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Talent Discovery, Layoff Risk and Unemployment Insurance

Marco Pagano* **and Luca Picariello****

Abstract
In talent-intensive jobs, workers' quality is revealed by their performance. This enhances productivity and earnings, but also increases layoff risk. We show that, if firms compete for talent, they cannot insure workers against this risk, so that the more risk-averse workers will choose less quality-revealing jobs. This lowers expected productivity and salaries. Our model predicts that public unemployment insurance corrects this inefficiency, increasing employment in talent-sensitive industries. This prediction is consistent with the distribution of U.S. employment across occupations and states. Unemployment insurance dominates legal restrictions on firms' dismissals, which penalize more talentsensitive firms and thus depress expected productivity.

JEL classification: D83, J24, J63, J65.

Keywords: talent, learning, layoff risk, unemployment insurance.

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1 Introduction

In the knowledge economy it is increasingly important to discover workers' talent, as a firm's performance depends crucially on the quality of its employees' human capital (Kaplan and Rauh, 2013). Computerization has greatly altered the composition of job tasks, increasing the share of nonroutine cognitive tasks at the expense of routine ones (Autor et al., 2003; Acemoglu and Autor, 2011): computers substitute for workers in carrying out limited and well-defined activities that can be described by explicit rules ("routine tasks"), while they complement workers in carrying out problem-solving and complex communication activities ("nonroutine tasks"). In this setting, corporate success increasingly hinges on identifying the most talented workers and assigning them to the tasks they are best at.

If the labor market is competitive, talented workers share in the productivity gains they generate, in the form of high salaries or bonuses. However, *ex ante* talent discovery is a source of risk for workers, if they are not fully aware of their own quality: *ex post*, they may turn out to be worse than they had expected, and if so they may be dismissed and forced to search for a more suitable job. This risk entails considerable welfare losses for workers (Low et al., 2010): those who are dismissed suffer earnings losses not only while unemployed but also upon reentry (Jacobson et al., 1993) and typically cut back on consumption (Gruber, 1997; Browning and Crossley, 2001).

In principle, this risk is privately insurable: firms commit to severance pay for dismissed employees and so compensate them if they are found to be untalented. But firms can provide such insurance only if the labor market is not fully competitive, i.e. workers are not free to move to another employer once their talent is discovered. If they are, firms cannot provide severance payments to the less talented as this would mean cross-subsidizing them at the expense of the talented, who would react by going over to a competing employer.

Hence, in the presence of *ex-post* competition for talent, workers are left to bear the layoff risk arising from the talent discovery process, absent any public unemployment insurance. We show that in these circumstances, risk-averse workers have an incentive to reduce unemployment risk by choosing to work for firms whose projects convey little information about employees' quality. By the same token, these firms are also those where talent matters less for productivity and is less rewarded: the absence of layoff risk is accompanied by lower average wages. As a result, industries with talent-sensitive technologies (where job performance reveals a worker's ability) will find it harder to recruit workers and develop: only the least risk-averse workers – if any – will want to work in such industries.

As Hirshleifer (1971) points out, information revelation brings benefits in terms of productive efficiency, but also entails the cost of forgone opportunities for insurance. In this paper, we show that this lack of insurance can impair the development of talent-sensitive industries and technologies. By the same token, this market failure highlights a hitherto neglected efficiency rationale for public unemployment insurance (UI), whereby it is society – rather than firms – that supports dismissed workers, funding their benefits with payroll taxes on those who retain their jobs. Being buffered against layoff risk, even risk-averse workers will prefer jobs in talent-sensitive industries with their high salaries. The prediction is that such industries should be able to flourish in economies where competition for workers' talent is associated with a generous public safety net against layoff risk. We show that this prediction is consistent with the distribution of U.S. employment across occupations featuring different degrees of talent sensitivity, which we assume to be inversely related to their routine intensity. We find that employees are more likely to perform talent-sensitive jobs in states that offer more generous UI benefits. This finding dovetails with other evidence showing that reductions in UI coverage are associated with fewer workers opting for riskier jobs, again consistently with our model.

Compared with public UI, trying to protect workers by limiting firms' power of dismissal is socially inefficient. Employment protection legislation (EPL) effectively forces firms to retain low-quality workers too, inducing firms in the talent-intensive industries to refrain from hiring in the first place, in order to break even. This is because workers share in the firm's surplus in good states but are protected by the loss they generate in bad ones. Thus EPL leads to an inefficiently low level of learning about workers' talent, and results in lower average wages, not just reduced layoff risk. Hence, in our framework EPL is inferior to UI.

As our model is quite stylized, we extend it to test its robustness. First, we allow workers to self-insure against layoff risk by saving, and find that precautionary saving does not modify job selection behavior, so that the efficiency-enhancing role of public UI persists. Second, we test the robustness of the model's results to the presence of moral hazard in employment relationships, assuming that workers can improve their performance by exerting an unobservable costly effort. We show that a UI system providing full coverage against layoff risk is unfeasible, as it eliminates all incentives for workers to exert effort. Yet, it is still efficient and feasible for the government to provide incomplete UI coverage that elicits effort from the workers who take risky jobs. The welfare gain from this arrangement is lower than that of a full-coverage UI system, for two reasons: first, the workers who choose talent-sensitive jobs bear some layoff risk; second, the most risk-averse workers may opt for safe jobs, which feature lower expected wages and productivity than risky ones. Finally, we discuss the possible implications of extending the baseline model to a general equilibrium framework and to an open economy setting.

The paper is structured as follows. Section 2 frames our contribution within the relevant literature. Section 3 lays out the model's assumptions. Section 4 derives the evolution of beliefs about employees' talent and firms' resulting optimal layoff rule. Sections 5.1 and 5.2 characterize the equilibria in noncompetitive and competitive labor markets and compare them. Section 6 derives predictions regarding the effect of public UI on the equilibrium allocation of employees across jobs, and presents empirical evidence regarding these predictions. Section 7 investigates the effects of employment protection legislation, and compares them with those of UI. Section 8 discusses the robustness of our results. Section 9 concludes.

2 The Literature

This work lies at the intersection of two strands of research: the literature on learning about workers' quality and that on the insurance offered by private employers and public institutions. What naturally links the two is the simple fact that talent discovery is a source of risk for the worker.

Learning about talent can occur either within the firm (based on work performance with a given employer) or in the market (via sequential matching with different employers). In our model, learning is within the firm, as in the career concerns models dating back to Fama (1980), Harris and Holmström (1982) and Holmström (1999). But since such learning spills over to other potential employers, labor market competition implies that firms cannot insure workers against talent uncertainty. Thus workers have an incentive to shield themselves against this uncertainty by avoiding talent discovery: in our setting, they do so by choosing talent insensitive jobs. In contrast, in search models of the labor market such as Jovanovic (1979) and Papageorgiou (2014) learning about workers' quality enhances their expected productivity, by promoting their efficient matching with firms, so that mobility of workers across firms is beneficial.

The idea that in competitive labor markets workers wish to reduce their human capital risk by preventing learning by their employers is also present in Acharya et al. (2016). However, the implications for risk taking are quite different in the two settings: in ours, workers can prevent learning by choosing talent-insensitive jobs, while in Acharya et al. (2016) workers delay learning by churning across firms and undertaking risky projects even if they lack the necessary talent. As a result, in that setting firms' ignorance about employees' talent results in excessive risk-taking, while in ours it leads to inefficiently low risk-taking, which can be remedied by unemployment insurance.

In our setting, workers bear the cost of talent discovery in the form of layoff risk. In reality, firms too bear costs in such a learning process, since hiring novices means forgoing senior employees with proven track records. Terviö (2009), in a search model with uncertain worker quality, shows that this implicit screening cost deters efficient talent discovery: rather than test promising novices, firms pay inefficiently high salaries to mediocre incumbent workers. Thus, in Terviö (2009)'s model too, labor market competition leads to inefficiently little talent discovery, but owing to screening costs and not, as in our framework, to uninsurable layoff risk.

Far from being inessential, this feature of our model is at the root of its main prediction: that public UI enables efficient talent discovery even with labor market competition. Interestingly, substitutability between firm-level insurance provision and public UI is documented empirically by Ellul et al. (2017a).

Our paper contributes to the literature on the costs and benefits of UI, showing that it enhances productive efficiency. Past research recognizes that UI stabilizes workers' consumption (Gruber, 1997) and avoids mortgage defaults (Hsu et al., 2018), but also stresses the disincentive to job search and the resulting increase in the duration of unemployment spells(Moffitt and Nicholson, 1982; Katz and Meyer, 1990).[1] But other papers show that UI also allows workers to search longer and so to find better matches, thus raising aggregate productivity (Diamond, 1981; Acemoglu, 1997; Marimon and Zilibotti, 1999; Choi and Fernndez-Blanco, 2018). Indeed, Nekoei and Weber (2017) document empirically that UI improves the quality of the firms where the jobless eventually find work and raises their wages. In these papers UI raises productivity by subsidizing talent discovery in the marketplace; in our setting, it subsidizes talent discovery within the firm.

Acemoglu and Shimer (1999) and Acemoglu and Shimer (2000) study search-theoretic models of UI with risk-averse workers. In their general equilibrium setting, if firms choose a labor-intensive technology, they create many vacancies and can fill them offering low wages: risk-averse workers accept low wages because they have good chances of filling a vacancy and avoiding unemployment. If instead firms choose a capital-intensive technology, they create few vacancies, and even if they offer high wages, few workers will apply for fear that the job will be taken by a competing applicant. This creates vacancy risk for firms, deterring them from opting for such technology. UI changes this by encouraging even risk-averse workers to take the unemployment risk associated with a capital-intensive technology.

Hence, also in Acemoglu and Shimer UI implies higher productivity of employed workers, as well as higher unemployment risk, as in our model. But our model differs in two important respects: first, unemployment risk arises from the danger of being

[1]Moffitt and Nicholson (1982) find that a 26-week extension of the benefit duration lengthens the average period of unemployment by about 2.5 weeks. (Meyer, 1990) shows that the probability of getting a new job declines as the level of benefits rises and increases just before the entitlement period expires.

dismissed, not from the risk of the job being filled by a competing applicant; and second, the productivity-enhancing effect of UI stems from better talent discovery, not the selection of a more capital-intensive technology. This translates into different predictions about the effects of UI: according to our model, UI reallocates employees towards talent-intensive industries, while according to Acemoglu and Shimer it induces firms to adopt more capital-intensive technologies.

Krusell et al. (2010) present another search-theoretic model with risk-averse workers who face employment shocks against which they cannot fully insure. In their setting, UI provides workers with valuable insurance against employment shocks, but it also reduces their re-employment opportunities, as UI benefits improve workers' outside options and thus make firms less inclined to post job vacancies. Hence, it is not optimal for the UI system to provide full coverage. In our model, where unemployment only stems from layoffs and not also from job search frictions, the optimal UI coverage may still be limited because of moral hazard issues. More recent work by Griffy (2021), Chaumont and Shi (2022) and Eeckhout and Sepahsalari (2023) analyzes the interactions between job search and asset accumulation by workers in the presence of financial market frictions, and shows that these frictions induce low-wealth workers to choose easier to find, low paying jobs, and that unemployment benefits could mitigate this phenomenon. In our setting, even when workers are able to accumulate wealth, risk aversion may induce them to choose low-paying jobs to avoid the layoff risk generated by talent discovery. However, our model shares with thes papers the prediction that UI benefits encourage workers to seek better paying jobs.

3 The Model

We study a model with Bayesian learning about workers' talent. The economy is populated by competitive firms owned by risk-neutral shareholders and a continuum of measure N of workers. Each worker can operate at most one project. Upon being hired, each worker undergoes a training stage in which she can succeed or fail; if the worker is retained, she is assigned to a production project. The worker's performance at the training stage is informative about her ability at the subsequent production stage, since in both cases the performance depends on talent, as will be explained below. If the worker resigns or is dismissed at the end of the training stage, she produces no output.

Firms belong to one of two industries, $j = \{1, 2\}$, with technologies featuring specific sensitivity to employees' talent $\lambda_j \in [0\,,\,1]$, as is explained below in greater detail. Each industry j has a continuum of homogeneous projects of measure $M_j > N$. As a result, in each industry there is at least one project per worker: workers – not projects – are the scarce factor of production. The model can be easily generalized to any number of industries.

Workers are risk-averse: they have CARA utility function $u(C) = -e^{-\gamma C}$. They have no initial wealth and no access to insurance markets. These assumptions enable us to focus on the firm as the only source of insurance against these shocks, unless such insurance is provided by the government.

3.1 Worker Types and Productivity

Workers differ in talent: worker i's quality is $q_i = \{G, B\}$ ("good" or "bad") and is initially unknown to all, including workers themselves. The common prior belief about workers' quality is $\Pr(q = G) = p \in [0\,,\,1]$. The outcome of the training stage is observed by all firms, which therefore have common posterior beliefs about the worker's quality. This assumption is without loss of generality, if firms can observe whether job applicants have previously undergone training.[2]

Workers have reservation wage $w_0 > 0$, which can be thought of as the monetary value of their leisure. The signal σ issued at the training stage, which equals S in case of success of the trainee or F in case of failure, has the same probability distribution as subsequent production y, which takes value $\overline{y}$ in case of success at the production stage, and $\overline{y} - c$ in case of failure. This process is described in Figure 1: the outcome of both stages depends on the combination of technological risk and worker's talent. With probability $1 - \lambda$, the outcome depends only on technological risk: success occurs with probability p and failure with probability $1 - p$. Alternatively, with probability λ the outcome reflects the worker's talent: if good, she succeeds; if bad, she fails. At the production stage, success translates into high revenue $\overline{y} > w_0$ for the firm, while failure entails low revenue $\bar{y} - c$, which does not cover the worker's reservation wage w_0, and thus yields a negative surplus: $\overline{y} - c - w_0 < 0$.

Hence, λ can be seen as the project's sensitivity to the worker's talent: the higher λ, the less the "noise" in the project's payoff, and the sharper its "signal" about talent.[3] For example, in the extreme case where $\lambda = 1$, a good worker always succeeds

[2]To see why, suppose that the outcome of training is observed only by the current employer, but employees leaving their firm after the first stage can be told apart from other job applicants. In this case, other employers would infer that such employees have been dismissed and therefore must have performed poorly, since it is optimal to fire only such employees. Workers who performed well at the training stage would have no incentive to resign, as otherwise they would be mistaken for low-quality workers. Hence, other employers' belief about the low quality of workers leaving their firm is rational.

[3]Here we take talent sensitivity λ to be determined by technology. But it can also be affected by the firm's organizational structure: the performance of a small firm depends more on the individual performance of its employees than that of a large-scale firm; similarly, a production process performed in small teams is more informative about individuals' talent than one performed by large teams.

and a bad one invariably fails, so training is perfectly informative about talent. In the polar opposite case $\lambda = 0$, success occurs with the unconditional probability p, so that training is totally uninformative.

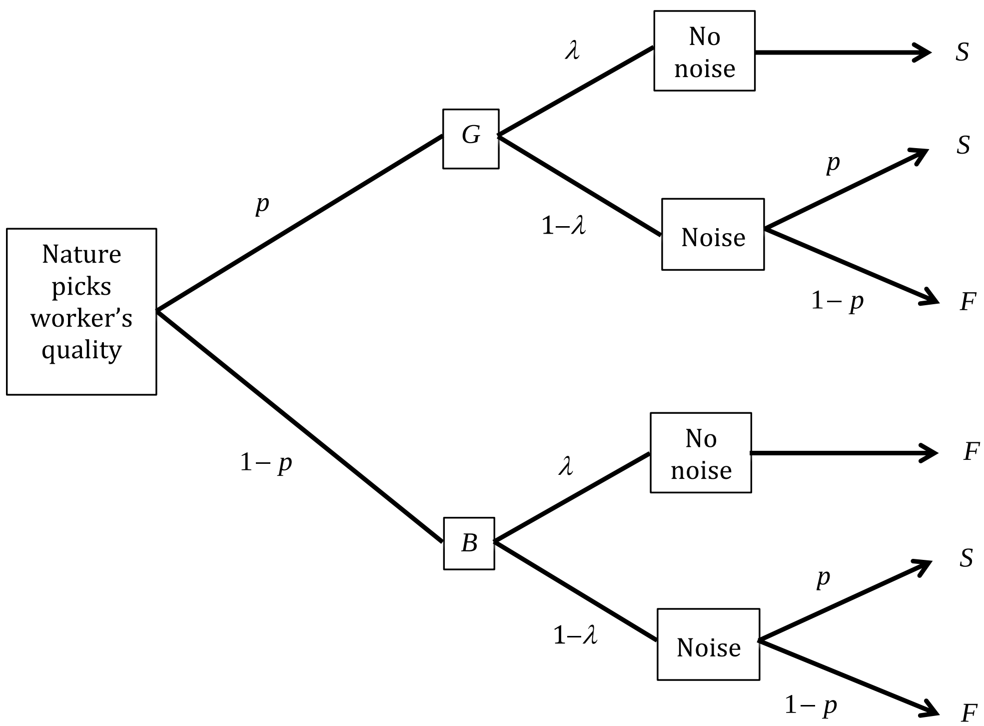

Figure 1: Outcome tree

Notice that λ does not affect a project's unconditional probability of success and therefore its expected revenue, $\bar{y} - (1-p)c$, or its variance $p(1-p)c^2$. As we shall see, in this model a project's sensitivity to talent, λ, increases expected return and risk only by sharpening the firm's learning and thus heightening its propensity to liquidate bad-performing projects ahead of time: the relationship between λ and payoff moments is driven by the firm's behavioral response, not by technology.

To make the problem interesting, we impose the following parameter restrictions:

$$\bar{y} - (1-p)c \geq w_0 > \bar{y} - c > 0. \tag{1}$$

The left-hand-side inequality implies that it is initially efficient to hire any worker, since the unconditional expected revenue is positive; it also implies that workers are willing to undergo training as it entails an expected income in excess of their reservation wage. The right-hand-side inequality implies that the productivity of bad workers is low enough that the employer does not wish to retain them. Condition (1) can be rewritten as

$$p \geq 1 - \frac{\bar{y} - w_0}{c} > 0, \tag{2}$$

so that in what follows we restrict our attention to the interval $p \in \left[1 - \frac{\bar{y}-w_0}{c}, 1\right]$.

3.2 Labor Contracts

Firms are assumed to compete for workers at the hiring stage. After training, workers can be dismissed or retained, based on their performance. We consider two labor market regimes: noncompetitive, in which workers cannot resign and seek new jobs after training, owing to loyalty or market frictions (search costs, say, or regulation); and competitive, in which workers are free to resign and switch to a new employer. In other terms, in the first regime workers commit to stay with their initial employer, in the second they do not. Firms, instead, are able to commit to contingent contracts: when hiring, they offer a wage w, conditional on retaining the employee for the production stage. In other words, workers' performance in each stage is verifiable.[4]

[4]Failing this, firms would not be able to offer any insurance, even in the noncompetitive regime, as firms would always renege on the pledged compensation.

However, since in the competitive labor market regime workers can resign after the training stage, they can renegotiate their salary w based on their past performance. Hence, in this regime, the salary paid to retained workers is the same as that generated by a spot contract.

Once a worker undergoes training and generates the corresponding signal $\sigma = \{S, F\}$, the firm forms its posterior belief about the worker's quality, $\theta_1 = \Pr(q = G|\sigma)$, and decides whether to keep the worker running the project or not: if the expected "continuation revenue" y falls short of the worker's reservation wage w_0, then the firm is better off dismissing the employee and liquidating the project, thus forgoing production rather than paying the reservation wage for being idle.

The firm chooses its wage offer w so as to maximize its expected profit

$$\mathbb{E}_0(\pi) = \begin{cases} \mathbb{E}_0(y - w) & \text{if the worker is retained,} \\ 0 & \text{otherwise,} \end{cases} \tag{3}$$

and workers maximize expected utility $\mathbb{E}_0[u(w)]$ as of the beginning of the game.

3.3 Time Line

The time line has four stages (see Figure 2):

- at $t = 0$ firms compete for workers, offering contingent contracts that pay a wage w, subject to retention and workers choose which firm to work for;
- at $t = 1$ employees undergo training, whose outcome is the signal $\sigma = \{S, F\}$;
- at $t = 2$ beliefs on each employee's quality are updated, and firms accordingly decide whether to retain or dismiss workers. If the labor market features ex-post

competition, workers may leave;

- at $t = 3$, retained employees produce revenue $y = \{\overline{y},\ \overline{y} - c\}$ and receive wage w; otherwise, the project is liquidated and employees earn the reservation wage w_0 plus severance pay if pledged by the firm, or else an unemployment benefit if a public UI system exists.

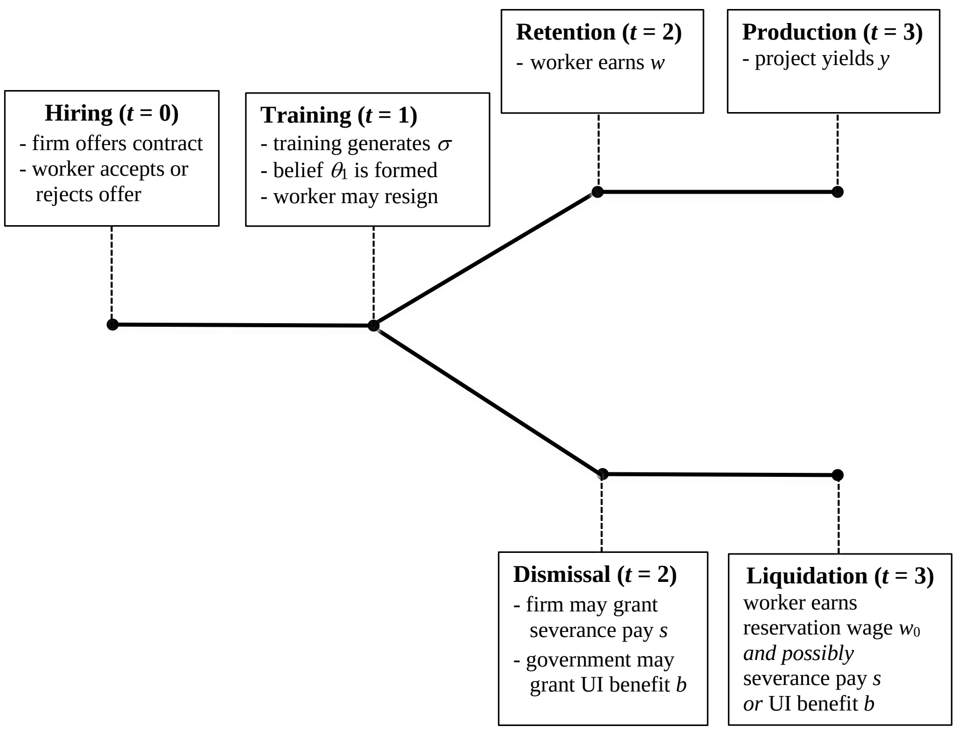

Figure 2: Time line

4 Profits, Beliefs and Layoffs

The unconditional expectation of revenues is the same for all firms, irrespective of λ:

$$\mathbb{E}_0(y) = \bar{y} - (1-p)c. \tag{4}$$

However, the actual value of the revenue y will generally differ depending on the employee operating the project. Based on the training outcome, the belief about the quality of the employee is updated from the prior $\theta_0 = p$ to the posterior θ_1, which can take one of two values: $\Pr(q = G|\sigma = S) \equiv \theta_H$ for workers who succeeded at $t = 1$ or $\Pr(q = G|\sigma = F) \equiv \theta_L$ for those who failed.

This Bayesian updating depends on the informativeness λ of the firm's technology:

$$\theta_H = \lambda + (1-\lambda)p \geq p \tag{5}$$

and

$$\theta_L = (1-\lambda)p \leq p. \tag{6}$$

Hence, the expected revenue of the project upon success, $y_H \equiv \mathbb{E}_1(y|\sigma = S)$ is

$$y_H = \bar{y} - (1 - \theta_H(\lambda))\, c, \tag{7}$$

while the corresponding expression upon failure, $y_L \equiv \mathbb{E}_1(y|\sigma = F)$, is

$$y_L = \bar{y} - (1 - \theta_L(\lambda))\, c. \tag{8}$$

These two expressions bracket the unconditional expected revenue: $y_H \geq \mathbb{E}_0(\sigma) \geq y_L$, for any λ. The revenue from the project is expected to increase upon good performance and decrease upon bad.

Based on the updated beliefs, firms will choose different optimal dismissal policies depending on the informativeness of their technology, λ:

Lemma 1. *If the training outcome is $\sigma = S$, the firm retains the worker. If $\sigma = F$ the firm dismisses the worker and liquidates her project if its talent-sensitivity is $\lambda \geq \widehat{\lambda} = [\bar{y} - (1-p)c - w_0]/pc$; otherwise, it retains the worker.*

This lemma, proved in the Appendix (as all subsequent results), is illustrated by Figure 3. The informativeness of the firm's technology, λ, ranges from 0 to 1. Above the threshold value $\widehat{\lambda}$, it is optimal for the firm to dismiss low-performing workers. This raises the firm's productive efficiency, namely, its ex-ante expected surplus $\mathbb{E}_0(y) - w_0$, because, when λ exceeds $\widehat{\lambda}$ the firm's screening ability is good enough to liquidate unpromising projects and continue only those that are likely to be profitable, and thus to pay a higher average wage. Such a dismissal policy is tantamount to an "up-or-out" mechanism, by which employees that prove successful at the training stage are promoted to the status of regular workers and the others are dismissed. In fact, "up-or-out" contracts are common in talent-sensitive industries, such as academia, professional services and high tech.

However, this gain in productive efficiency comes at the cost of employment risk, as workers who happen to perform poorly at $t = 1$ are dismissed. This can be seen in Figure 3, where the $y_L - w_0$ line flattens to the right of $\lambda = \widehat{\lambda}$: by dismissing low-performing workers and terminating their projects, highly talent-sensitive firms generate zero surplus, instead of a negative expected surplus. This raises these firms' unconditional expected surplus at $t = 2$, as shown by the $p\,[y_H(\lambda) - w_0]$ upward-

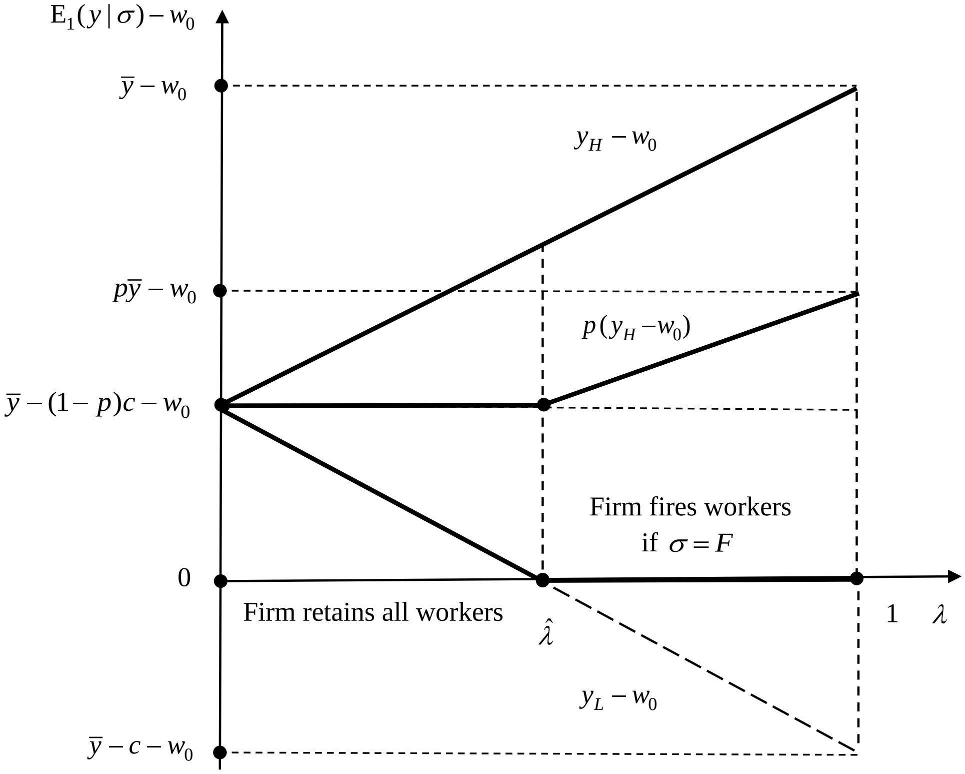

Figure 3: Informativeness of technology and dismissal policy

sloping line in the figure:

$$p\left[y_H(\lambda) - w_0\right] + (1-p)\max\left\{y_L(\lambda) - w_0, 0\right\} = \begin{cases} \mathbb{E}_0(y) - w_0 & \text{if } \lambda < \widehat{\lambda}, \\ p\left(y_H - w_0\right) > \mathbb{E}_0(y) - w_0 & \text{if } \lambda \geq \widehat{\lambda}, \end{cases} \tag{9}$$

where $\mathbb{E}_0(y)$, y_H and y_L are given by expressions (4), (7) and (8), respectively.

5 Labor Market Equilibrium

Let us now turn to the equilibrium of the labor market. First, we consider the benchmark case of the noncompetitive regime, where workers cannot be poached by other firms at $t = 2$, after the training stage. Next, we study a regime in which such poaching is possible, so that there is competition for workers also at $t = 2$. Finally, we contrast the allocation of risk and workers across firms in these two regimes.

5.1 The Benchmark: Noncompetitive Labor Market

We start with a labor market regime without ex-post competition for workers, owing – for instance – to prohibitive switching costs or regulatory constraints that prevent workers from resigning, so that they are effectively committed not to leave their employer after the screening stage. In this regime, when firms bid for workers' services at $t = 0$, they commit to pay their workforce a wage equal to the revenue they are expected to generate during their career. This is immediate in firms with $\lambda < \widehat{\lambda}$, where workers are expected to produce revenue $\mathbb{E}_0(y)$, and earn wage $w = \mathbb{E}_0(y)$. In these firms there is no need to insure workers, as they are never dismissed. Instead, in firms with $\lambda \geq \widehat{\lambda}$ workers generate expected revenue py_H, since only retained workers are expected to produce.

Ex-ante competition leads firms to bid wages up to the point where total expected profits (3) are zero. Owing to lack of ex-post competition, these firms can insure workers against layoff risk. They can do so because they manage to retain high-performing workers without compensating them fully for the expected revenue y_H that they generate; hence they can insure low-performing workers by offering them severance pay funded at the expense of retained ones. Absent such insurance, with probability p the employees of these firms would be retained and earn their expected revenue y_H, and with probability $1-p$ would be dismissed and earn the reservation wage w_0. Thus, their expected income is $py_H + (1-p)w_0$. With perfect insurance, all of the firms' employees earn this sum with certainty, whether retained or not. Specifically, the wage of retained workers is

$$w = py_H + (1-p)w_0. \tag{10}$$

Dismissed workers earn the same amount, as they receive severance pay $s = p(y_H - w_0)$ supplementing their reservation wage w_0, so that their income is

$$w_0 + s = py_H + (1-p)w_0. \tag{11}$$

Since retained workers produce expected revenue y_H in excess of their wage in (10), they pay an insurance premium $(1-p)(y_H - w_0)$, which funds severance pay s to dismissed workers, resulting in a transfer $p(y_H - w_0)$ across the two groups. The firm breaks even in providing such insurance, while still optimally using the information about its employees' quality inferred from their performance at the training stage and terminating employment relationships that are expected to produce losses at the production stage.

Notice that in firms where $\lambda \geq \widehat{\lambda}$ employees earn strictly more than in those where $\lambda < \widehat{\lambda}$, since $py_H + (1-p)w_0 > \mathbb{E}_0(y)$. Moreover, since in these firms the expected output $py_H + (1-p)w_0$ is increasing in λ, the employees of the most informative firms receive the highest possible compensation, without bearing any risk. In this labor market regime the firms with the highest value of λ – namely, those with the most informative technology and the highest expected productivity – will be able to attract all the employees, and no other firms can operate. This is summarized in the following:

Proposition 1. *If the labor market is noncompetitive at $t = 2$, in equilibrium efficiency in production and risk sharing is attained, as the most talent-sensitive firms employ the entire workforce and fully insure their employees.*

As we shall see in Section 5.2, if the labor market is competitive at $t = 2$, this result does not hold.[5]

5.2 Competitive Labor Market

If the labor market is competitive at $t = 2$, the workers whose projects are expected to be profitable after training at $t = 1$ can be poached by other firms: conditional on success at the training stage by the worker ($\sigma = S$), competing firms can offer her a wage exceeding the unconditional expectation of the revenue that she generates. Hence, if a firm were to pay its employees the unconditional expected revenue they generate, so as to provide them with full insurance, it would lose all of its best workers to its competitors, and would be left only with overpaid low-quality workers, as in Acharya et al. (2016).

Hence, competing firms bid the wage up to the expected revenue generated by the worker:

$$w = \begin{cases} \mathbb{E}_1(y) & \text{if retained,} \\ 0 & \text{if dismissed.} \end{cases} \tag{12}$$

Note that if $\lambda < \widehat{\lambda}$, dismissals never occur, by Lemma 1, so that the wage w equals $\mathbb{E}_1(y) = \{y_H, y_L\}$, where y_H and y_L are respectively given by the conditional expected

[5] It is worth noticing that for this outcome to obtain in equilibrium, it is necessary not only that workers commit not to resign from their job, but also that firms commit to the payments envisaged in their contracts, conditional on workers' performance. Thus, commitment is required on both sides: otherwise, firms could hold up their employees and earn higher profits by paying less than the agreed wages. Clearly, this would prevent efficient risk-sharing.

revenue (7) and (8). So in this case the workers' expected utility is

$$\mathbb{E}_0(U) = pu(y_H) + (1-p)u(y_L). \tag{13}$$

Instead, employees in a firm with $\lambda \geq \widehat{\lambda}$ have unconditional expected utility

$$\mathbb{E}_0(U) = pu(y_H) + (1-p)u(w_0), \tag{14}$$

since in these firms a worker whose training outcome is $\sigma = F$ yields a conditional expected revenue $y_L < w_0$ and therefore is dismissed at $t = 2$.

A key feature of the model is that workers can choose among different jobs. Initially let us consider separately the cases in which all available jobs are either "safe"(offered by firms with talent intensity $\lambda < \widehat{\lambda}$) or "risky"(in firms with talent intensity $\lambda \geq \widehat{\lambda}$). In both cases, workers' choices polarize:

Proposition 2. *(i) If all firms have $\lambda < \widehat{\lambda}$, risk-averse workers accept employment in those with the lowest λ. (ii) If all firms have $\lambda \geq \widehat{\lambda}$, all workers accept employment in those with the highest λ, irrespective of their risk attitudes.*

The intuition for part (i) of the proposition is that firms with talent-intensity below $\widehat{\lambda}$ effectively offer wage lotteries that are mean-preserving spreads of those offered by firms with $\lambda = 0$, whose technology is totally insensitive to talent. Since all the wage lotteries at $t = 2$ have the same unconditional expected payoff but a variance that increases in λ, at $t = 0$ risk-averse workers prefer the least informative firm (i.e. choose the lowest-risk lottery as per Rothschild and Stiglitz (1970)). If instead only firms with high talent-sensitivity are present, workers cannot insure themselves against dismissal by picking a safer but less lucrative job. Absent the possibility of limiting downside risk, workers will want to maximize upside opportunity, and thus to work for the most informative firms, recalling that the expected wage is linearly increasing in λ.

Next, consider the more interesting case where workers can choose between safe jobs ($\lambda < \widehat{\lambda}$) and risky ones ($\lambda \geq \widehat{\lambda}$). In this case, workers sort themselves into jobs depending on their risk aversion, the more risk-averse opting for safe jobs, and the less risk-averse preferring the risky ones. This point can clearly be seen recalling the assumption that workers' utility function is $u(C) = -e^{-\gamma C}$, where $\gamma > 0$ is their absolute risk aversion parameter, and comparing two different jobs: one with low talent-sensitivity $\lambda_1 < \widehat{\lambda}$, and the other with high talent-sensitivity $\lambda_2 \geq \widehat{\lambda}$. Denoting by y_{ij} the revenue of firm $i = \{1, 2\}$ conditional on the posterior belief $\theta_j = \{\theta_H, \theta_L\}$, we establish that:

Proposition 3. *Workers prefer jobs in firms with $\lambda_1 < \widehat{\lambda}$ if their risk aversion is $\gamma \geq \widehat{\gamma}$ and jobs in firms with $\lambda_2 \geq \widehat{\lambda}$ otherwise, where*

$$\widehat{\gamma} \equiv \frac{\ln\left[\frac{p(\lambda_2-\lambda_1)c}{y_{1L}-w_0}\right]}{x_2 - x_1} \geq 0$$

and $x_2 \in (y_{1H}, y_{2H})$, $x_1 \in (y_{1L}, w_0)$.

The proof of this proposition relies on the fact that the incremental benefit of a safe job compared to a risky one increases with the degree of risk aversion. Hence, workers with risk aversion above the threshold $\widehat{\gamma}$ are willing to forgo the higher expected payoff of a risky job for the sake of employment security; the opposite applies to workers with risk aversion below $\widehat{\gamma}$. The threshold risk aversion $\widehat{\gamma}$ is monotonically increasing from 0 to a finite maximum as the talent-sensitivity λ_2 of the risky industry rises from $\widehat{\lambda}$ to 1: intuitively, as the informativeness of technology increases, jobs become more productive and pay higher wages, inducing even more risk-averse workers to accept the implied greater risk of dismissal. This prediction is not obvious, because a more informative technology increases both the risk and the expected return of human capital; however, the implied increase in expected return dominates that in risk, attracting more workers to the talent-sensitive industry.

Taken together, the last two propositions enable us to address the more general case in which the talent-sensitivity λ of potentially active firms is distributed over a continuum that includes $\widehat{\lambda}$. In this more general case, the model predicts a “polarized sorting”of workers across firms based on their risk aversion: employees with risk aversion $\gamma \geq \widehat{\gamma}$ will only accept offers from firms featuring the lowest level of talent-sensitivity; conversely, employees with risk-aversion $\gamma < \widehat{\gamma}$ will only accept job offers from the most talent-sensitive firms.

5.3 Inefficiency of Labor Market Competition

Section 5.2 shows that labor market competition at $t = 2$ prevents firms from insuring their employees against layoff risk and so induces risk-averse workers to choose less talent-sensitive jobs. By contrast, in the noncompetitive labor market posited in Section 5.1, where workers cannot resign at $t = 2$, firms offer severance payments that implement efficient risk-sharing, so that all workers are willing to be employed in the most talent-sensitive firms. The provision of such insurance also raises workers' average output, as illustrated by Figure 3.

This means that labor market competition destroys opportunities for risk-sharing and produces a less efficient allocation of the workforce. The model predicts that when workers are sufficiently risk-averse (that is, at least some feature risk aversion larger than $\widehat{\gamma}$), labor market competition results in fewer workers choosing talent-sensitive firms. At the limit, no such firm will be viable. So the economy will feature less talent discovery, less layoff risk (hence, a lower unemployment rate), and lower productivity (and consequently, lower wages) than if firms could offer severance pay.

If instead all workers have low risk aversion ($\gamma < \widehat{\gamma}$), they will choose jobs in highly talent-sensitive firms (those with $\lambda > \widehat{\lambda}$) even in a competitive labor market, but this production efficiency comes at the cost of less efficient risk-sharing. In principle, in this kind of economy layoff risk is insurable, as it is idiosyncratic; yet firms cannot insure it, since they cannot cross-subsidize dismissed workers via severance payments financed by lower wage payments to retained, high-quality workers.

This suggests that, in a competitive labor market, public intervention can improve efficiency by offering the risk-sharing that firms cannot. The next two sections consider two alternative government interventions in this economy and explore the extent to which they can increase efficiency.

6 Public Unemployment Insurance

The government can intervene by introducing a public UI scheme to protect dismissed employees of talent-intensive industries. We assume the scheme is run on a balanced budget: the unemployment benefits b paid to dismissed workers are funded by taxing the income of employees of the same firms at rate $\tau \in [0\,,\,1]$. We further assume no deadweight costs: the taxes levied require no collection costs and impose no distortion of labor supply decisions,[6].

The introduction of UI affects optimal strategies of both the firms and workers:

Lemma 2. *With a public UI system, (i) all employees exposed to layoff risk receive full insurance, paying payroll taxes at the rate* $\tau^* = (1-p)(1-w_0/y_H)$ *and receiving benefits* $b^* = p(y_H - w_0)$*, and (ii) jobs with talent sensitivity* $\lambda^* = \frac{\bar{y}-(1-p)c-(w_0+b^*)}{pc}$

[6] Thus, it is irrelevant whether the taxes that fund the system are lump-sum or payroll-based.

will feature layoff risk.

Clearly, unemployment insurance makes a difference only for sectors that feature layoff risk. Hence, in our setting it is efficient to provide UI only in industries whose employees face layoff risk (i.e., where $\lambda \geq \lambda^*$), so as to eliminate their income risk. Indeed, this is precisely the design of the UI system in the United States, where experience rating ensures that the payroll tax rate paid by each firm is proportional to the UI benefits paid to its employees, so that employers using the system more often pay additional taxes and there are no transfers across firms. This applies also in our setting, where both τ^* and b^* are increasing in the layoff risk of each industry, as determined by its talent sensitivity λ.[7]

Lemma 2 highlights that the UI system has two effects. First, it eliminates labor income risk stemming from layoffs by granting the same net income to employees of risky firms, irrespective of whether they are retained or not: these employees will earn net-of-tax wage income $y_H(1-\tau^*) = py_H + (1-p)w_0$; dismissed workers earn the same amount because unemployment benefits top up their reservation wage, i.e., $b^* + w_0 = py_H + (1-p)w_0$. Hence, UI implies that workers in risky firms have the same income whether employed or not.

Second, the availability of the unemployment benefit b^* increases workers' outside option: when firms bid for employees, they must take into account that their outside option is now $w_0 + b$, not just the reservation wage w_0. As this increases their cost of labor, firms become stricter in their dismissal policy than in the absence of UI: not only firms with talent sensitivity $\lambda \geq \widehat{\lambda}$, but also those with $\lambda \in [\lambda^*, \widehat{\lambda})$ will dismiss workers upon bad performance at $t = 1$. This effect widens the parameter region where layoff risk can materialize. However, the widening of this region is

[7]To see this, note that both τ^* and b^* are increasing in y_H, which in turn is increasing in λ.

inconsequential: the wage offers of any firm with talent-sensitivity $\lambda \in [\lambda^*, \widehat{\lambda})$ will be unattractive to workers compared with those of firms with $\lambda > \widehat{\lambda}$, as they have lower expected productivity, and therefore offer lower expected wages, as shown in Proposition 4. Dismissing low-performing workers is not the optimal dismissal rule for these firms, and they adopt it only because of UI. Hence, workers will shun job offers from firms in this region.[8]

The availability of UI encourages workers to accept employment in risky firms. and enables them to earn a higher expected wage:

Proposition 4. *If workers are offered contracts by firms with different talent sensitivity such that $\lambda_1 < \widehat{\lambda} < \lambda_2$, public UI ensures that they will accept offers from the most talent-sensitive firm, regardless of their risk aversion, and will earn higher expected income than in the absence of UI.*

Intuitively, the reallocation of employment towards risky firms triggered by UI generates an increase in workers' per-capita income, as risky firms are more productive than safe ones, due to their better talent discovery. As such, the introduction of UI not only achieves efficient risk sharing but also enables society to take more risk and reap the associated benefits in terms of greater productive efficiency. Hence, the model predicts that a more generous UI system should raise unemployment frequency as well as average labor productivity and wages.

A key difference between firms' provision of severance pay and public UI is that the latter is universal in coverage. As seen in Section 5.1, if a firm were to pledge severance pay in a competitive labor market, it would lose its best workers to competitors and be left with a pool of overpaid employees. Hence no firm can commit to insure

[8] This argument presupposes that there are firms with $\lambda > \widehat{\lambda}$. But if this were not the case, no firm would feature layoff risk in the absence of UI, implying that there would be no scope for introducing UI in the first place.

dismissed workers via severance pay. By contrast, public UI effectively forces all firms to fund unemployment benefits via the payroll tax. So when the government provides workers with insurance against layoff risk, labor market competition is no longer an issue.

To sum up, the introduction of public UI should induce workers – irrespective of their risk aversion – to accept jobs with high layoff risk, which in our model are those offered in industries with highly talent-sensitive technology. As a result, the public UI system enables the economy to achieve both efficient risk sharing and efficient production, as these jobs feature higher productivity than safer ones. The empirical prediction is that the number of employees exposed to layoff risk, and more specifically of those working in talent-sensitive firms, is positively correlated with the coverage of the public UI system. In what follows we show that this prediction is consistent with empirical evidence.

6.1 Risky Jobs and Unemployment Insurance

Changes in the coverage of the public UI system offer evidence regarding the impact of such coverage on the allocation of workers across firms with different unemployment risk. Van Doornik et al. (2022) study one such policy experiment, namely, an unexpected reform in Brazil that reduced eligibility for UI benefits for part of the workforce. They document that the reform triggered a decline in employment and an increase in wages for affected workers, more so for riskier firms, i.e., those featuring greater layoff risk. Furthermore, affected workers moved to safer employers, and risky firms experienced a relative decline in their market value after the announcement of the reform. The authors interpret their results as evidence of an effect of the reduced UI coverage, which increased employees' exposure to layoff risk and thus prompted them to shun risky jobs and/or induced them to require a higher wage premium to accept such jobs. This is consistent with our model, which predicts that employees should be less willing to take risky occupations when the protection offered by the UI system decreases.

Our model can also be seen as providing predictions about entrepreneurship: in our setting, workers may be thought of as entrepreneurs, since they are claimants to the whole firm's revenue, owing to perfect labor market competition. Indeed, Van Doornik et al. (2022) also document that changes in the UI system affect new business formation in Brazil: fewer firms are created upon tightening UI eligibility requirements. This result is also consistent with the evidence provided by Hombert et al. (2020), who study a large-scale French reform that extended UI coverage, by insuring unemployed workers who started new businesses. The reform significantly increased firm creation, and while jobs created by new entrants crowded out those in incumbent firms almost one for-one, they featured higher productivity than incumbents. This is consistent with our model's prediction that extending UI coverage triggers firms' transition towards more efficient hiring and retention policies of their employees, thus increasing overall productivity.

UI coverage may also have an impact on technology adoption. To illustrate this point, suppose that firms may invest in new technologies that increase their reliance on non-routine occupations and thus the talent sensitivity of their employees' jobs. Consider an economy where initially all firms have low talent-sensitivity $\lambda < \widehat{\lambda}$, all workers have risk aversion $\gamma \geq \widehat{\gamma}$, and there is no UI system. Then, even if firms could invest in technologies that increase their talent-sensitivity to $\lambda \geq \widehat{\lambda}$, they would have no incentive to do so, as adopting such a technology would scare off potential hires. However, if a UI system offering perfect insurance were created, firms would have the incentive to invest in the new technology, unless the cost of this investment were prohibitively high: indeed, firms electing not to invest in the new technology would no longer be able to attract workers. Ellul et al. (2017b) provide evidence on this point, showing that US firms located in states with more generous UI feature greater risk-taking behavior along various dimensions, including technology adoption. They regress the ratio of R&D investment to total assets on the UI replacement rate (defined as the UI benefits scaled by the industry mean wage) in the state where the company is headquartered, and on lagged company-level controls (total assets, leverage, ROA, market-to-book ratio, asset tangibility and sales growth), and find that the coefficient of the replacement rate is positive and significant.[9]

6.2 Talent-Sensitive Jobs and Unemployment Insurance

While the above-discussed evidence is consistent with UI coverage promoting industries featuring greater employment risk, it does not directly establish that this occurs because a more generous UI system encourages workers to accept more talent-sensitive jobs. Mapping this prediction to the data requires finding an empirical counterpart to the talent-sensitivity of jobs. It is natural to assume that creative, non-routine tasks require significantly more talent than routine tasks. Autor et al. (2003), Autor and Dorn (2013) and Autor (2015) define routine tasks as those that can be explicitly codified because of their repetitiveness: "for example, the mathematical calculations involved in simple bookkeeping; the retrieving, sorting, and storing of structured information typical of clerical work; and the precise executing of a repetitive physical operation in an unchanging environment as in repetitive production tasks". In contrast, non-routine tasks are those whose execution cannot be

[9]While their R&D evidence comes from a subsample of firms where they observed data on managerial compensation, a comprehensive sample of 139,210 firm-year observations between 1992 and 2013, drawn from Compustat yields the same result. We are grateful to Kuo Zhang for kindly re-estimating the R&D regressions on this larger sample.

explicitly and fully codified: they are "tasks that people understand tacitly and accomplish effortlessly" (Autor (2015), p. 11), owing to their personal talent in taking decisions and finding solutions to diverse and ill-defined problems.

Thus, one can interpret our model as predicting that jurisdictions with more generous UI systems should feature more workers performing non-routine (i.e., talent-intensive) jobs and fewer performing routine-intensive jobs. To test this prediction, we rely on a panel of yearly state-level U.S. data, and exploit variation in the routine intensity of the jobs held by employees across states and over time, as well as in the generosity of state-level UI systems. We classify jobs based on their Standard Occupational Classification (SOC) codes produced by the Bureau of Labor Statistics (BLS), using the measure of jobs' routine intensity proposed by Autor and Dorn (2013) based on information from the Dictionary of Occupational Titles from 2002 to 2013. This measure ranges from 1.18 to 8.64, with an average of 4.23.[10] We merge this variable with BLS data for the number of employees by occupations in each U.S. state and year over the 2002-13 interval. The number of employees by state and occupation averages 5,005, and ranges from a minimum of 30 to a maximum of 490,660.

Next, for each state and year, we compute two measures of the generosity of the UI system, based on data drawn from the "Significant Provision of State UI Laws" of the U.S. Department of Labor: the maximum weekly benefit in the relevant state and year, and the product between this maximum benefit and its maximum duration (as done by Agrawal and Matsa (2013)). The maximum weekly UI benefit averages \$391 for the whole sample, and differs widely across states: in 2013 it ranged from \$1011 in Massachusetts, \$707 in Rhode Island and \$581 in Pennsylvania, to \$240 in

[10]We draw the data for this measure on Dorn's website at `https://www.ddorn.net/data.htm#Occupational%20Tasks`.

Arizona, \$265 in Alabama and \$275 in Florida. Moreover, it varies differently over time across states: for instance, in Minnesota and Pennsylvania it grew by 35% and 32% respectively between 2002 and 2013, whereas it only grew by 16% in Georgia and remained constant in Florida. In contrast, the maximum duration of UI benefits is quite homogeneous, being 26 weeks is most states, with a few exceptions, such as Massachusetts with 30 weeks and four states with a 20-week UI duration.

The regressions in Table 1 show how the number of employees in each occupation varies across states, occupations and over time depending both on the generosity of the UI system and on its interaction with the routine intensity of the respective occupation. In the regressions shown in columns 1 and 2, UI generosity is measured by the maximum unemployment benefit, while in columns 3 and 4 it also takes the time dimension into account, being the product of the maximum benefit by its maximum duration. The specification shown in columns 1 and 3 includes time, state and occupation fixed effects, to control for aggregate fluctuations in U.S. employment and for unobserved heterogeneity in employment levels across states and occupations; in columns 2 and 4 the latter two fixed effects are replaced by state-occupation fixed effects, to take into account that some occupations may be particularly concentrated in certain states, such as high-tech jobs in California.

Table 1. Talent-Sensitive jobs and maximal UI benefits

The table shows estimates of regressions whose dependent variable is the number of employees in each occupation and state of the U.S. from 2002 to 2013, using two different measures of the generosity of the unemployment insurance (UI) system. In columns 1 and 2, UI generosity is defined as the dollar amount of the maximum weekly benefits in the corresponding state and year; in columns 3 and 4, instead, it is defined as the product of the maximum weekly benefits and the maximum duration (in terms of weeks) of unemployment benefits. Job routine intensity is measured as in Autor and Dorn (2013). T-statistics are shown in parenthesis below the corresponding coefficients, and the asterisks denote the corresponding statistical significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1)	(2)	(3)	(4)
UI generosity	4.145***	4.181***	0.133***	0.140***
	(4.53)	(3.62)	(4.43)	(3.41)
UI generosity × routine intensity	-0.640***	-0.757***	-0.021***	-0.025***
	(-3.15)	(-2.76)	(-3.5)	(-2.5)
Constant	-854.1	4610.0***	-781.512	4646.846***
	(-1.33)	(34.83)	(-1.22)	(39.8)
Time effects	✓	✓	✓	✓
State effects	✓		✓	
Occupation effects	✓		✓	
State × occupation effects		✓		✓
N	204,084	203,815	204,084	203,815

Two findings emerge from the estimates shown in Table 1. First, employment correlates positively with the generosity of the UI system across occupations, states and years, irrespective of the measure of generosity used in the estimation. Second, this correlation is significantly lower for routine-intensive jobs, as the coefficient of the interaction between the generosity of the UI system and the routine intensity measure is negative and precisely estimated: states where UI benefits are more generous feature comparatively fewer routine jobs. Otherwise stated, the generosity of the UI system is associated with an occupation structure that is skewed toward non-routine jobs, namely, those that require more talent from employees. To gain an idea of the economic significance of the estimates, note that a 1-standard-deviation increase in the generosity of the UI system (equal to 124) elicits a 7.8% increase in the number of employees holding jobs in the bottom-decile routine intensity and a 1.3% decrease in those holding jobs in the top-decile intensity (in both cases, relative to the 5,005 average of employees by occupation, state and year in our sample).[11] This is consistent with our theoretical prediction that employment in talent-sensitive jobs is riskier, and thus benefits more from the safety net provided by UI.

The evidence does not pin down the direction of causality between UI generosity and the allocation of employees across occupations. In principle, causality might go in either direction. On one hand, a more generous UI system should make employees more inclined to work in talent-sensitive industries, and allow these to attract a larger fraction of the total workforce. On the other hand, if in a given state many employees hold talent-sensitive jobs (for instance, because local firms excel in high-tech industries), that state will feature a strong constituency in support of a generous UI system, while the opposite will occur if most local workers are employed in industries with low talent sensitivity. Both of these lines of argument are consistent with our model, as both of them imply that UI generosity is more highly valued, in equilibrium, in those locations where talent-sensitive jobs are more widespread, since it mitigates the employment risk associated with these jobs.

[11] These estimates are obtained taking into account both the estimated coefficients shown in column 1: for the bottom decile by routine intensity (1.55), the predicted change in employment is $(4.145 - 0.64 \times 1.55) \times 124 = 391$, while for the top decile of routine intensity (7.29) it is $(4.145 - 0.64 \times 7.29) \times 124 = -65$.

7 Employment Protection Laws

An alternative public intervention that is often thought to reduce employment risk is to restrict the freedom to dismiss, via "employment protection legislation" (EPL). Such restriction can take various forms: (i) prohibition of dismissals, (ii) requirement of "just cause" for dismissals, or (iii) requirement of a pre-set payment to dismissed workers, which amounts to universal mandatory severance pay, and as such is similar to public UI. Governments consider EPL and UI as substitute mechanisms to mitigate unemployment risk. Boeri et al. (2012) document the existence of a stable trade-off between these two types of public policies in cross-country OECD data: Greece, Italy, Portugal and Spain feature strict EPL but low spending on unemployment benefits; conversely, Austria, Denmark, Finland and Switzerland opt for comparatively mild EPL and more generous UI systems, i.e. "flexicurity". Hence, comparing the efficiency of these two policies configurations in our setting is quite relevant.

We focus on EPL that restricts dismissals – indeed, for clarity, we take the extreme case of an outright ban on dismissals, and show that, in a competitive labor market, dismissal restrictions have radically different effects from UI:

Lemma 3. *If EPL forbids dismissals, firms with $\lambda \geq \widehat{\lambda}$ are not viable.*

Intuitively, since EPL forces employers to keep workers despite bad performance at $t = 1$, the more talent-sensitive firms will refrain from hiring them at $t = 0$, expecting not to break even otherwise. This result hinges on the assumption of labor market competition: this enables workers to appropriate all the surplus that they generate, when positive, while being protected from the losses that they generate in bad states at $t = 2$, as firms must pay them their reservation wage to retain them. As a result, talent-sensitive firms will not break even in expectation: only those with

$\lambda < \widehat{\lambda}$ will be active in the market.

This result implies that the introduction of EPL is inefficient compared both to no government intervention and the introduction of a public UI system:

Proposition 5. *(i) If the labor market is competitive and EPL forbids dismissals, production is (weakly) less efficient than with no government intervention. (ii) Compared with public UI, EPL implies less efficient production, and (weakly) less insurance against layoff risk.*

The intuition behind this proposition is that EPL weakly decreases welfare by eliminating the more talent-sensitive firms, whose jobs may appeal to the less risk-averse workers. Hence, EPL drives expected revenue and wages below the no-intervention level: the elimination of layoff risk is achieved at the cost of lower production efficiency. This is consistent with the finding of Bartelsman et al. (2016) that, in countries with restrictive EPL, risky industries, which are the strongest contributors to aggregate productivity growth, are smaller and less productive.

The comparison with public UI drawn in the second statement of the proposition is even starker: with UI all workers opt for jobs in more productive firms, while with EPL all end up taking jobs in less productive ones. Nor does this efficiency loss imply better insurance of workers, as UI eliminates all layoff risk while EPL leaves employees exposed to wage risk in low talent-sensitivity firms. Hence, our model provides a strong normative endorsement of "flexicurity", both on productive efficiency and risk-sharing grounds.

8 Robustness

The strong normative results presented in this paper are partly due to the stylized nature of the model. In this section we explore to what extent and how our results would be modified by allowing for a richer economic environment.

First, our model rules out workers' self-insurance via saving, and thus disregards their ability to mitigate the adverse effects of unemployment by relying on their accumulated wealth upon dismissal. In subsection 8.1 we relax this assumption, by letting workers choose their saving optimally, conditioning on their employment choice, and show that precautionary saving does not modify their job selection behavior, so that public UI provision still favors more efficient talent allocation.

Second, if employment relationships feature moral hazard issues, the availability of full UI can induce workers to shirk, as the disciplinary effects of layoffs would be softened by unemployment benefits (Shapiro and Stiglitz, 1984). Subsection 8.2 presents an extension of the model that shows that in the presence of moral hazard it is optimal to provide incomplete UI coverage, so that the workers who choose talent-sensitive jobs will be exposed to some employment risk, while most risk-averse workers will prefer to take jobs in talent-insensitive firms. Hence, moral hazard eliminates the extreme prediction that the provision of UI induces all workers to prefer talent-sensitive jobs, irrespective of their risk aversion. However, it remains true that the provision of some UI coverage improves both risk sharing and talent discovery relative to the no-intervention case.

Finally, Subsection 8.3 discusses the implications of extending the model to a general equilibrium framework, and of embedding it in a multi-country setting with international labor mobility.

8.1 Workers' Saving

If workers can save, they can self-insure against layoff risk to some extent. To investigate whether this self-insurance eliminates the inefficiency identified so far and thus remove the need for the provision of public UI, we slightly modify the baseline model as follows: at $t = 1$ workers are assumed to have wealth ω, out of which they can save by investing in a safe asset an amount $s \leq \omega$ for future consumption. Without loss of generality, we posit no discounting and a zero interest rate.[12]

As in previous sections, workers can choose between two jobs, where job 1 features less talent sensitivity, and thus lower layoff risk, than job 2 ($\lambda_1 < \widehat{\lambda} < \lambda_2$). They will optimally want to condition their saving s_i^* (for $i = 1, 2$) to their job selection, namely, choose

$$s_1^* = \underset{s}{\operatorname{argmax}} \; u(\omega - s) + pu(y_{1H} + s) + (1 - p)u(y_{1L} + s) \tag{15}$$

upon selecting job 1, and

$$s_2^* = \underset{s}{\operatorname{argmax}} \; u(\omega - s) + pu(y_{2H} + s) + (1 - p)u(w_0 + s) \tag{16}$$

upon selecting job 2. Recalling that workers' preferences are described by a negative exponential utility function $u(c) = -e^{-\gamma c}$, we show that:

Lemma 4. *Upon choosing the safe job, workers' optimal saving is*

$$s_1^* = \frac{\omega}{2} + \frac{\ln[pe^{-\gamma y_{1H}} + (1 - p)e^{-\gamma y_{1L}}]}{2\gamma}, \tag{17}$$

[12] Relaxing these two assumptions would not change our results qualitatively.

while upon choosing the risky job, it is

$$s_2^* = \frac{\omega}{2} + \frac{\ln[pe^{-\gamma y_{2H}} + (1-p)e^{-\gamma w_0}]}{2\gamma}. \tag{18}$$

Workers' risk aversion affects their saving in two ways: both directly, as shown by expressions (17) and (18), and indirectly, by affecting workers' job selection. However, it turns out that, even when their ability to save is taken into account, their job selection depends on risk aversion in the same way as in the absence of saving:

Proposition 6. *If they choose their saving optimally, workers select safe jobs if their risk aversion is $\gamma > \widehat{\gamma}$, and risky jobs otherwise.*

Although workers can rely on saving to mitigate layoff risk, this mitigation is not sufficient to alter their job selection criterion, under our assumption of CARA preferences. Hence, savings do not substitute for public unemployment insurance as a way to restore efficient talent allocation in our model. This result hinges on the fact that savings do not provide full insurance against layoff risk, as they help smoothing consumption across periods rather than across states in which employees are revealed to have different talent.

8.2 Moral Hazard

We now consider the impact of public UI in a framework in which workers can exert costly and unobservable effort to improve their performance. Due to the classical tradeoff between insurance and incentives, in this situation the provision of UI may be expected to lower workers' expected productivity and therefore reduce or even eliminate the efficiency rationale of UI shown in Section 6.

Specifically, we modify the baseline model by assuming that workers, after choosing their job, can exert an unobservable effort $e = \{0, 1\}$ at a monetary cost $\psi > 0$. For those who exert effort, the signal σ issued at the training stage has the same probability distribution as in Subsection 3.1, i.e., $\sigma = S$ with probability p and $\sigma = F$ with probability $1 - p$. Workers who do not exert effort, instead, invariably generate the negative signal $\sigma = F$ and thus earn y_{1L} if choosing safe jobs, while they are dismissed and earn the reservation wage w_0 upon taking risky jobs.[13]

As in the previous section, we consider two jobs, labelled 1 and 2, featuring different talent sensitivity $\lambda_1 < \widehat{\lambda} < \lambda_2$: hence, job 1 entails no layoff risk, while job 2 does. We assume effort to be efficient in both jobs. To this purpose, it is sufficient to suppose that this applies to the safe job, by positing $\psi < p(y_{1H} - y_{1L})$, as this condition is tighter than the corresponding one for risky jobs (i.e., $\psi < p(y_{2H} - w_0)$, since $y_{2H} - w_0 > y_{1H} - y_{1L}$.

Upon taking job 1, workers exert effort if its cost does not exceed the following bound:

$$\psi \leq p[u(y_{1H}) - u(y_{1L})]. \tag{19}$$

If this condition is met, the incentive compatibility condition is also met for risky jobs, i.e., $\psi \leq p[u(y_{2H}) - u(w_0)]$, as the payoff of these jobs is more volatile. Since we wish to determine whether UI lowers workers' incentives to exert effort, we assume condition (19) to hold, so that in the absence of UI workers would exert effort. However, this is no longer the case if the UI system completely shields workers from layoff risk, which has dramatic implications for the government's ability to provide UI coverage:

[13] Our assumption that workers who do not exert effort invariably fail at the training stage rules out full-coverage UI, as shown by Proposition 7. If instead we were to assume that workers who do not exert effort succeed at the training stage with a positive probability $p' < p$, full-coverage UI could still be offered accepting to violate incentive compatibility, i.e., letting workers choose $e = 0$. In this case, the cost of moral hazard would take the form of an inefficiently low effort provision by workers instead of inefficiently low insurance provision by the government.

Proposition 7. *In the presence of moral hazard, the UI system can at best provide partial coverage against layoffs, and its maximum coverage is decreasing in the cost of effort ψ.*

Intuitively, the reason why full coverage against layoff risk cannot be offered is that it would remove all incentives to exert effort, as even upon dismissal workers with risky jobs would suffer no income loss. Hence, any worker holding such jobs would be dismissed at the training stage. As a result, a UI system offering full coverage of layoff risk would not break even. In contrast, a UI system offering only partial coverage against layoff risk can give workers the incentive to exert effort, provided its coverage is low enough. This incentive-compatible coverage is a decreasing function of the cost of effort ψ, which measures the severity of the moral hazard problem: if effort is costlier, workers must be less protected against layoff risk to preserve their incentive to exert effort.

Clearly, limiting the coverage of the UI system reduces the expected utility attainable by workers who choose risky jobs below the level that they could obtain with full coverage. While the resulting layoff risk may not deter the most risk-tolerant workers from choosing the risky job, it may induce sufficiently risk-averse workers to prefer the safe one, differently from what they would do under full UI coverage:

Proposition 8. *If the UI system provides partial coverage against layoff risk, there is a threshold value of risk aversion above which workers prefer the safe job to the risky one. The lower the coverage, the lower this threshold value.*

In conclusion, the limited scope of the UI system imposed by moral hazard induces two distinct inefficiencies. First, workers who still choose risky jobs (being sufficiently risk tolerant) suffer a welfare loss due to the residual layoff risk that they have to bear. Second, workers who are induced to switch to safe jobs (being too risk averse to bear the layoff risk not covered by UI) will receive a lower expected income than they would otherwise, as safe jobs are on average less productive than risky ones. The first, intensive-margin inefficiency arises from incomplete risk sharing; the second, extensive-margin inefficiency instead consists of a distortion in the allocation of workers across jobs.[14]

8.3 Further Extensions

The baseline model abstracts from the general equilibrium effects of the reallocation of workers among industries triggered by the introduction of UI or the extension of its coverage. This approach is appropriate for a small open economy where relative prices are dictated by the world market. Instead, in a large economy, where the relative prices of goods are determined endogenously, the reallocation of workers towards talent-sensitive industries and the implied increase in their output would trigger a reduction in the relative prices of goods produced by these industries. This price response would dampen the extent of equilibrium labor reallocation. Nevertheless, the result that more labor would be employed in the talent-sensitive industries would still hold.

We also rule out international labor mobility. If firms compete for workers across national borders, the domestic provision of UI improves the labor pool that can be attracted by firms in foreign jurisdictions with lower UI contributions; this outflow of high-quality workers in turn may threaten the viability of domestic provision of UI. This is seen most clearly in the extreme case of two symmetric countries with perfect labor mobility: in this case, there is no equilibrium where one country provides UI to its workers and the other does not. Indeed, if the home country were to provide UI

[14] Similar implications would arise in the presence of frictions other than moral hazard, for instance if payroll taxes generate labor supply distortions or entail collection costs.

to workers employed in its risky industries and the foreign country did not, domestic workers would accept jobs in talent-sensitive industries, but those who perform well at the training stage would prefer to move abroad, so as to earn higher wages, benefiting from the absence of UI payroll taxes abroad. As a result, the home country would be unable to fund UI on a balanced budget, as only laid-off employees would be left in its risky industries. Anticipating this, the home government cannot offer UI in the first place. Neither would the foreign country do so if the home country does not, as the argument applies symmetrically.[15]

Hence, international competition for talent may hinder the provision of public insurance to workers at the national level in the same way as labor market competition within each country impairs the provision of private insurance to employees by their firms (as previously shown in this paper). Public UI systems are sustainable only if there is no full international mobility of labor, for instance due to language, technical or legal barriers or to individual preferences for household location. If at least some workers are immobile across national boundaries, they provide a tax base that can be used to fund UI in their country. However, since this tax base is smaller the larger is the fraction of mobile workers, the payroll tax rate to be charged (for a given level of benefits) is an increasing function of international labor mobility.

9 Conclusions

In human capital-intensive industries (such as high-tech and professional services), talent discovery is crucial: it is essential to the efficient matching of workers to tasks, which translates into increased production and higher wages. At the same time, talent

[15]In this symmetric world, UI can be provided in both countries only in the knife-edge equilibrium where workers happen not to move across national border; but this equilibrium is unstable, being exposed to the threat of international migration of the most productive workers.

discovery entails risks for workers who are uncertain about their own skills, insofar as after some work experience they may prove to be less talented than expected, and thus possibly subject to dismissal.

In a noncompetitive labor market, firms can offer severance pay to insure their employees against unemployment risk. A competitive labor market, however, prevents such insurance, as it can only be provided at the expense of more talented workers: the cross-subsidy to poorly performing employees would induce the more talented to switch to a competitor, leaving their initial employer with only overpaid, untalented employees. Absent insurance, risk-averse workers will select themselves into less talent-sensitive occupations, which reveal less precise information about their skills and thus generate less or no layoff risk.

The core implication of our model for policy is that in competitive labor markets, public unemployment insurance (UI) will encourage workers to seek employment in the more talent-sensitive industries, irrespective of their risk aversion, as they prefer to test their skills in jobs that reveal better information about their talent. We show this prediction to be consistent with the distribution of U.S. employment across occupations featuring different degrees of talent sensitivity, assuming the latter to be inversely related to occupations' routine intensity, and exploiting variation in the maximum UI benefit and in its maximal duration across states and over time.

The improved risk sharing enabled by UI also implies more efficient job-talent matches, hence higher average wages. By shifting employment towards riskier industries, it also raises the frequency of job loss (and consequently the unemployment rate), but this does not entail any welfare loss owing to the UI safety net.

UI also turns out to dominate another possible policy intervention aimed at protecting employees from dismissal risk, namely employment protection laws (EPL) restricting firms' power of dismissal. In fact, if the labor market is competitive, EPL will prevent highly talent-sensitive firms from breaking even, and so will distort employment toward firms with less talent-sensitive technologies and therefore lower expected productivity. Hence, to foster the discovery and efficient allocation of talent, public policy should opt for "flexicurity", i.e. insurance of employees against dismissals rather than norms that impede them. A corollary is that UI will encourage firms to enhance the talent sensitivity of their technologies. So the development of high-tech industry may be favored by "flexicurity"rather than strict EPL. As discussed in the paper, these predictions are consistent with several pieces of empirical evidence (Boeri et al., 2012; Ellul et al., 2017b; Hombert et al., 2020; Van Doornik et al., 2022).

Two possible concerns about our results are whether they survive when one considers workers' ability to self-insure against layoff risk by accumulating wealth, as well as the moral hazard issues that the provision of insurance against layoffs can generate. We show that precautionary saving does not affect workers' job selection process, hence the rationale for public UI, while moral hazard limits the coverage that can be offered to workers via UI systems, and thus constrains the efficiency gains that these systems can achieve in both risk-sharing and talent allocation.

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Appendix: Proofs

Lemma 1

Proof. Since $\theta_H \geq p$, by condition (2) we have $1-\theta_H < \frac{\bar{y}-w_0}{c}$. Therefore, if at $t=1$ the worker generates a signal $\sigma = S$, she is retained and the project continued. If instead the worker produces a signal $\sigma = F$ at $t=1$, the belief of her being good is updated to $\theta_L \leq p$. We need to distinguish two possible cases for the conditional expected revenue:

1. $1-\theta_L < \frac{\bar{y}-w_0}{c}$: the worker is retained for any realization of σ, being expected to produce a positive surplus;

2. $1-\theta_L \geq \frac{\bar{y}-w_0}{c}$: the worker is dismissed, being expected to generate a loss for any wage of w_0 or greater.

Whether a firm conforms to case 1 or case 2 depends on the talent-sensitivity of its production technology λ. By continuity of θ_L, $\exists\, \widehat{\lambda} \;:\; \bar{y}-(1-\theta_L)c = w_0$ given by

$$\widehat{\lambda} \equiv \frac{\bar{y}-(1-p)c-w_0}{pc}. \tag{20}$$

If the project's informativeness is $\widehat{\lambda}$, the firm is indifferent between dismissing and retaining a worker who failed at the training stage, as in expectation it will always break even. If $\lambda < \widehat{\lambda}$, the firm optimally keeps all its employees (case 1). If $\lambda \geq \widehat{\lambda}$, instead, the firm dismisses workers who generate a loss at $t=1$ and retains those who generate a positive surplus (case 2), as the former would not enable it to break even. ∎

Proposition 1

Proof. We prove this proposition in two steps:

1. if all firms offer contracts with severance pay, workers choose to work for firms with $\lambda \geq \widehat{\lambda}$.

2. given the previous point, workers choose to work for the most talent-sensitive firm in the market.

Step 1. Any firm with $\lambda < \widehat{\lambda}$ pays all workers a wage that does not depend on their performance:

$$w = \bar{y} - (1-p)c. \tag{21}$$

Instead, firms with $\lambda \geq \widehat{\lambda}$ offer a wage:

$$w = p[\bar{y} - (1-\theta_H)c] + (1-p)w_0. \tag{22}$$

Since workers' utility is increasing in their wage, and

$$\bar{y} - (1-p)c < p[\bar{y} - (1-\theta_H)c] + (1-p)w_0$$

for any $\lambda \geq \widehat{\lambda}$, it follows that any worker prefers to work for firms with $\lambda \geq \widehat{\lambda}$.

Step 2. To see that workers prefer the firm with the highest λ among those with $\lambda \geq \widehat{\lambda}$, note that (22) is increasing in λ, since:

$$\frac{\partial(w)}{\partial\lambda} = pc \cdot \frac{\partial\theta_H}{\partial\lambda} = p(1-p)c > 0.$$

Hence, they will pick the most talent-sensitive firm in the market. ■

Proposition 2

Proof. (i) In firms with $\lambda < \widehat{\lambda}$, the unconditional expected wage at $t = 2$ equals the worker's expected productivity:

$$\mathbb{E}_0(y) = p\left[\bar{y} - (1 - \theta_H)c\right] + (1 - p)\left[\bar{y} - (1 - \theta_L)c\right]. \tag{23}$$

Upon substituting for θ_H and θ_L, this expression becomes

$$\begin{aligned}\mathbb{E}_0(y) &= p\left[\bar{y} - (1 - p)(1 - \lambda)c\right] + (1 - p)\left\{\bar{y} - \left[1 - (1 - \lambda)p\right]c\right\} \\ &= \bar{y} - (1 - p)c \ \forall \lambda < \widehat{\lambda},\end{aligned}$$

which is independent of λ. However, the unconditional variance of the wage is increasing in λ:

$$var(w) = p\left\{y_H - \left[\bar{y} - (1 - p)c\right]\right\}^2 + (1 - p)\left\{y_L - \left[\bar{y} - (1 - p)c\right]\right\}^2 = p(1 - p)\lambda^2 c^2.$$

Hence, the wage paid by firms with informativeness $\lambda < \widehat{\lambda}$ is a mean-preserving spread of the distribution of the wage that would be paid by a firm with $\lambda = 0$, which does not update its beliefs. Thus, a risk-averse worker will always choose the least informative project available.

(ii) In firms with $\lambda \geq \widehat{\lambda}$, a worker whose training outcome is $\sigma = F$, at $t = 2$ is dismissed and gets her reservation utility. If instead $\sigma = S$ at $t = 2$, the worker's wage is increasing in λ (as is shown in the proof of Proposition 1). Thus, all workers prefer to work for the firm featuring the highest λ. ■

Proposition 3

Proof. A worker with CARA utility function facing two job offers with $\lambda_1 < \widehat{\lambda} \leq \lambda_2$ chooses the safer job, i.e. the one at firm 1 if

$$-[pe^{-\gamma y_{1H}} + (1-p)e^{-\gamma y_{1L}}] \geq -[pe^{-\gamma y_{2H}} + (1-p)e^{-\gamma w_0}] \tag{24}$$

This inequality can be rewritten as

$$(1-p)\Big(e^{-\gamma y_{1L}} - e^{-\gamma w_0}\Big) \leq p\Big(e^{-\gamma y_{2H}} - e^{-\gamma y_{1H}}\Big) \tag{25}$$

Recalling that the CARA utility function is strictly concave, there exist two unique expected revenues $x_1 \in (w_0, y_{1L})$ and $x_2 \in (y_{1H}, y_{2H})$ such that, by the mean value theorem, (25) can be rewritten as

$$(1-p)e^{-\gamma x_1}(y_{1L} - w_0) \geq pe^{-\gamma x_2}(y_{2H} - y_{1H}). \tag{26}$$

Taking the natural logarithm on both sides of (26) and rearranging the inequality yields:

$$\gamma \geq \frac{\ln\left[\frac{p(y_{2H}-y_{1H})}{(1-p)(y_{1L}-w_0)}\right]}{x_2 - x_1} \equiv \widehat{\gamma} \tag{27}$$

Notice that $\widehat{\gamma}$ is increasing in λ_2, whose minimum is $\lambda_2 = \widehat{\lambda}$, such that $\widehat{\gamma} = \ln(1)/(x_2 - x_1) = 0$. As $\partial\widehat{\gamma}/\partial\lambda_2 > 0$, $\widehat{\gamma}$ is strictly positive for any $\widehat{\lambda} \in (\lambda_1, \lambda_2)$. ■

Lemma 2

Proof. The government chooses the optimal tax rate τ and transfer to unemployed workers b in order to maximize the social welfare function given by the expected utility of workers working in a risky sector, subject to the binding budget constraint and the non-negativity constraint for the tax rate τ:

$$\underset{\{\tau\,,b\}}{max} \;\; pu[y_H(1-\tau)] + (1-p)u(w_0+b)\,,$$

subject to

$$py_H\tau = (1-p)b, \quad \text{for } \tau \in [0\,,\,1],$$

which is equivalent to:

$$\underset{\tau}{max}\; pu[y_H(1-\tau)] + (1-p)u\left(w_0 + \frac{py_H\tau}{1-p}\right).$$

Working out the first-order condition for an interior solution to this problem gives the optimal level of τ:

$$\tau^* = (1-p)\left(1 - \frac{w_0}{y_H}\right). \tag{28}$$

Substituting τ^* into the budget constraint yields the optimal UI benefit:

$$b^* = p(y_H - w_0), \tag{29}$$

so that employees in firms with $\lambda \geq \lambda^*$ obtain full insurance. Replacing the unemployment benefit b with its optimal value b^* in (29) yields the value of λ^*. Since $b^* > 0$, it is immediate that $\lambda^* < \widehat{\lambda}$.

Let us now derive the new condition that defines the firms that layoff underperforming workers at $t = 1$ under UI. As in the proof of Lemma 1, we distinguish two possible cases for the conditional expected revenue:

1) $1-\theta_L < \frac{\bar{y}-w_0-b}{c}$: the worker is retained for any realization of $y\sigma$, being expected to produce a positive surplus;

2) $1-\theta_L \geq \frac{\bar{y}-w_0-b}{c}$: the worker is dismissed, being expected to generate a loss for any wage of w_0+b or greater.

Whether a firm conforms to case 1 or case 2 depends on the talent-sensitivity of its production technology λ. By continuity of θ_L, $\exists\, \lambda^* \;:\; \bar{y}-(1-\theta_L)c = w_0+b$ given by

$$\lambda^* = \frac{\bar{y}-(1-p)c-(w_0+b)}{pc} \tag{30}$$

where $\lambda^* < \widehat{\lambda}$. ■

Proposition 4

Proof. The proof proceeds in two steps, showing that (i) expected labor income is higher in risky firms than in safe ones; (ii) workers prefer jobs in risky firms, irrespective of their risk aversion. Let talent sensitivity be $\lambda_1 < \widehat{\lambda}$ in safe firms and $\lambda_2 > \widehat{\lambda}$ in risky ones.

(i) If employed by risky firms, workers earn $py_{2H}+(1-p)w_0$, as shown in the text following Lemma 2. In safe firms, instead, they earn expected income $py_{1H}+(1-p)y_{1L} = \bar{y}-(1-p)c$, as shown in the proof of Proposition 3. By equations (7) and (20), it immediately follows that

$$py_{2H}+(1-p)w_0 \geq \bar{y}-(1-p)c \iff \lambda \geq \widehat{\lambda} \equiv \frac{\bar{y}-(1-p)c-w_0}{pc}, \tag{31}$$

as assumed in the proposition.

(ii) Under public UI, workers employed by risky firms with $\lambda_2 \geq \widehat{\lambda}$ have riskless income, so that their utility is:

$$u(py_{2H}+(1-p)w_0), \tag{32}$$

whereas workers employed by safe firms with $\lambda_1 \in [0\,, \widehat{\lambda})$ have expected utility

$$pu(y_{1H}) + (1-p)u(y_{1L}). \tag{33}$$

For a risk-neutral worker, utility (32) exceeds expected utility (33), because, as just shown, $py_{2H} + (1-p)w_0 > py_{1H} + (1-p)y_{1L}$ for every $\lambda_2 \geq \widehat{\lambda}$. *A fortiori*, this applies to a risk-averse worker:

$$pu(y_{1H}) + (1-p)u(y_{1L}) < u[py_{1H} + (1-p)y_{1L}] < u[py_{2H} + (1-p)w_0]. \tag{34}$$

where the first inequality stems from the concavity of the utility function and the second from inequality (31). This holds for any $\lambda_2 \geq \widehat{\lambda} > \lambda_1$. Hence, with public UI, any worker will prefer the more talent-sensitive job. ■

Lemma 3

Proof. If firms cannot fire workers in a competitive labor market, those featuring talent-sensitivity $\lambda < \widehat{\lambda}$ earn zero unconditional expected profit. On the other hand, if workers are not dismissed after a bad outcome at $t = 1$, the unconditional expected profit for a firm with $\lambda \geq \widehat{\lambda}$ is:

$$\mathbb{E}_0(\pi) = (1-p)[\bar{y} - (1-\theta_L)c - w_0] \leq 0 \tag{35}$$

Note that firms with $\lambda \geq \widehat{\lambda}$ will not want to keep under-performing employees idle, as this would generate an expected loss equal to their reservation wage:

$$\mathbb{E}_0(\pi) - w_0 < 0. \tag{36}$$

Hence, if highly talent-intensive firms do not fire workers after a bad outcome at $t = 1$, they make losses. Anticipating this at $t = 0$, in an EPL regime such firms have no incentive to hire workers, and will be inactive. This is an equilibrium, since there are no profitable deviations from a situation in which all such firms are inactive: if any one of them were to start production and enter the labor market, the others would have an incentive to poach the employees tested by this firm: any other firm with $\lambda \geq \widehat{\lambda}$ has an incentive to free ride on the others, so that in equilibrium none would be active at $t = 0$. ■

Proposition 5

Proof. (i) By Proposition 2, in a competitive labor market without government intervention, workers with risk-aversion $\gamma < \widehat{\gamma}$ opt for firms with $\lambda \geq \widehat{\lambda}$. By Lemma 3, when EPL is in place, these jobs are no longer available, so that expected revenue and wages in the economy are lower than in the absence of EPL. If instead all workers have risk-aversion $\gamma \geq \widehat{\gamma}$, then they will all opt for firms with $\lambda < \widehat{\lambda}$ that feature no layoff risk, so that the introduction of EPL is inconsequential.

(ii) By Proposition 4, in a competitive labor market with public UI, all workers choose the most talent-sensitive (highest-λ) job available, which generates the highest feasible production while maintaining efficient risk-sharing. By Lemma 3, when EPL is in place only jobs in firms with $\lambda < \widehat{\lambda}$ are available, so that the expected revenue and wages in the economy are strictly lower than with public UI. Moreover, with EPL all workers will have to take jobs in firms with $\lambda_{<}\widehat{\lambda}$, which feature wage risk (unless $\lambda = 0$), whereas in the presence of UI they would have chosen jobs in firms with $\lambda \geq \widehat{\lambda}$, yet would bear no layoff risk. Hence, EPL also implies less efficient risk sharing than UI. ■

Lemma 4

Proof. Upon choosing the safe job, the worker's optimal saving solves

$$s_1^* = \underset{s}{\operatorname{argmax}} -e^{-\gamma(\omega - s)} - \Big[pe^{-\gamma(y_{1H}+s)} + (1-p)e^{-\gamma(y_{1L}+s)}\Big],$$

and therefore is given by the following first-order condition:

$$e^{-\gamma(\omega - s)} = pe^{-\gamma(y_{1H}+s)} + (1-p)e^{-\gamma(y_{1L}+s)},$$

which can be rearranged as follows:

$$e^{2\gamma s} = e^{\gamma\omega}\Big[pe^{-\gamma y_{1H}} + (1-p)e^{-\gamma y_{1L}}\Big]$$

yielding expression (17).

The worker's optimal saving upon choosing the risky job instead solves

$$s_2^* = \underset{s}{\operatorname{argmax}} -e^{-\gamma(\omega - s)} - \Big[pe^{-\gamma(y_{2H}+s)} + (1-p)e^{-\gamma(w_0+s)}\Big],$$

and therefore is given by the following first-order condition:

$$e^{-\gamma(\omega - s)} = pe^{-\gamma(y_{2H}+s)} + (1-p)e^{-\gamma(w_0+s)},$$

which can be rearranged as follows:

$$e^{2\gamma s} = e^{\gamma\omega}\Big[pe^{-\gamma y_{2H}} + (1-p)e^{-\gamma w_0}\Big]$$

yielding expression (18). ∎

Proposition 6

Proof. Let us consider job selection for a worker with risk-aversion $\gamma \geq \widehat{\gamma}$. Absent savings, this worker would choose the safe job. If she can save, the worker chooses the safe job if

$$-e^{-\gamma(\omega-s_1^*)}-\left[pe^{-\gamma(y_{1H}+s_1^*)}+(1-p)e^{-\gamma(y_{1L}+s_1^*)}\right] \geq -e^{-\gamma(\omega-s_2^*)}-\left[pe^{-\gamma(y_{2H}+s_2^*)}+(1-p)e^{-\gamma(w_0+s_2^*)}\right].$$

This inequality can be rewritten as

$$e^{-\gamma\omega}\left(e^{\gamma s_2^*}-e^{\gamma s_1^*}\right)+e^{-\gamma s_2^*}\left[pe^{-\gamma y_{2H}}+(1-p)pe^{-\gamma w_0}\right]-e^{-\gamma s_1^*}\left[pe^{-\gamma y_{1H}}+(1-p)pe^{-\gamma y_{1L}}\right] \geq 0. \tag{37}$$

Comparing expressions (17) and (18), it is immediate that

$$s_2^* \leq s_1^* \iff pe^{-\gamma y_{2H}} + (1-p)e^{-\gamma w_0} \geq pe^{-\gamma y_{1H}} + (1-p)e^{-\gamma y_{1L}},$$

which, by Proposition 3, is equivalent to stating that

$$s_2^* \geq s_1^* \iff \gamma \geq \widehat{\gamma}. \tag{38}$$

Hence, the first term of the left-hand side of (37) is positive. Hence the inequality holds if

$$e^{-\gamma s_2^*}\left[pe^{-\gamma y_{2H}} + (1-p)pe^{-\gamma w_0}\right] \geq e^{-\gamma s_1^*}\left[pe^{-\gamma y_{1H}} + (1-p)pe^{-\gamma y_{1L}}\right],$$

which, by taking the natural logarithm on both sides can be rearranged as

$$\ln\left[\frac{pe^{-\gamma y_{2H}} + (1-p)e^{-\gamma w_0}}{pe^{-\gamma y_{1H}} + (1-p)e^{-\gamma y_{1L}}}\right] \geq \gamma(s_2^* - s_1^*).$$

Using expressions (17) and (18), it is immediate that this inequality is satisfied, as it boils down to $1 \geq \frac{1}{2}$. Thus inequality (37) holds: the worker chooses the safe job even if she can save.

Let us now consider job selection for a worker with risk-aversion $\gamma < \widehat{\gamma}$. Absent savings, this worker would choose the risky job. When she can save, the worker chooses the risky job if

$$-e^{-\gamma(\omega - s_2^*)} - \left[pe^{-\gamma(y_{2H}+s_2^*)} + (1-p)e^{-\gamma(w_0+s_2^*)}\right] \geq -e^{-\gamma(\omega - s_1^*)} - \left[pe^{-\gamma(y_{1H}+s_1^*)} + (1-p)e^{-\gamma(y_{1L}+s_1^*)}\right].$$

Going through the same steps as in the previous case, we can rearrange this condition as follows:

$$\gamma(s_1^* - s_2^*) < \ln\left[\frac{pe^{-\gamma y_{1H}} + (1-p)e^{-\gamma y_{1L}}}{pe^{-\gamma y_{2H}} + (1-p)e^{-\gamma w_0}}\right].$$

Using (17) and (18), this inequality reduces to $\frac{1}{2} < 1$, which implies that the worker chooses the risky job even if she can save. ■

Proposition 7

Proof. Consider the UI scheme $\{\tau^*, b^*\}$ that fully insures workers against layoff risk, as done in Section 6. Workers exert effort if $u[py_{2H} + (1-p)w_0] - \psi \geq u[py_{2H} + (1-p)w_0]$. As this condition is clearly not satisfied, any feasible UI scheme must feature limited coverage.

Since workers' effort is efficient, this limited coverage UI scheme must satisfy the workers' incentive-compatibility (IC) constraint:

$$pu[y_{2H}(1-\tau)] + (1-p)u(w_0 + b) - \psi \geq u(w_0 + b).$$

As feasibility requires the government's budget to be balanced, i.e., $b = \frac{py_{2H}\tau}{1-p}$, the IC constraint can be rewritten as follows:

$$\psi \leq p\left[u\Big(y_{2H}(1-\tau)\Big) - u\Big(w_0 + \frac{py_{2H}\tau}{1-p}\Big)\right]. \tag{39}$$

As risk-averse workers value insurance, the constrained-optimal UI scheme will offer the highest payroll tax rate $\widehat{\tau}$ (and thus the highest possible UI benefit $\widehat{b}$) such that condition (39) is satisfied. As the right-hand side of inequality (39) is continuous and decreasing in τ, this optimal tax rate $\widehat{\tau}$ will be such that condition (39) holds with equality. Now, note that with full coverage, i.e., $\tau = \tau^* = \frac{(1-p)(y_{2H}-w_0)}{y_{2H}}$, the right-hand side of (39) is equal to zero, so that the condition is violated; instead, with zero coverage ($\tau = 0$), the condition holds with strict inequality, by (19). Hence, by continuity and monotonicity of the right-hand side of (39), there exists a cutoff tax rate $\widehat{\tau} \in (0, \tau^*)$ such that the condition is met with equality. If the cost of effort ψ increases, $\widehat{\tau}$ must decrease for the equality to hold. ∎

Proposition 8

Proof. Workers choose the risky job if

$$pu[y_{2H}(1-\tau)] + (1-p)u\Big(w_0 + \frac{py_{2H}\tau}{1-p}\Big) - \psi \geq pu(y_{1H}) + (1-p)u(y_{1L}) - \psi. \tag{40}$$

If $\tau = \tau^*$, then this condition holds with strict inequality for any level of workers' risk aversion, as full insurance ensures that the risky job yields greater expected payoff than the safe job with lower income risk (recalling that the safe job features wage risk, although no layoff risk). If the UI system offers the constrained-efficient limited coverage $\tau = \widehat{\tau} < \tau^*$ characterized in Proposition 7, then the left-hand side of inequality (40) will be lower than for $\tau = \tau^*$, as reducing τ raises the variance of the payoff of the risky job, leaving its expected value constant. Hence, there must be a finite value of risk aversion $\bar{\gamma}$ that is large enough as to make condition (40) hold with equality. So workers whose risk aversion exceeding the threshold $\bar{\gamma}$ will opt for the safe job, and those with lower risk aversion will opt for the risky one. ■