34* (1), 21–60.

Pei, Di Harry, "Reputation with strategic information disclosure," working paper 2016.

Pinkston, Joshua C, "A model of asymmetric employer learning with testable implications," *The Review of Economic Studies*, 2009, *76* (1), 367–394.

Pissarides, Christopher A, "The unemployment volatility puzzle: Is wage stickiness the answer?," *Econometrica*, 2009, *77* (5), 1339–1369.

Postel-Vinay, Fabien and Helene Turon, "On-the-job search, productivity shocks, and the individual earnings process," *International Economic Review*, 2010, *51* (3), 599–629.

___ **and Jean-Marc Robin**, "Equilibrium wage dispersion with worker and employer heterogeneity," *Econometrica*, 2002, *70* (6), 2295–2350.

___ **and** ___ , "To match or not to match?: Optimal wage policy with endogenous worker search intensity," *Review of Economic Dynamics*, 2004, *7* (2), 297–330.

Prendergast, Canice and Lars Stole, "Impetuous youngsters and jaded old-timers: Acquiring a reputation for learning," *Journal of political Economy*, 1996, *104* (6), 1105–1134.

Robin, Jean-Marc, "On the dynamics of unemployment and wage distributions," *Econometrica*, 2011, *79* (5), 1327–1355.

Robinson, Joan, *The Economics of Imperfect Competition*, London: Macmillan, 1933.

Sannikov, Yuliy, "A continuous-time version of the principal-agent problem," *The Review of Economic Studies*, 2008, *75* (3), 957–984.

Sarpietro, Silvia, Yuya Sasaki, and Yulong Wang, "Nonexistent Moments of Earnings Growth," *Journal of Applied Econometrics*, 2026, *41* (1), 39–55.

Shaked, Avner and John Sutton, "Involuntary unemployment as a perfect equilibrium in a bargaining model," *Econometrica: Journal of the Econometric Society*, 1984, pp. 1351–1364.

Shapiro, Carl and Joseph E Stiglitz, "Equilibrium unemployment as a worker discipline device," *The American economic review*, 1984, *74* (3), 433–444.

Shi, Liyan, "Optimal regulation of noncompete contracts," *Econometrica*, 2023, *91* (2), 425–463.

Simon, Herbert A., *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization*, New York: Macmillan, 1947.

Simon, Herbert A, "A formal theory of the employment relationship," *Econometrica: Journal of the Econometric Society*, 1951, pp. 293–305.

Spence, A Michael, "Monopoly, quality, and regulation," *The Bell Journal of Economics*, 1975, pp. 417–429.

Starr, Evan P, James J Prescott, and Norman D Bishara, "Noncompete agreements in the US labor force," *The Journal of Law and Economics*, 2021, *64* (1), 53–84.

Steenburgh, Thomas J, "Effort or timing: The effect of lump-sum bonuses," *QME*, 2008, *6* (3), 235–256.

Sterk, Stewart E, "Restraints on alienation of human capital," *Virginia Law Review*, 1993, *79*, 383.

Stole, Lars A and Jeffrey Zwiebel, "Intra-firm bargaining under non-binding contracts," *The Review of Economic Studies*, 1996, *63* (3), 375–410.

Sung, Jaeyoung, "Linearity with project selection and controllable diffusion rate in continuous-time principal-agent problems," *The RAND Journal of Economics*, 1995, pp. 720–743.

Taber, Christopher and Rune Vejlin, "Estimation of a roy/search/compensating differential model of the labor market," *Econometrica*, 2020, *88* (3), 1031–1069.

Thomas, Jonathan and Tim Worrall, "Self-enforcing wage contracts," *The Review of Economic Studies*, 1988, *55* (4), 541–554.

Tian, Xuan and Tracy Yue Wang, "Tolerance for failure and corporate innovation," *The Review of Financial Studies*, 2014, *27* (1), 211–255.

Trevor, Charlie O, Barry Gerhart, and John W Boudreau, "Voluntary turnover and job performance: Curvilinearity and the moderating influences of salary growth and promotions.," *Journal of applied psychology*, 1997, *82* (1), 44.

Tripodi, Giorgio, Xiang Zheng, Yifan Qian, Dakota Murray, Benjamin F Jones, Chaoqun Ni, and Dashun Wang, "Tenure and research trajectories," *Proceedings of the National Academy of Sciences*, 2025, *122* (30), e2500322122.

Viscusi, W Kip, "Union, Labor Market Structure, and the Welfare Implications of the Quality of Work.," *Journal of Labor Research*, 1980, *1* (1).

Waldman, Michael, "Job assignments, signalling, and efficiency," *The Rand journal of economics*, 1984, *15* (2), 255–267.

Walker, David I, "Rethinking rights of first refusal," *Stanford Journal of Law, Business and Finance*, 1999, *5*, 1.

Williamson, Oliver E, "The economics of organization: The transaction cost approach," *American journal of sociology*, 1981, *87* (3), 548–577.

Winter, Sidney G, "Satisficing, selection, and the innovating remnant," *The Quarterly Journal of Economics*, 1971, *85* (2), 237–261.

Wu, Alice H, "Reveal or conceal? employer learning in the labor market for computer scientists," 2024.

Yeh, Chen, Claudia Macaluso, and Brad Hershbein, "Monopsony in the US labor market," *American Economic Review*, 2022, *112* (7), 2099–2138.

Zwiebel, Jeffrey, "Corporate conservatism and relative compensation," *Journal of Political Economy*, 1995, *103* (1), 1–25.