

The Rat Race at Work: Technology and Burnout

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Abstract

Technological progress can raise employee productivity, yet empirical evidence suggests it may also lead employees to work more. This paper examines how productivity-enhancing technology affects employee welfare through two channels: employees’ strategic work decisions and their risk of burnout. We develop a model in which employees’ productivity increases in both technology quality and their chosen work intensity. A high work intensity causes employee strain to accumulate more quickly, raising the hazard rate of burnout. A burnout event ends an employee’s production, making burnout costly for the firm through reduced productive capacity. We show that when employees’ pay is sufficiently sensitive to their performance relative to peers, better technology can lead to a competitive “rat race” that induces more work. As a result, employee welfare can initially decrease in technology quality as competition intensifies, but eventually recover as competition cools and employees reap the productivity benefits of the technology. For the firm, the possibility of burnout can lead to decreasing marginal returns to technology; firm profit is otherwise convex in technology quality. When the firm chooses employee performance incentives, a reduction in the underlying burnout hazard can lead to higher realized burnout and lower employee welfare in equilibrium. Finally, when technology quality is low, a profit-maximizing firm may invest more in burnout mitigation than a social welfare-maximizing firm, which instead promotes welfare by suppressing workplace competition through weaker performance incentives.

1. Introduction

Productivity-enhancing technologies like generative artificial intelligence (AI) are transforming the workplace. AI assistance has been shown to increase either the quality or volume of employee output in professional writing, management consulting, customer support, and software development (Noy and Zhang, 2023; Dell’Acqua et al., 2023; Brynjolfsson et al., 2025; Cui et al., 2025). These findings show that AI has the potential to boost employee productivity across several types of knowledge work. Improvements in workplace technology, however, need not translate into lighter workloads for employees. In fact, recent empirical evidence suggests AI may be having exactly the opposite effect. Using U.S. time-diary data, Jiang et al. (2025) find that workers in occupations with greater AI exposure work longer hours, with stronger effects when AI complements employee work. Similarly, Ranganathan and Ye (2026) find that employees at a technology firm took on more tasks and worked longer hours

following the adoption of AI, often without being asked, and a study of workplace activity data from 10,000 AI users also found that digital activity (e.g., email, messaging) increased dramatically after AI adoption (ActivTrak Productivity Lab, 2026).

Why might technological progress lead to *more* work? When employees are compensated based on their performance relative to peers, better technology can make production easier for everyone, leading employees to work harder for the same rewards.¹ This type of strategic overwork can create a “rat race” in which employees work harder to preserve their position relative to coworkers, even though they would collectively prefer a less demanding equilibrium (Nalebuff and Stiglitz, 1983; Landers et al., 1996). OpenAI CEO Sam Altman makes a similar prediction about how AI will affect work: “It’s like a relative game. People are very focused on how they’re doing relative to other people . . . I think we’re all going to be much busier than we thought we were supposed to be in a post-superintelligence world” (Altman, 2026).

Relative performance evaluations of employees are common in practice, particularly in the technology sector. In 2025, Meta set a target for teams with at least 150 employees to place 15 to 20 percent of employees in the lowest performance category, and described the review process as an opportunity to make exit decisions (Dixit and Mann, 2025). Microsoft and Amazon have also used similar ranking systems (Eichenwald, 2012; Soper, 2022). However, ranking-based systems are not necessary for employees to compete: Bonuses, raises, and promotions are often limited, so employees may recognize that compensation and career advancement implicitly depend on how their performance compares with coworkers’. In such settings, an across-the-board productivity gain from technology can heighten workplace competition, even when the firm leaves its formal evaluation system unchanged.

Whether technological improvements compel employees to work more intensely matters because high workloads are costly for both firms and employees. In particular, excessive workloads may lead to employee *burnout*, which refers to the exhaustion and reduced effectiveness caused by chronic workplace stress (World Health Organization, 2019; Maslach et al., 2001). For the firm, burnout can reduce productive capacity through lower work quality, increased sickness absence, or employee departures (Corbeanu et al., 2023; Schaufeli et al., 2009; Salvagioni et al., 2017). Recent estimates place the annual cost of burnout at approximately \$5 million for an average U.S. company with 1,000 employees, largely through missed work (Martinez et al., 2025). Technological improvements can therefore create an operational tradeoff: They can raise individual employee productivity, but may also intensify work and increase burnout, reducing the firm’s productive capacity.

In recognition of the costs imposed by burnout, many firms explicitly invest in employee well-being,

¹Nalebuff and Stiglitz (1983) note this possibility; we analyze it formally and show how burnout risk can change the result.

with workplace wellness programs now covering more than 50 million U.S. workers (Jones et al., 2019). For example, HubSpot combines coaching, therapy, and meditation in what it calls a “long-term framework to prevent and battle burnout” (HubSpot, 2021), and Salesforce and Adobe reimburse employees for activities that support mental well-being (Hyder, 2022; Adobe, 2026). Many companies view employee well-being as a strategic priority: In a Deloitte survey, 83 percent of executives said well-being should be discussed by the board (Fisher et al., 2023). Beyond wellness programs, firms can also reduce burnout by changing the work environment itself, for example, by giving employees greater flexibility over their work schedules (Moen et al., 2016). Support from supervisors and coworkers can weaken the link between job demands and burnout (Bakker et al., 2005), suggesting that firms may also reduce burnout by promoting a supportive organizational culture. Whether through wellness programs or changes to the work environment, burnout mitigation may become increasingly important if technological improvements intensify work.

Although a rich literature examines how relative-performance incentives shape workplace competition (Lazear and Rosen, 1981; Connelly et al., 2014), less is known about how such incentives interact with technological progress, especially when high workloads are costly to employee well-being. This paper therefore asks two questions. First, how does productivity-enhancing technology affect employee welfare in competitive workplaces? Second, if better technology reduces employee welfare, to what extent can improved work conditions protect employees?

1.1. Summary of Model and Results

We develop a single-period model in which n identical employees in a firm simultaneously choose their work intensities at the start of the period. Technology increases the output produced by work, and employees are rewarded based on both their absolute output and output relative to the group average. We employee model burnout through a time-to-failure process in which greater work intensity raises the hazard rate of burnout, and a burnout event imposes a fixed cost on the employee and ends their production for the remainder of the period. The firm’s payoff is total output less employee payments, making burnout costly for the firm through reduced production. We consider three settings: one in which the strength of the relative-performance incentive is fixed, one in which the firm chooses it, and one in which the firm also invests in burnout mitigation.

We first examine how technology affects employee welfare when relative-performance incentives are fixed. We show that better technology can initially reduce employee welfare, despite making every employee more productive, but that welfare can recover as technology improves further. In particular, at low technology quality, an improvement creates a “rat race effect”: Employees work more intensely to keep up with coworkers who they anticipate will become more productive, and the resulting strain

outweighs the direct benefit of better technology. At higher technology quality, however, competition can cool. This occurs because better technology amplifies the performance advantage of those employees that remain productive when a coworker burns out, allowing them to earn large relative-performance rewards simply by avoiding burnout. This “strategic survival” behavior weakens the marginal incentive to work intensely, so work intensity can rise more slowly or eventually decline in technology quality. The resulting moderation allows the direct productivity benefit of better technology to dominate, and employee welfare to recover.

We next show that employees’ strategic work intensity decisions in light of burnout risk also shape the firm’s marginal return to technology. Without burnout, better technology both raises the value of completed work and induces employees to work more intensely. These direct and strategic effects reinforce one another, making firm profit convex in technology quality. With the possibility of burnout, however, the strategic survival behavior described above can discourage work, making the firm’s marginal return to technology decrease at high technology quality. We provide conditions under which this occurs.

Naturally, better work conditions ought to protect employees. However, when performance incentives are endogenous (i.e., chosen by the firm), a reduction in the underlying burnout hazard can lead to higher burnout and lower employee welfare in equilibrium. The intuition is that a lower burnout hazard makes employees safer, which benefits the firm by making its productive capacity more secure. The firm’s response is then to demand more work from the employees, which it does by strengthening relative-performance incentives. When burnout hazard is sufficiently low, the resulting increase in work intensity more than offsets the direct reduction in burnout risk, causing an increase in the equilibrium burnout probability. The change in expected compensation does not offset these costs, leaving employees worse off despite the improvement in work conditions.

Finally, we consider a setting where the firm jointly chooses the employees’ relative-performance incentive alongside an investment in burnout mitigation that lowers the hazard rate of burnout. We compare the optimal designs of a profit-maximizing firm and a social welfare-maximizing firm. When technology quality is low, the profit-maximizing firm invests *more* in burnout mitigation than the social welfare-maximizing firm, which instead chooses a weaker incentive to suppress employee competition and limit burnout. Because moderating competition sacrifices output, this result arises at low technology levels, where the output loss is limited; when technology quality is high, we find numerically that the social welfare-maximizing firm invests more in mitigation than the profit-maximizing firm. This result suggests that mitigation spending alone can be a misleading indicator of how well a workplace protects its employees, and that modifying performance incentives may be more welfare-efficient.

1.2. Related Literature

Our paper relates to the people-centric operations literature, which studies how employee behavior shapes operational performance (Boudreau et al., 2003; Roels and Staats, 2021). This literature has shown that workers adjust their pace to the load on the system and to their coworkers’ pace (Schultz et al., 1998; KC and Terwiesch, 2009; Delasay et al., 2016), but these adjustments can be difficult to sustain. For example, KC and Terwiesch (2009) find that hospital workers speed up as load increases, but that prolonged periods of high load slow them down and are associated with worse patient outcomes, a pattern that Delasay et al. (2016) capture in a queueing model that distinguishes load effects from overwork effects. More broadly, beyond a point, high workloads reduce productivity and service quality (Tan and Netessine, 2014; Kuntz et al., 2015; Berry Jaeker and Tucker, 2017) and may also increase absenteeism (Green et al., 2013).

Our paper also draws on research on employee burnout, which identifies workload and job demands as its central drivers (Cordes and Dougherty, 1993; Maslach et al., 2001; Schaufeli and Bakker, 2004). Burnout is costly for both employees and firms and is associated with worse job performance (Corbeanu et al., 2023). Goh et al. (2016) estimate that workplace stressors are associated with more than 120,000 deaths and 5–8% of healthcare spending each year in the United States. However, the same job demands need not lead to the same level of burnout. Job resources such as employee autonomy and strong supervisor relationships can buffer the effect of job demands on burnout (Bakker et al., 2005). Our model captures this distinction by separating employees’ chosen work intensity from an underlying burnout exposure, which the firm can lower by investing in employee well-being. Improvements in employee health have been linked to higher productivity (Gubler et al., 2018), but the effects of workplace interventions also depend on how firms respond. For example, Jiao et al. (2026) show that interventions intended to reduce excessive overtime in global supply chains can backfire once firms adjust their monitoring behavior. We build on this literature by studying how firms should design incentives and mitigation as technology changes the demands placed on employees.

Our paper also relates to the operations management literature on how firms organize work around AI. This literature shows that the benefits of AI depend on how tasks are allocated between humans and AI, how their interaction is designed, and their relative capabilities (Fügener et al., 2026; Fang et al., 2026; Hu et al., 2026). Working with AI can also be demanding: AI assistance can increase the cognitive effort and time pressure that workers face (Boyacı et al., 2024, 2026; Legros and de Véricourt, 2026). Other work studies how AI interacts with worker incentives. Dai and Taylor (2025) examine how firms jointly design AI and employee incentives, and Lu and Tomlin (2026) and Guan et al. (2025) show that limiting the information or precision of AI can motivate workers to acquire information themselves. Bastani and Cachon (2025) show that more reliable AI can make human oversight more

costly to induce, and [Siderius et al. \(2026\)](#) show that better AI can weaken workers' incentives to check its output, causing skill atrophy.

A growing empirical literature also examines how new workplace technologies affect employee welfare. AI assistance has been shown to improve task satisfaction and lower employee attrition ([Noy and Zhang, 2023](#); [Brynjolfsson et al., 2025](#)), but new technologies can also raise work demands, leading to more overtime and greater work intensity ([Giebel and Lammers, 2025](#)), expectations of constant availability ([Mazmanian et al., 2013](#)), and longer workdays with less leisure, particularly in more competitive labor and product markets ([Jiang et al., 2025](#)). We complement this work with a theoretical model of how AI interacts with employees' performance incentives to shape welfare.

Our work connects to a rich literature on the use of relative performance evaluation to motivate employee effort, including rank-order tournaments ([Lazear and Rosen, 1981](#); [Green and Stokey, 1983](#)) and more general incentive contracts ([Nalebuff and Stiglitz, 1983](#); [Mookherjee, 1984](#)). Performance pay has been found to raise worker output ([Lazear, 2000](#)), and feedback on relative performance can change how much employees work ([Casas-Arce and Martínez-Jerez, 2009](#); [Song et al., 2018](#)). Our work is closest to studies of the unintended consequences of performance incentives, which can encourage workers to undermine coworkers ([Lazear, 1989](#)), increase stress and burnout ([Habel et al., 2021](#)), or push workers to overexert ([Landers et al., 1996](#); [Greiner et al., 2026](#)). [Waiser et al. \(2025\)](#) model burnout as an intertemporal effort-cost spillover, and show that strong incentives can lead employees to overwork and eventually quit. Our model differs in that we study how productivity-enhancing technology changes competition among employees, and thus burnout risk.

2. Model

2.1. Work and Burnout

Consider a firm with $n \geq 3$ ex ante identical employees, indexed by $i \in \mathcal{N} \equiv \{1, \dots, n\}$. There is one period, normalized to unit length, with continuous time $t \in [0, 1]$. At the beginning of the period, employees simultaneously choose sustained work intensities $x_i \in [0, \infty)$, which remain fixed while they are productive. Let $\mathbf{x} = (x_1, \dots, x_n)$ denote the intensity profile and $\mathbf{x}_{-i}$ the profile excluding employee i . Work intensity captures the pace at which the employee accepts and completes work during a performance evaluation cycle or a long project.

Let $\tau_i(x_i) \in (0, 1]$ denote the time for which employee i remains productive during the period. If employee i does not burn out during the period, then $\tau_i(x_i) = 1$. Continued work generates strain, which raises burnout risk. We assume a power-law relationship between cumulative work and strain: After working for time t , accumulated strain is $(x_i t)^\alpha / \alpha$, with accumulation rate $x_i^\alpha t^{\alpha-1}$. Conditional

on remaining productive until time $t \in [0, 1]$, employee i 's burnout hazard rate is $\rho x_i^\alpha t^{\alpha-1}$.

Here, $\rho > 0$ denotes underlying burnout *exposure*: It scales the hazard rate at a given work intensity, reflecting the prevailing work conditions. For example, two teams may sustain the same pace of work while differing in employees' control over their work schedules (Moen et al., 2016) or in the support available from coworkers and supervisors (Cordes and Dougherty, 1993; Demerouti et al., 2001; Bakker et al., 2005). We represent the effect of these conditions through ρ , which is common across employees. Treating ρ as common reflects that work conditions apply at the level of the team or firm rather than at the individual level.

The parameter $\alpha > 2$ is the burnout work *sensitivity* and determines how sharply the hazard rises with work intensity. The hazard rises as strain accumulates, and is higher at greater work intensity for a given strain level. The restriction $\alpha > 2$ is a technical condition that ensures that the firm's optimal induced work intensity in Sections 5 and 6 is finite.

For $t \in [0, 1]$, integrating the hazard rate from 0 to t gives

$$\begin{aligned} \Pr(\tau_i(x_i) < t \mid x_i) &= 1 - \exp \left\{ - \int_0^t \rho x_i^\alpha s^{\alpha-1} ds \right\} \\ &= 1 - e^{-\rho x_i^\alpha t^\alpha / \alpha}. \end{aligned} \tag{1}$$

This is a Weibull time-to-failure model, censored at the end of the period (Weibull, 1951).² Figure 1 shows the cumulative burnout probability for different levels of exposure, sensitivity, and work intensity.

If $\tau_i(x_i) < 1$, employee i stops producing for the rest of the period, with no recovery or reassignment of work. This captures episodes such as extended sickness absence or severe disengagement (Schaufeli et al., 2009; Cordes and Dougherty, 1993).³ Completed work is therefore $x_i \tau_i(x_i)$. The variables $\tau_i(x_i)$ are independent across employees conditional on their intensity choices. The burnout hazard and all model parameters are common knowledge.

An active employee bears the instantaneous work cost $x_i^\alpha t^{\alpha-1}$ (i.e., work cost is linear in accumulated strain, with cost per unit of strain normalized to one). Burnout imposes an employee cost $\phi^w > 0$, which captures its health and career consequences (Goh et al., 2016; Salvagioni et al., 2017). A burnout episode also imposes an employer burnout cost $\phi^f > 0$, which captures additional expenses such as employer-funded counseling.

²This specification has parallels in reliability engineering, where machine failure depends on cumulative strain through a power-law relationship (Miner, 1945; Manson, 1953).

³We conjecture that milder forms of burnout, in which an employee continues to produce at reduced quality, would temper our main results but not change them qualitatively.

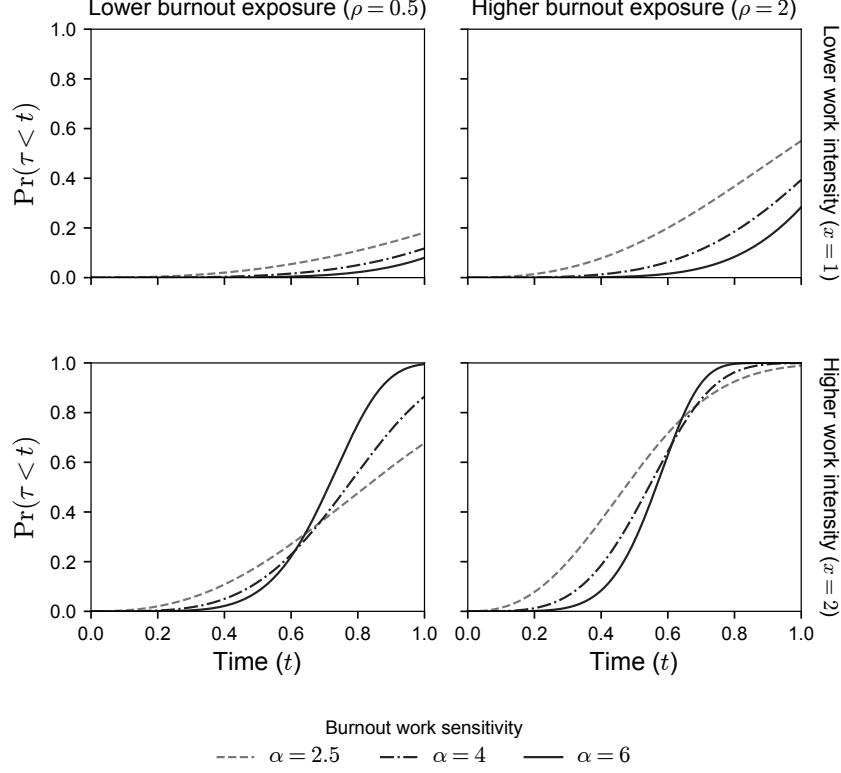


Figure 1: Burnout probability over the performance period. Columns compare burnout exposure $\rho \in \{0.5, 2\}$, rows compare work intensity $x \in \{1, 2\}$, and line types compare burnout work sensitivity α . Higher α makes burnout more sensitive to work intensity, as the comparison across rows shows.

2.2. Technology Quality and Performance Incentives

All employees use a common technology of quality $\theta \in [1, \theta^m]$, where $\theta^m > 1$ is an upper bound on technology quality. We assume throughout that θ is determined by external forces (e.g., market-wide advances in AI), and is thus exogenous. Technology multiplies the output produced by work: Employee i 's realized output as a function of work intensity is $y_i(x_i) \equiv \theta x_i \tau_i(x_i)$, and $\mathbf{y}(\mathbf{x}) = (y_1(x_1), \dots, y_n(x_n))$ is the realized output profile across workers. This multiplicative specification follows [Nalebuff and Stiglitz \(1983\)](#) and is also consistent with an O-ring production technology ([Kremer, 1993](#)), which has been widely used to model productivity gains from AI ([Gans and Goldfarb, 2025](#)).

The employee is paid for their realized output y_i ; we normalize payment per unit of output to one. The firm values each unit of output at $v > 1$. Motivated by the tournament and multi-agent contracting literature, we also allow compensation to depend on performance relative to coworkers ([Lazear and Rosen, 1981](#); [Nalebuff and Stiglitz, 1983](#); [Mookherjee, 1984](#)). We do so by including a relative-performance adjustment, r_i , so the firm's total payment to the employee is $y_i(x_i) + r_i$.

To define r_i , for any $z \in \mathbb{R}$, write $(z)_+ \equiv \max\{z, 0\}$. Let $\bar{y} = n^{-1} \sum_j y_j$ denote average output, and

let $\gamma \geq 0$ denote the strength of the relative-performance incentive, equivalently the relative-output advantage at which the reward reaches its maximum. Employee i 's relative-performance adjustment is then

$$r_i(\mathbf{y}, \gamma) = \int_0^{y_i - \bar{y}} (\gamma - z)_+ dz. \quad (2)$$

Because firms' exact pay schedules are rarely observable, we use (2) as a tractable approximation—it rewards performance relative to the group average, up to a maximum that depends on γ . Larger γ rewards high performers more aggressively; for simplicity, we refer to γ as the *incentive*. All parties are risk neutral.

3. Preliminaries

This section derives the expected payoffs of employees and the firm and characterizes the equilibrium of the work-intensity game. Setting $t = 1$ in (1), the probability that burnout ends production during the period is $\psi(x_i, \rho) \equiv \Pr(\tau_i(x_i) < 1 \mid x_i) = 1 - e^{-\rho x_i^\alpha / \alpha}$. The remaining probability mass is at $\tau_i = 1$. Then, because the instantaneous work cost is $x_i^\alpha t^{\alpha-1}$, an employee's total expected work cost over the period is

$$\begin{aligned} \mathbb{E} \left[\int_0^{\tau_i(x_i)} x_i^\alpha t^{\alpha-1} dt \mid x_i \right] &= \int_0^1 x_i^\alpha t^{\alpha-1} e^{-\rho x_i^\alpha t^\alpha / \alpha} dt \\ &= \frac{1}{\rho} \left(1 - e^{-\rho x_i^\alpha / \alpha} \right) \\ &= \frac{1}{\rho} \psi(x_i, \rho). \end{aligned}$$

Incorporating the burnout cost ϕ^w , the employee's total expected cost is

$$c(x_i, \rho) \equiv \left(\frac{1}{\rho} + \phi^w \right) \psi(x_i, \rho). \quad (3)$$

Taking coworkers' intensities $\mathbf{x}_{-i}$ as given, employee i chooses x_i to maximize $u_i(x_i, \mathbf{x}_{-i}) = \mathbb{E}[y_i(x_i) + r_i(\mathbf{y}(\mathbf{x}), \gamma) \mid \mathbf{x}] - c(x_i, \rho)$, the expected compensation net of the cost in (3). An intensity that maximizes this expected payoff is a best response to $\mathbf{x}_{-i}$. Total expected employee welfare for an arbitrary intensity profile is then

$$\sum_{i=1}^n u_i(x_i, \mathbf{x}_{-i}). \quad (4)$$

Let $L(\mathbf{x}, \rho)$ denote the total expected work completed by employees during the period:

$$L(\mathbf{x}, \rho) \equiv \sum_{i=1}^n \mathbb{E}[x_i \tau_i(x_i) \mid \mathbf{x}] = \sum_{i=1}^n x_i \int_0^1 \Pr(\tau_i(x_i) > t \mid \mathbf{x}) dt = \sum_{i=1}^n \int_0^{x_i} e^{-\rho k^\alpha / \alpha} dk.$$

This includes work completed by employees who later burn out. Expected aggregate output is then $\theta L(\mathbf{x}, \rho)$. Incorporating payments to all employees, the firm's expected profit is

$$\pi(\mathbf{x}, \theta, \rho, \gamma) \equiv \underbrace{(v-1)\theta L(\mathbf{x}, \rho)}_{\text{Net value of labor output}} - \underbrace{\mathbb{E} \left[\sum_{i=1}^n r_i(\mathbf{y}(\mathbf{x}), \gamma) \middle| \mathbf{x} \right]}_{\text{Incentive payments}} - \underbrace{\phi^f \sum_{i=1}^n \psi(x_i, \rho)}_{\text{Employer burnout cost}}. \quad (5)$$

A pure-strategy Nash equilibrium is an intensity profile in which every employee's intensity is a best response to coworkers' intensities. Formally, $\mathbf{x}^*$ is an equilibrium if $u_i(x_i^*, \mathbf{x}_{-i}^*) \geq u_i(z, \mathbf{x}_{-i}^*)$ for all $z \geq 0$ and $i \in \mathcal{N}$. Intensities are chosen before burnout is realized, so outputs and payoffs remain random at the time of choice.

Lemma 1 (Best responses and Nash equilibrium). *For each profile of coworkers' intensities, each employee has a unique best response. The work-intensity game has a unique Nash equilibrium, and this equilibrium is symmetric. The equilibrium intensity x^* is the unique positive solution to*

$$(1 + \rho\phi^w)(x^*)^{\alpha-1} = \theta \left[1 + \frac{n-1}{n} \mathbb{E} \left[\left(\gamma - \frac{\theta x^*}{n} \sum_{j=1}^{n-1} [1 - \tau_j(x^*)] \right) \right] \right]_+. \quad (6)$$

The equilibrium condition balances the rewards from additional work against its strain and burnout costs. The term $x^*[1 - \tau_j(x^*)]$ captures the work lost when coworker j burns out. This lost work gives employees who remain productive a relative-performance advantage. Because the marginal reward from relative performance declines as this advantage grows, coworker burnout can weaken the incentive to work more.

We write the symmetric equilibrium profile as $\mathbf{x}^* = \mathbf{x}^*(\theta, \rho, \gamma) = (x^*, \dots, x^*)$, and the equilibrium burnout probability as $\psi^* = \psi(x^*, \rho)$. Evaluating (4) and (5) at this profile gives equilibrium employee welfare $W(\theta, \rho, \gamma) \equiv \sum_{i=1}^n u_i(x_i^*, \mathbf{x}_{-i}^*)$ and firm profit $\Pi(\theta, \rho, \gamma) \equiv \pi(\mathbf{x}^*, \theta, \rho, \gamma)$. For fixed ρ , write $L(x) \equiv L((x, \dots, x), \rho)$. Holding ρ and γ fixed, equilibrium expected total work is $L(x^*(\theta))$, and expected aggregate output is $\theta L(x^*(\theta))$.

4. Technology, Employee Welfare, and Firm Profit

This section examines how improvements in technology quality affect employee welfare and firm profit when the incentive γ is fixed. Lemma 2 first characterizes how equilibrium work intensity x^* and burnout probability ψ^* change with technology quality θ . These responses drive Propositions 1 and 2, which characterize the effects of better technology on employee welfare W and firm profit Π .

4.1. Rat Race Effect: Impact of Technology on Work Intensity

Lemma 2. *Let $\bar{\gamma}_R \equiv n/(n-1)$. The following statements hold.*

- (i) *If $\gamma \in [0, \bar{\gamma}_R]$, then equilibrium work intensity x^* and burnout probability ψ^* strictly increase in technology quality θ on $[1, \theta^m]$.*
- (ii) *Suppose $\theta^m > 1 + \bar{\gamma}_R$. For each $\gamma \in (\bar{\gamma}_R, \theta^m - 1)$, there exists an exposure threshold $\bar{\rho} > 0$ such that if $\rho > \bar{\rho}$, there are burnout-cost thresholds $0 \leq \underline{\phi}^w < \bar{\phi}^w$ with the following property: If $\phi^w \in (\underline{\phi}^w, \bar{\phi}^w)$, then both x^* and ψ^* strictly decrease in θ on $[\bar{\theta}, \theta^m]$ for some $\bar{\theta} \in (1, \theta^m)$.*

Two forces determine how the equilibrium work intensity x^* changes as technology quality θ increases. The first is the *rat race effect*: Each employee anticipates that better technology will raise their coworkers' output. This creates an incentive to increase their own work intensity to avoid falling behind their peers and being penalized through the relative-performance component of pay. Consequently, an increase in θ creates upward pressure on the equilibrium work intensity x^* .

Second, better technology creates a *competition cooling effect*. When coworker j burns out, they lose $\theta x[1 - \tau_j(x)]$ units of output, lowering the group average and giving employees who remain productive a relative-performance advantage. Higher technology quality magnifies this advantage, reducing the additional relative reward from working harder. This encourages “strategic survival” behavior: Employees benefit simply by remaining productive and avoiding burnout, which incentivizes them to moderate their work intensity, putting downward pressure on x^* .

The conditions in Lemma 2(ii) describe when the competition cooling effect dominates the rat race effect, leading equilibrium work intensity x^* to decrease as technology improves. The condition $\gamma > \bar{\gamma}_R$ ensures that employees' relative performance is a large enough component of their total payoff for coworkers' burnout to meaningfully impact their strategic work intensity. Requiring burnout exposure to be sufficiently high, $\rho > \bar{\rho}$, plays a similar role. The bounds on ϕ^w keep work intensity high enough for coworker burnout to create a meaningful relative-output advantage, but low enough that relative rewards remain below the maximum amount. The equilibrium burnout probability ψ^* moves in the same direction as x^* because $\psi(x, \rho)$ increases in x .

4.2. Employee Welfare

We now examine how the strategic work behavior described above shapes employee welfare. Because better technology makes each unit of work more productive, one might expect it to benefit employees. Our first result shows that this need not be the case: It characterizes when better technology lowers welfare without burnout, and shows that with burnout the rat race effect from Lemma 2 can initially

dominate, causing employee welfare to fall before eventually recovering.

Proposition 1 (Technology and employee welfare). *Let $\bar{\gamma}_W \equiv n(\alpha - 1)/(n - 1)$. The following statements hold.*

- (i) *In the absence of burnout, $\rho = 0$, employee welfare W is strictly increasing, constant, or strictly decreasing in θ on $[1, \theta^m]$ according as $\gamma < \bar{\gamma}_W$, $\gamma = \bar{\gamma}_W$, or $\gamma > \bar{\gamma}_W$.*
- (ii) *For any $\gamma > \bar{\gamma}_W$ and $\phi^w > 0$, sufficiently high exposure ρ implies that W strictly decreases in θ on $[1, \theta_1]$ for some $\theta_1 \in (1, \theta^m)$.*
- (iii) *For each $\gamma > \bar{\gamma}_W$, there exists a threshold $\bar{\phi}^w > 0$ such that if $\phi^w \in (0, \bar{\phi}^w)$, then for sufficiently large ρ there exist a finite $\theta^m > 1$ and thresholds $1 < \theta_1 < \theta_2 < \theta^m$ with the following property: W strictly decreases in θ on $[1, \theta_1]$, while equilibrium work intensity x^* and burnout probability ψ^* strictly decrease and W strictly increases on $[\theta_2, \theta^m]$. Consequently, W has at least one interior minimum over $[1, \theta^m]$.*

The no-burnout benchmark in Proposition 1(i) shows that strong relative-performance incentives alone can make productivity improvements reduce employee welfare. To understand the effects with burnout, let $\widehat{W}(x, \theta)$ denote total employee welfare when all employees choose the same work intensity x , holding ρ and γ fixed. Since equilibrium welfare is $W(\theta) = \widehat{W}(x^*(\theta), \theta)$, the total effect on welfare as θ increases is

$$\frac{dW}{d\theta} = \underbrace{\frac{\partial \widehat{W}}{\partial \theta}}_{\text{Direct technology effect}} + \underbrace{\frac{\partial \widehat{W}}{\partial x} \frac{dx^*}{d\theta}}_{\text{Strategic work-intensity effect}}. \quad (7)$$

Under the conditions in part (ii), the direct technology effect in (7) is positive. For the strategic work-intensity effect, note that when burnout exposure is high and θ is low, equilibrium work intensity x^* is also low, which makes coworker burnout rare. In this low-burnout setting, the rat race effect dominates, yielding $dx^*/d\theta > 0$. This additional work lowers total welfare, $\partial \widehat{W}/\partial x < 0$, because employees end up working more intensely than they would collectively prefer. The strong incentive condition $\gamma > \bar{\gamma}_W$ makes this negative strategic effect outweigh the positive direct effect of better technology.

Part (iii) shows that, if the employee burnout cost is also sufficiently small, welfare recovers over a higher-technology interval where competition cools and work intensity decreases, $dx^*/d\theta < 0$. Here the direct technology effect is positive and $\partial \widehat{W}/\partial x < 0$, so both terms in (7) are positive. Note that falling intensity is sufficient but not necessary for this recovery: Welfare can increase while intensity is still rising, provided competition has cooled enough for the direct effect to dominate (Figure 2).

What does Proposition 1 imply for firms adopting new technology? Advances in technology can raise

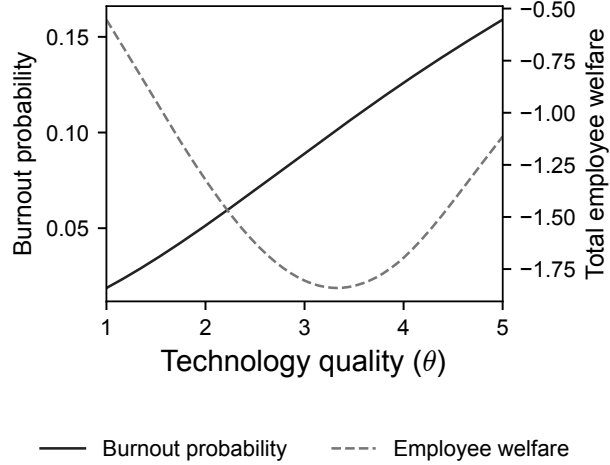


Figure 2: Technology and employee outcomes under a fixed incentive. Total employee welfare (dashed, right axis) reaches a minimum near $\theta = 3.3$ and then recovers as the rat race cools, even as burnout probability (solid, left axis) continues to rise. Parameters: $\alpha = 3$, $n = 4$, $\gamma = 3$, $\rho = 0.01$, $\phi^w = 2$.

output while lowering employee welfare if relative-performance incentives are strong. Each employee is incentivized to increase their work intensity to keep up with more productive coworkers, even though all employees would benefit from collectively moderating their response. Employees’ seemingly voluntary decisions to take on more work following AI adoption (Ranganathan and Ye, 2026) may therefore reflect competitive pressure to keep up with coworkers, rather than productivity gains alone.

This welfare loss arises even though the firm leaves its reward structure unchanged. A firm seeking to protect employee welfare may therefore consider weakening relative-performance incentives as technology improves, much as firms may compress pay differentials to curb harmful competition among employees (Lazear, 1989). Section 5 examines the firm’s own incentives in light of these competitive dynamics.

4.3. Firm Returns to Technology

At a fixed work intensity, output increases linearly in technology quality. Employees’ work responses can therefore determine whether the firm’s marginal returns rise or fall as technology improves. Our next result gives the no-burnout benchmark, shows that marginal returns can initially increase even with burnout, and provides conditions under which they later decrease as competition cools.

Proposition 2 (Burnout and marginal returns to technology). *The following statements hold.*

- (i) *In the absence of burnout risk, $\rho = 0$, the return to technology $d\Pi/d\theta$ is positive and strictly increases in θ on $[1, \theta^m]$.*
- (ii) *For any $\gamma > 0$ and $\phi^w > 0$, sufficiently large ρ implies that, for sufficiently large v , the return to technology is positive and strictly increases in θ on $[1, \theta_1]$ for some $\theta_1 \in (1, \theta^m)$.*
- (iii) *For each $\gamma > \bar{\gamma}_R$, there exists a threshold $\bar{\phi}^w > 0$ such that if $\phi^w \in (0, \bar{\phi}^w)$, then for sufficiently large ρ there exist a finite $\theta^m > 1$ and thresholds $1 < \theta_1 < \theta_2 < \theta^m$ with the following property: For sufficiently large v , the return to technology is positive and strictly increases on $[1, \theta_1]$, while it is positive and strictly decreases on $[\theta_2, \theta^m]$. On the latter interval, equilibrium work intensity x^* and burnout probability ψ^* also strictly decrease. Consequently, $d\Pi/d\theta$ has at least one interior maximum over $[1, \theta^m]$.*

To interpret the result, consider how the net value of employee output, $(v - 1)\theta L(x^*)$, changes as technology quality θ increases. As in the decomposition in (7), a direct effect arises from the productivity gain at a fixed level of expected total work $L(x)$. A second, strategic effect arises because employees adjust their work intensity $x^*(\theta)$ as technology improves, changing expected total work. The firm's marginal return to technology therefore depends on both the level of expected total work $L(x^*)$ and how the equilibrium work intensity x^* adjusts.

Proposition 2(i) gives the no-burnout benchmark when $\rho = 0$. Without burnout, better technology always intensifies the rat race. Equilibrium work intensity is proportional to $\theta^{1/(\alpha-1)}$, so profit is proportional to $\theta^{\alpha/(\alpha-1)}$. The firm's marginal return therefore rises with technology quality.

Part (ii) shows that marginal returns can also initially increase with burnout. As in Proposition 1(ii), high underlying exposure induces low work intensity at low technology levels, making realized burnout rare. Better technology then encourages additional work, and the firm's marginal return rises when the value of output is sufficiently high.

Part (iii) shows that, under stronger conditions, this initial increase reverses at higher technology levels within the same environment. Strong relative-performance incentives allow coworker burnout to cool competition, while a sufficiently small employee burnout cost allows work intensity to reach a level at which this effect becomes important. Near the point where work intensity turns downward, expected output continues to rise but at a decreasing rate. The large- v condition ensures that this output effect dominates changes in incentive payments and employer burnout costs. Technology therefore continues to raise profit on the higher-technology interval, but by progressively smaller amounts.

Proposition 2 suggests that improvements in technology may yield successively smaller gains in

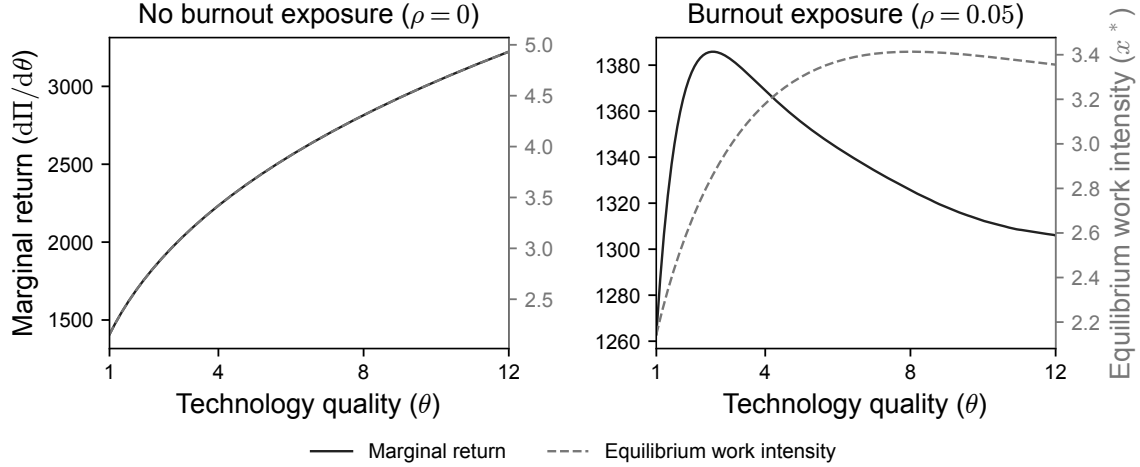


Figure 3: Marginal returns to technology with and without burnout exposure. Without burnout (left), the marginal return $d\Pi/d\theta$ is proportional to equilibrium work intensity x^* , so the two curves overlap and both increase in θ . With burnout (right), the marginal return peaks and then declines as competition cools, while work intensity turns downward only at higher θ . Parameters: $\alpha = 4$, $n = 10$, $\gamma = 10$, $v = 50$, $\phi^w = 0.1$, $\phi^f = 0.1$.

environments where employees face burnout risk. For managers, this implies that extrapolating from early gains may overstate the returns to further improvements, particularly in competitive environments. The competition cooling effect that drives Proposition 2(iii) is also consistent with evidence that contest leaders reduce effort as their lead grows (Casas-Arce and Martínez-Jerez, 2009). Our result also supports the view that organizational practices shape the returns to technology (Brynjolfsson and Hitt, 2000), in this case with respect to how employee performance is compared and rewarded.

5. Work Conditions and the Firm's Incentive Response

Section 4 shows that productivity-enhancing technology can intensify competition and reduce employee welfare. These effects may be tempered by improvements in work conditions, such as greater flexibility over work hours (Moen et al., 2016), which we capture as a reduction in burnout exposure ρ . Such improvements are often determined outside the firm's incentive decision, for example by regulation, company-wide policy, or broader changes in workplace norms. We therefore treat ρ as exogenous and ask: To what extent do improvements in work conditions benefit employees once the firm adjusts its performance incentive? We first hold technology quality θ fixed, allowing the firm to choose the performance incentive γ before employees choose their work intensities, and return to technology at the end of the section. Section 6 allows the firm to choose work conditions as well.

The firm chooses its performance incentive to maximize equilibrium profit:

$$\gamma^*(\theta, \rho) \in \arg \max_{\gamma \geq 0} \Pi(\theta, \rho, \gamma).$$

We write $x^*(\theta, \rho)$, $\psi^*(\theta, \rho)$, and $W^*(\theta, \rho)$ for equilibrium work intensity, burnout probability, and total employee welfare under this incentive.

Proposition 3 characterizes the effect of an improvement in work conditions when the firm can freely adjust the incentive γ .

Proposition 3 (Burnout exposure and employee outcomes). *Fix θ and $\phi^f > 0$. The following statements hold.*

- (i) *For any fixed incentive $\gamma > 0$, there exists an exposure threshold $\bar{\rho} > 0$ such that as ρ decreases within $(0, \bar{\rho})$, equilibrium work intensity x^* strictly increases but burnout probability ψ^* strictly decreases.*
- (ii) *When the firm chooses the incentive γ , there exists an exposure threshold $\bar{\rho} > 0$ such that as ρ decreases within $(0, \bar{\rho})$, the optimal incentive γ^* , work intensity x^* , and burnout probability ψ^* strictly increase, while employee welfare W^* strictly decreases.*
- (iii) *If $1 < (v - 1)\phi^w/\phi^f < \alpha$, there exists an exposure threshold $\underline{\rho} > 0$ such that as ρ decreases within $(\underline{\rho}, \infty)$, the firm's optimal incentive induces strictly higher work intensity x^* , burnout probability ψ^* , and employee welfare W^* .*

Part (i) establishes a benchmark with a fixed incentive. Lower burnout exposure encourages employees to work more, but when exposure is already low, the protection offered by better work conditions is strong enough that realized burnout still falls. Part (ii) reverses this conclusion: Once the firm adjusts its incentive, the additional work it induces outweighs the improvement in work conditions, and burnout rises.

To understand this reversal, it is helpful to consider the two effects of a reduction in burnout exposure. The first is a direct “protection effect”: At a fixed work intensity, lower exposure reduces the burnout hazard and keeps employees productive for longer. However, lower exposure also triggers an “incentive effect”: The firm responds to improved work conditions by ratcheting up the incentive γ^* and demanding more work. Under the conditions in part (ii), the incentive effect dominates.

Why would the firm accept higher burnout? Because $\psi(x, \rho) = 1 - e^{-\rho x^\alpha/\alpha}$, lower exposure ρ lets employees work more intensely at the same burnout probability and with the same distribution of burnout times $\tau_i(x)$ (Lemma 3), so each employee's output $\theta x \tau_i(x)$ grows in both mean and dispersion. Both benefit the firm: Higher output is more valuable, and greater dispersion reduces total relative pay because the schedule (2) penalizes falling behind more than it rewards getting ahead (Lemma 4). Since each increase in burnout probability now buys more work while the expected burnout cost $n\phi^f\psi$ is unchanged, the firm targets a higher ψ^* and implements it through a higher γ^* .

Figure 4(b) illustrates a numerical example of the firm's choice for two exposure levels, $\rho_1 < \rho_2$. Because equilibrium intensity is strictly increasing in γ , the firm's choice of incentive is equivalent to a choice of target intensity x . At each exposure level ρ_1 and ρ_2 , the firm's preferred target intensity x lies where its marginal return from additional work and marginal burnout cost intersect. A decrease in the exposure ρ shifts this intersection to a higher value of x , which, by monotonicity, the firm implements through a higher incentive γ^* . The shaded area under each crossing in Figure 4(b) is proportional to the cumulative burnout hazard $\rho(x^*)^\alpha/\alpha$, meaning the larger region corresponding to ρ_1 reflects a higher equilibrium burnout probability $\psi^* = 1 - e^{-\rho(x^*)^\alpha/\alpha}$.

For employees, the welfare effect depends on how much additional work strain they experience. Lower exposure does not reduce the strain generated by a given amount of work; instead, it allows employees to accumulate more strain before burning out. Expected work cost is ψ^*/ρ , which rises as exposure falls and equilibrium burnout increases. When exposure is sufficiently low, this higher work cost outweighs the change in expected compensation, and employee welfare falls (Figure 4(a)).

Finally, part (iii) shows that employee welfare need not decrease as ρ decreases. At sufficiently high exposure, lower exposure again induces more work and more burnout, but employee welfare now rises. The condition $1 < (v-1)\phi^w/\phi^f < \alpha$ places the employer's burnout cost in an intermediate range where the firm still prefers a positive relative-performance incentive, and the additional compensation outweighs employees' additional costs. An increase in burnout can therefore accompany either a welfare gain or a welfare loss. Figure 4(a) displays both cases.

One may interpret part (ii) as a form of risk compensation (Peltzman, 1975), in which a safety improvement is offset by riskier behavior. Here, the riskier behavior is prompted by the firm: Its change in the incentive induces employees to work more, which more than offsets the safety improvement.

The firm's incentive response also changes how technology affects employees, as the following result shows.

Corollary 1 (Technology under endogenous incentives). *Fix $\phi^f > 0$. When the firm chooses the incentive γ , there exists an exposure threshold $\bar{\rho} > 0$ such that, for any $\rho \in (0, \bar{\rho})$, equilibrium work intensity x^* and burnout probability ψ^* strictly increase in technology quality θ on $[1, \theta^m]$.*

Corollary 1 shows that, when exposure is sufficiently low, work intensity and burnout continue to rise as technology improves under the firm's optimal incentive. The decline in intensity and burnout that can arise under fixed incentives in Section 4 is therefore absent in this region.

Proposition 3 adds an important caveat to the view that improved work conditions buffer employees against burnout (Bakker et al., 2005): The firm can optimize away these protections by adjusting

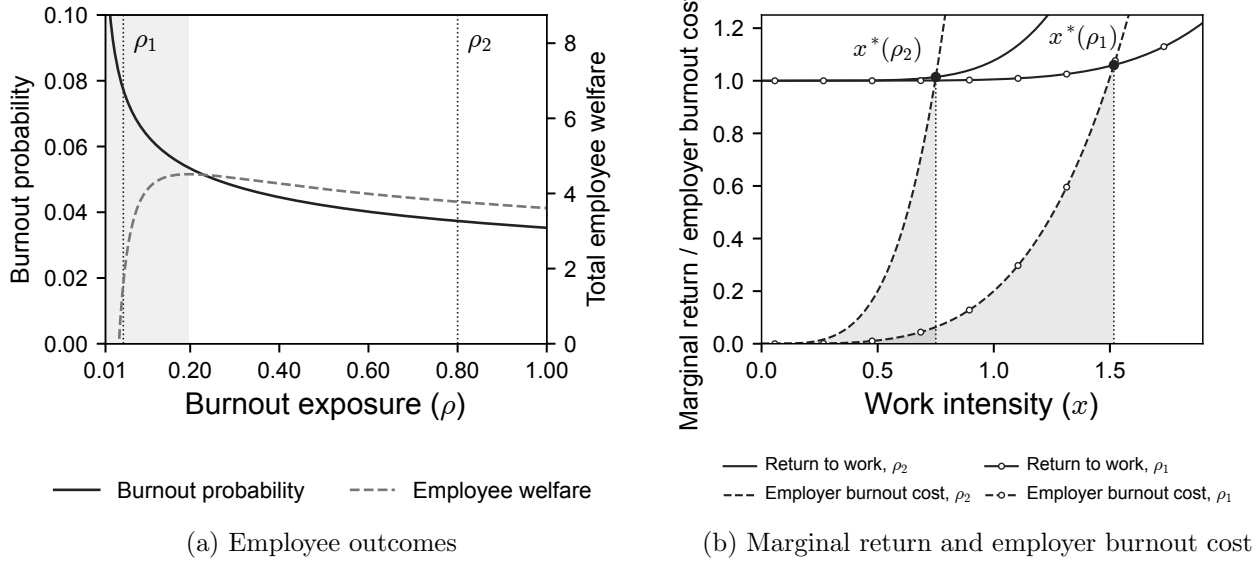


Figure 4: Burnout exposure under the firm's optimal incentive. Panel (a) shows equilibrium burnout and employee welfare; shading marks the low-exposure region in which a further decrease in exposure lowers welfare (Proposition 3(ii)). Panel (b) shows the firm's normalized marginal return (solid) and marginal employer burnout cost (dashed) at $\rho_1 = 0.05$ (circles) and $\rho_2 = 0.8$; their intersections give the firm's implemented work intensities. Parameters: $\alpha = 5$, $n = 4$, $\theta = 2$, $v = 1.5$, $\phi^w = 13.35$, $\phi^f = 4$.

its performance incentives. We next examine how the objective guiding workplace design shapes the combination of competitive pressure and preventive support the firm chooses.

6. Mitigation Spending and Employee Welfare

Investments in employee well-being, such as wellness programs, provide a natural starting point for assessing how well a workplace protects its employees. However, Section 5 shows that work conditions and performance incentives are closely linked: When work conditions improve, a profit-maximizing firm may respond by strengthening its incentive and inducing more work. Here we assume the firm invests in burnout mitigation jointly with choosing the performance incentive. We then compare the profit-maximizing design with one that maximizes social welfare, which also accounts for employees' costs. This benchmark reflects the choices of a regulator, or of a firm that fully internalizes employee welfare, so the comparison isolates the effect of the firm ignoring employees' costs of work and burnout.

Formally, we allow the firm to choose ρ , a stylized representation of the investments or policy choices, such as greater scheduling flexibility, through which it shapes employees' work conditions. Let $C(\rho)$ denote the per-employee cost required to achieve ρ . The firm chooses ρ jointly with the performance incentive γ , after which employees choose their work intensities.

Assumption 1 (Burnout mitigation). *Mitigation spending per employee is $C(\rho) > 0$, where C is*

continuously differentiable with $(\partial/\partial\rho)C(\rho) < 0$, $\lim_{\rho \rightarrow 0} \rho C(\rho) = \infty$, and $\lim_{\rho \rightarrow \infty} \rho C(\rho) = 0$.

Assumption 1 imposes regularity conditions on $C(\rho)$ such that it is optimal for the firm to choose a strictly positive and finite value of ρ .

We consider both profit-maximizing and social welfare-maximizing objectives. Using the equilibrium profit $\Pi(\theta, \rho, \gamma)$ defined by (5), the profit-maximizing design $(\rho^F(\theta), \gamma^F(\theta))$ maximizes $\Pi(\theta, \rho, \gamma) - nC(\rho)$ over $\rho > 0$ and $\gamma \geq 0$. For social welfare, combining firm profit in (5) with employee welfare in (4), and subtracting mitigation spending, gives the objective

$$\Pi(\theta, \rho, \gamma) + W(\theta, \rho, \gamma) - nC(\rho) = v\theta L(\mathbf{x}^*, \rho) - n \left[\left(\phi^f + \frac{1}{\rho} + \phi^w \right) \psi(x^*, \rho) + C(\rho) \right]. \quad (8)$$

Note that the employee payment terms cancel in the sum of firm profit and employee welfare. Each unit of output thus contributes its full gross value v to the social objective in (8).

Let $(\rho^S(\theta), \gamma^S(\theta))$ denote any design that maximizes (8), and let $\psi^S(\theta)$ and $\psi^F(\theta)$ denote the equilibrium burnout probabilities under the social welfare-maximizing and profit-maximizing designs, respectively. We suppress the dependence on θ when it is clear. To compare the designs under common work conditions, we also fix ρ and write $x^F(\rho)$ and $x^S(\rho)$ for the work intensities each design prefers when it chooses only γ , with associated incentives $\gamma^F(\rho)$ and $\gamma^S(\rho)$ and burnout probabilities $\psi^F(\rho)$ and $\psi^S(\rho)$. Lemma 8 in Appendix A characterizes $x^S(\rho)$.

Proposition 4 characterizes the optimal choice of ρ and γ under both the profit- and social welfare-maximizing designs, and the implications for employees' equilibrium burnout probabilities.

Proposition 4 (Social welfare and burnout mitigation). *The following statements hold.*

- (i) *At any exposure $\rho > 0$, the profit-maximizing design induces at least as much work, competitive pressure, and burnout as the social design: $x^F(\rho) \geq x^S(\rho)$, $\gamma^F(\rho) \geq \gamma^S(\rho)$, and $\psi^F(\rho) \geq \psi^S(\rho)$. All three inequalities are strict whenever $\gamma^S(\rho) > 0$.*
- (ii) *Suppose Assumption 1 holds. There exist thresholds $\underline{\phi}^w > 0$, $\overline{\phi}^f > 0$, and $\underline{\theta} > 1$ such that if $\phi^w > \underline{\phi}^w$, $\phi^f \in (0, \overline{\phi}^f)$, and $\theta \in [1, \underline{\theta}]$, the joint social design chooses higher exposure, $\rho^S > \rho^F$, and therefore spends less on mitigation. It also chooses a weaker incentive, $\gamma^S < \gamma^F$, and induces lower burnout, $\psi^S < \psi^F$.*

Part (i) gives a comparison under the same work conditions. Stronger competition raises work intensity and reduces equilibrium employee welfare at a fixed exposure. The firm therefore has a stronger reason to induce work than the social design, which also counts employees' costs. Part (ii) delivers a more striking contrast: Once both designs can choose work conditions, the social design can induce less

burnout while spending less on mitigation.

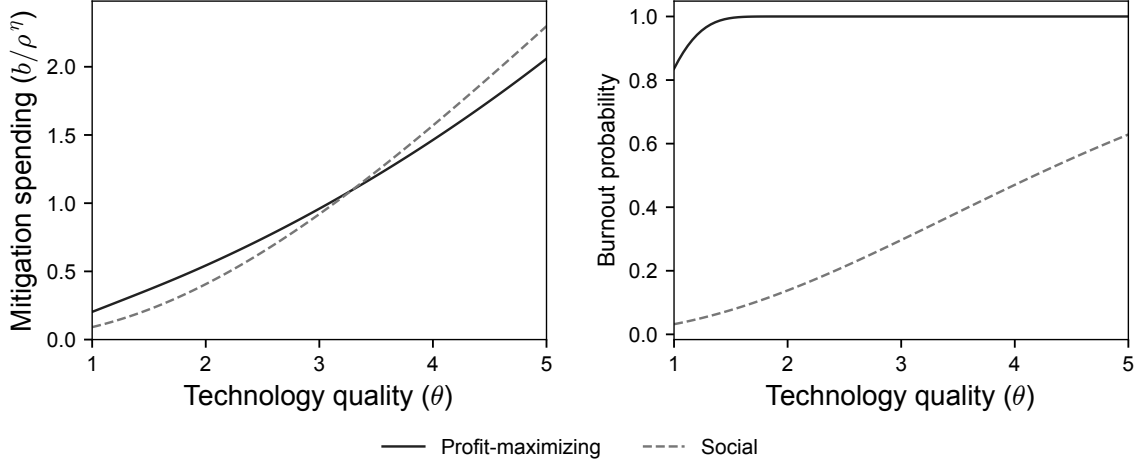


Figure 5: Profit-maximizing and social welfare-maximizing workplace designs. Under the mitigation cost $C(\rho) = b/\rho^\eta$, which satisfies Assumption 1, the social design spends less on mitigation (left) at low technology quality and more at high technology quality. Burnout probability (right) approaches one under the profit-maximizing design but remains much lower under the social design. Parameters: $\alpha = 3$, $n = 4$, $v = 3$, $\phi^w = 4$, $\phi^f = 0.25$, $b = 20$, $\eta = 1.5$.

The joint-design comparison in part (ii) is driven by the different ways in which the two designs value burnout. In Π , burnout affects expected total work, employee payments, and the employer burnout cost $n\phi^f\psi$, whereas the social objective in (8) also counts employees' active-work cost, $n\rho^{-1}\psi$, and burnout loss, $n\phi^w\psi$. When ϕ^w is high and ϕ^f is low, the social design therefore has a stronger reason to reduce work, which it does by weakening the incentive ($\gamma^S < \gamma^F$).

A weaker incentive also lowers the return to mitigation, which is valuable only to the extent that there is work to protect. Further, for the social design, keeping employees productive for longer means they also bear the cost of that work for longer. When technology quality is low, the output sacrificed by reducing work is small, so the social design prefers to reduce work rather than protect it ($\rho^S > \rho^F$). Although higher exposure raises the burnout hazard at a given intensity, the reduction in work is large enough that cumulative exposure is lower under the social design, $\rho^S(x^S)^\alpha < \rho^F(x^F)^\alpha$, so $\psi^S < \psi^F$. The incentive determines how much work is performed, and mitigation protects that work; a design that values employee welfare uses less of both.

In the numerical example in Figure 5, the profit-maximizing design induces near-certain burnout once technology quality is sufficiently high. This reflects the parameters chosen to satisfy Proposition 4(ii) (namely, a high employee burnout cost ϕ^w and a low employer burnout cost ϕ^f), under which the firm extracts the maximum work each employee can sustain and absorbs burnout as the cost of doing so. At higher technology quality, however, reducing work sacrifices more valuable output, and mitigation can become the better way to protect employees, which is why the social design spends more on mitigation

in this range.

What does Proposition 4 imply for evaluating investments in employee well-being? Part (ii) shows that mitigation spending can be a misleading measure of employee protection. The profit-maximizing firm spends more on mitigation because it induces more intensive work through strong incentives, and so must spend more to protect employee productivity from burnout. A firm’s spending on well-being may therefore reflect the demands it places on employees through induced competition.

7. Discussion

When firms adopt productivity-enhancing technologies such as artificial intelligence, it is natural to expect that employees would benefit from lighter workloads. However, empirical evidence suggests that the opposite may occur: Workers in occupations with greater AI exposure work longer hours, and employees at one technology firm took on more tasks after adopting AI, often without being asked (Jiang et al., 2025; Ranganathan and Ye, 2026). Our model offers one explanation for this pattern, in which the effects of better technology depend on three features of the workplace: the quality of the technology, the strength of relative-performance incentives, and how readily intensive work leads to burnout. Table 1 summarizes our main findings and their managerial implications.

Table 1: Summary of main findings.

Dimension	Main Finding	Implication for Managers
Technology quality (θ)	With strong relative-performance incentives, better technology can intensify competition and lower employee welfare. Welfare can recover as technology improves further (Proposition 1).	Relative evaluation, such as forced ranking systems, may lead to longer hours for employees as technology improves. A willingness to take on more work may be due to competitive pressures.
Returns to technology ($d\Pi/d\theta$)	Burnout risk can lead to decreasing marginal returns to technology, which are increasing in the absence of burnout (Proposition 2).	Diminishing returns may reflect employees’ strategic responses to the technology and work environment, rather than limits of the technology itself.
Burnout exposure (ρ)	When the firm adjusts its incentives, improved work conditions (e.g., flexible work) can raise burnout and lower employee welfare; at low burnout exposure, burnout increases in technology quality (Proposition 3, Corollary 1).	Improvements in work conditions may be more effective when paired with a commitment not to raise performance expectations.
Mitigation spending ($C(\rho)$)	At low technology quality, a profit-maximizing firm may spend more on mitigation than a welfare-maximizing firm, which instead weakens incentives; this can reverse at high technology quality (Proposition 4, Figure 5).	Spending on employee wellness may be a misleading measure of employee protection. Moderating competition by weakening relative-performance incentives may be more cost-efficient.

Our results suggest that the effect of technology on employees depends critically on how they are evaluated. When employee rewards are based on relative performance, a firm-wide productivity gain can raise the output required to maintain the same relative standing. Under forced-ranking systems (e.g., Meta’s target of placing 15 to 20 percent of employees in the lowest performance tier; [Dixit and Mann, 2025](#)), productivity gains from AI may lead to longer hours and lower employee welfare, even if the firm leaves its compensation scheme unchanged (Proposition 1). This mechanism is consistent with empirical findings about the effect of technology on work intensity ([Jiang et al., 2025](#); [Ranganathan and Ye, 2026](#)). Conversely, when relative-performance incentives are weak, better technology can raise employee welfare (Proposition 1(i)), which may help explain why AI assistance has also been associated with lower employee attrition ([Brynolfsson et al., 2025](#)). Firms mandating AI use should therefore consider revisiting their evaluation systems, for example by loosening forced-ranking quotas or placing more weight on other measures of performance, such as collaborative efforts.

When evaluating new technology, it is natural for firms to focus on the productivity gains it generates. Proposition 2 adds a caveat to this approach. In particular, output per employee reflects both the direct productivity gain and employees’ decisions to work more. When employees face burnout risk, this increase in workload may not persist as technology continues to improve, or may even reverse. As a result, extrapolating the effect of technology from early productivity gains may overstate the returns to further improvements. Firms should therefore consider evaluating technology investments alongside measures of work intensity, such as hours, after-hours digital activity ([ActivTrak Productivity Lab, 2026](#)), absences, and turnover.

Our results also suggest that investments in employee well-being should not be judged by spending alone. Improvements in work conditions, such as greater schedule flexibility ([Moen et al., 2016](#)), reduce the burnout hazard at a given work intensity, but a firm that responds by strengthening its incentives may demand enough additional work to raise realized burnout and lower employee welfare (Proposition 3). Similarly, a profit-maximizing firm may spend more on burnout mitigation than a welfare-maximizing firm precisely because it induces more intensive work (Proposition 4). Strikingly, mitigation spending and realized burnout may therefore be positively correlated across firms, a pattern aligned with evidence that workplace wellness programs have had limited measurable effects on employee outcomes ([Jones et al., 2019](#)), although other factors likely contribute. For managers, these results suggest holding performance targets fixed when work conditions improve, so that the improvement translates into lower burnout (Proposition 3(i)), and, when technology quality is low, moderating competition rather than adding well-being spending.

Our model also sheds light on the prediction that AI will make workers “much busier” ([Altman, 2026](#)). Under fixed incentives, competition can cool as technology improves and the advantage of avoiding

burnout grows (Proposition 1), but when the firm adjusts its incentives and burnout exposure is low, work intensity and burnout continue to increase in technology quality (Corollary 1). Whether employees become busier may therefore depend as much on how firms adjust their evaluation systems as on the technology. Our analysis also yields testable predictions: Work intensification following AI adoption should be stronger where evaluation is relative, such as under forced ranking or limited promotion slots, and measured burnout need not fall after improvements in work conditions that coincide with stronger performance incentives.

Lastly, our model abstracts away from several features that may matter in practice. Employees are identical and face independent burnout events, whereas in practice they may differ in how effectively they use technology, burnout may shift work onto coworkers, and work intensity may change over time. Firms may also use other design levers, such as team-based rewards, which may dampen competition but invite free-riding, or technology access, mitigation, and evaluation tailored to heterogeneous employees. Technology quality is also exogenous in our analysis; endogenizing the adoption decision may inform how firms should design evaluation systems and well-being investments as technology continues to progress.

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A Proofs

Throughout this appendix, $x\tau_i(x)$ and $x[1 - \tau_i(x)]$ denote completed work and work lost to burnout, respectively.

Lemma 3. *For $x > 0$ and $\rho > 0$, the following statements hold.*

(i) *Completed work has survival function $\Pr(x\tau_i(x) > k) = e^{-\rho k^\alpha/\alpha}$ for $0 \leq k < x$ and zero for $k \geq x$. Thus,*

$$\mathbb{E}[x\tau_i(x)] = \int_0^x e^{-\rho k^\alpha/\alpha} dk, \quad \mathbb{E}[(x\tau_i(x))^2] = \int_0^x 2k e^{-\rho k^\alpha/\alpha} dk. \quad (9)$$

For every x , $\mathbb{E}[x\tau_i(x)] \leq c_\alpha \rho^{-1/\alpha}$ and $\mathbb{E}[(x\tau_i(x))^2] \leq c_\alpha \rho^{-2/\alpha}$, where c_α depends only on α .

- (ii) Completed work is stochastically increasing in x , and lost work is stochastically increasing in x and ρ . Their expectations satisfy $(\partial/\partial x)\mathbb{E}[x\tau_i(x)] = 1 - \psi$ and $(\partial/\partial x)\mathbb{E}[x(1 - \tau_i(x))] = \psi$. Also, $(\partial/\partial x)\text{Var}(x\tau_i(x)) = 2(1 - \psi)\mathbb{E}[x(1 - \tau_i(x))]$ and $(\partial/\partial x)\psi = \rho x^{\alpha-1}(1 - \psi)$.
- (iii) With respect to exposure, $\alpha\rho(\partial/\partial\rho)\mathbb{E}[x\tau_i(x)] = x(1 - \psi) - \mathbb{E}[x\tau_i(x)]$, $\alpha\rho(\partial/\partial\rho)\mathbb{E}[(x\tau_i(x))^2] = 2\{x^2(1 - \psi) - \mathbb{E}[(x\tau_i(x))^2]\}$, and $(\partial/\partial\rho)\psi = x^\alpha(1 - \psi)/\alpha$. Consequently,

$$\begin{aligned} \alpha\rho(\partial/\partial\rho)\text{Var}(x\tau_i(x)) &= 2\{x^2(1 - \psi) - \mathbb{E}[(x\tau_i(x))^2]\} \\ &\quad - 2\mathbb{E}[x\tau_i(x)]\{x(1 - \psi) - \mathbb{E}[x\tau_i(x)]\}, \end{aligned} \quad (10)$$

and $|\rho(\partial/\partial\rho)\text{Var}(x\tau_i(x))| \leq 4x^2/\alpha$. Expected completed work strictly decreases in ρ , while expected lost work and burnout probability strictly increase.

- (iv) The distribution of $\tau_i(x)$ depends on x and ρ only through cumulative exposure $u = \rho x^\alpha/\alpha$, with $\Pr(\tau_i(x) \geq t) = e^{-ut^\alpha}$ for $t \in [0, 1]$. Its expectation strictly decreases in u . As $u \rightarrow 0$, $\mathbb{E}[\tau_i(x)] \rightarrow 1$ and $\text{Var}(\tau_i(x)) \rightarrow 0$. As $u \rightarrow \infty$, $\mathbb{E}[\tau_i(x)] \rightarrow 0$ and $\text{Var}(\tau_i(x))/\mathbb{E}[\tau_i(x)] \rightarrow 0$.

Proof. (i). Setting $t = k/x$ in (1) gives the survival function. Integrating it gives (9). Extending these integrals to infinity and substituting $w = \rho^{1/\alpha}k$ gives the moment bounds.

(ii). The survival function in part (i) weakly increases in x , as does $\Pr(x[1 - \tau_i(x)] > l) = 1 - e^{-\rho(x-l)^\alpha/\alpha}$ for $0 \leq l < x$; the latter also increases in ρ . Differentiating (9) with respect to x gives the derivatives of expected completed and lost work. The variance derivative follows from $\text{Var}(x\tau_i(x)) = \mathbb{E}[(x\tau_i(x))^2] - \mathbb{E}[x\tau_i(x)]^2$, and the burnout derivative follows from $\psi = 1 - e^{-\rho x^\alpha/\alpha}$.

(iii). Differentiating the two moment integrals in (9) with respect to ρ and integrating by parts gives the stated moment derivatives. Substituting these derivatives into the variance formula gives (10). The bound follows because $x(1 - \psi)$, $\mathbb{E}[x\tau_i(x)]$, and $\mathbb{E}[(x\tau_i(x))^2]^{1/2}$ lie in $[0, x]$. The exposure derivative of ψ follows directly from its formula. Expected completed work strictly decreases in ρ by (9), so expected lost work strictly increases.

(iv). By (1), $\Pr(\tau_i(x) \geq t) = e^{-ut^\alpha}$. Hence $\mathbb{E}[\tau_i(x)] = \int_0^1 e^{-ut^\alpha} dt$ strictly decreases in u , and $\mathbb{E}[\tau_i(x)^2] = \int_0^1 2t e^{-ut^\alpha} dt$. Both integrals converge to one as $u \rightarrow 0$. As $u \rightarrow \infty$, substituting $w = u^{1/\alpha}t$ shows that $u^{1/\alpha}\mathbb{E}[\tau_i(x)]$ and $u^{2/\alpha}\mathbb{E}[\tau_i(x)^2]$ converge to positive constants. Thus $\mathbb{E}[\tau_i(x)] \rightarrow 0$ and $\text{Var}(\tau_i(x))/\mathbb{E}[\tau_i(x)] \leq \mathbb{E}[\tau_i(x)^2]/\mathbb{E}[\tau_i(x)] \rightarrow 0$. $\square$

Proof of Lemma 1. Step 1. Fix $\mathbf{x}_{-i}$ and condition on coworkers' completed work. By Lemma 3(i), employee i 's completed work has density $\rho k^{\alpha-1}e^{-\rho k^\alpha/\alpha}$ on $(0, x_i)$ and mass $1 - \psi(x_i, \rho)$ at x_i . Differentiating expected compensation cancels the boundary terms, leaving $1 - \psi(x_i, \rho)$ times marginal compensation at completed work x_i . Using $(\partial/\partial y_i)r_i = \frac{n-1}{n}[\gamma - (y_i - \bar{y})]_+$ and differentiating the private cost in (3) gives

$$(\partial/\partial x_i)u_i = [1 - \psi(x_i, \rho)] \left\{ \theta \left[1 + \frac{n-1}{n} \mathbb{E} \left[\left(\gamma - \frac{n-1}{n} \theta x_i + \frac{\theta}{n} \sum_{j \neq i} x_j \tau_j(x_j) \right)_+ \right] \right] - (1 + \rho \phi^w) x_i^{\alpha-1} \right\}. \quad (11)$$

The term in braces is positive at $x_i = 0$ and strictly decreases to $-\infty$, because the reward term weakly decreases while $(1 + \rho \phi^w) x_i^{\alpha-1}$ strictly increases to infinity. Since $1 - \psi(x_i, \rho) > 0$, each employee has a unique positive best response, characterized by the first-order condition.

Step 2. If all employees choose x , then $\frac{n-1}{n}\theta x - \frac{\theta}{n} \sum_{j \neq i} x \tau_j(x) = \frac{\theta}{n} \sum_{j \neq i} x[1 - \tau_j(x)]$, so setting the term in braces in (11) to zero gives (6). The left-hand side of (6) strictly increases in x , from 0 at $x = 0$ to infinity as $x \rightarrow \infty$, whereas the right-hand side is positive, bounded, and weakly decreasing in x because lost work is stochastically increasing in x (Lemma 3). Therefore, (6) has a unique positive solution x^* , which gives the unique symmetric equilibrium.

Step 3. Suppose an equilibrium has $x_i > x_j$. Relative to employee j 's first-order condition, employee i 's has a smaller own-intensity term and stochastically smaller completed work from the other employee (Lemma 3), while the remaining coworkers' contribution is common to both. Thus employee i 's marginal reward is no greater than employee j 's, while i 's marginal cost is strictly greater, a contradiction. Every equilibrium is therefore symmetric and, by Step 2, unique. $\square$

If $\gamma \geq \frac{n-1}{n}\theta x$, the expression inside $(\cdot)_+$ in (6) is nonnegative for every realization of coworkers' lost work. The expectation then equals $\gamma - \frac{n-1}{n}\theta \mathbb{E}[x(1 - \tau_i(x))]$, and the equilibrium condition simplifies to

$$(1 + \rho\phi^w)x^{\alpha-1} = \theta \left[1 + \frac{n-1}{n}\gamma - \left(\frac{n-1}{n} \right)^2 \theta \mathbb{E}[x(1 - \tau_i(x))] \right]. \quad (12)$$

Because lost work equals 0 with positive probability and has a density on $(0, x)$, the sum $\frac{\theta}{n} \sum_{j=1}^{n-1} x[1 - \tau_j(x)]$ equals $\gamma > 0$ with probability zero, so the expectation in (6) is continuously differentiable in x , θ , ρ , and γ . The implicit function theorem then gives continuous differentiability of x^* , W , and Π in θ , ρ , γ , and ϕ^w , since the derivative of the equilibrium condition with respect to x is strictly positive. When $\gamma > \frac{n-1}{n}\theta x^*$, x^* is infinitely differentiable by (12), because $\mathbb{E}[x(1 - \tau_i(x))] = x - \int_0^x e^{-\rho k^\alpha/\alpha} dk$.

Lemma 4. (i) For each realized output profile,

$$\sum_{i=1}^n r_i(\mathbf{y}, \gamma) = -\frac{1}{2} \sum_{i=1}^n (y_i - \bar{y})^2 + \frac{1}{2} \sum_{i=1}^n (y_i - \bar{y} - \gamma)_+^2 \leq 0. \quad (13)$$

(ii) Let $W(x, \theta, \rho, \gamma)$ and $\pi(x, \theta, \rho, \gamma)$ denote total expected employee welfare and expected firm profit when every employee chooses x , and let $\tilde{P}(x; \theta, \rho) = (v-1)\theta \mathbb{E}[x\tau_i(x)] - \phi^f \psi(x, \rho) + \frac{n-1}{2n}\theta^2 \text{Var}(x\tau_i(x))$. Then

$$\begin{aligned} \pi(x, \theta, \rho, \gamma)/n &= \tilde{P}(x; \theta, \rho) - \frac{1}{2} \mathbb{E}[(y_1 - \bar{y} - \gamma)_+^2], \\ W(x, \theta, \rho, \gamma)/n &= \theta \mathbb{E}[x\tau_i(x)] - c(x, \rho) - \frac{n-1}{2n}\theta^2 \text{Var}(x\tau_i(x)) + \frac{1}{2} \mathbb{E}[(y_1 - \bar{y} - \gamma)_+^2], \end{aligned} \quad (14)$$

where $\mathbb{E}[(y_1 - \bar{y} - \gamma)_+^2] = 0$ if and only if $\gamma \geq \frac{n-1}{n}\theta x$. If mitigation spending is $C(\rho)$ per employee, total social welfare, $\pi + W - nC(\rho)$, is $n\{v\theta \mathbb{E}[x\tau_i(x)] - (\phi^f + 1/\rho + \phi^w)\psi(x, \rho) - C(\rho)\}$.

Proof. By (2), $r_i = \gamma(y_i - \bar{y}) - (y_i - \bar{y})^2/2 + (y_i - \bar{y} - \gamma)_+^2/2$. Summing over employees and using $\sum_i (y_i - \bar{y}) = 0$ gives (13), where the inequality holds because $0 \leq (y_i - \bar{y} - \gamma)_+ \leq |y_i - \bar{y}|$ for $\gamma \geq 0$. At a symmetric intensity, outputs are i.i.d., so $\mathbb{E}[\sum_i (y_i - \bar{y})^2] = (n-1)\theta^2 \text{Var}(x\tau_i(x))$. Taking expectations in (13) and substituting into the payoff definitions gives (14). Because the support of $y_1 - \bar{y} = \frac{\theta}{n} \sum_{j=2}^n [\tau_1(x) - \tau_j(x)]$ has supremum $\frac{n-1}{n}\theta x$, $\mathbb{E}[(y_1 - \bar{y} - \gamma)_+^2] = 0$ if and only if $\gamma \geq \frac{n-1}{n}\theta x$. Adding profit and employee welfare cancels employee payments; subtracting $nC(\rho)$ gives social welfare. $\square$

Proof of Lemma 2. Step 1. Write $x = x^*(\theta, \rho, \gamma)$. Because the left-hand side of (6) strictly increases in x and the right-hand side weakly decreases in x , the implicit function theorem implies that $(d/d\theta)x$ has the same sign as the derivative of the right-hand side with respect to θ at fixed x , which is

$$1 + \frac{n-1}{n} \mathbb{E} \left[\left(\gamma - \frac{2\theta}{n} \sum_{j=1}^{n-1} x[1 - \tau_j(x)] \right) \mathbf{1} \left\{ \frac{\theta}{n} \sum_{j=1}^{n-1} x[1 - \tau_j(x)] < \gamma \right\} \right]. \quad (15)$$

Because $\psi(x, \rho)$ strictly increases in x , ψ^* moves in the same direction as x^* .

Step 2. If $\gamma = 0$, the event in the indicator is empty, and (15) equals one. If $\gamma > 0$, the term in parentheses exceeds $\gamma - 2\gamma = -\gamma$ on the event in the indicator, which has positive probability because it contains the event that no coworker burns out. Therefore, (15) exceeds $1 - \frac{n-1}{n}\gamma$, which is nonnegative when $\gamma \leq \bar{\gamma}_R$. In both cases, $(d/d\theta)x^* > 0$, which establishes part (i).

Step 3. Fix $\gamma \in (\bar{\gamma}_R, \theta^m - 1)$. When $\gamma > \frac{n-1}{n}\theta x$, differentiating (12) with respect to θ and using Lemma 3 gives

$$\left[(1 + \rho\phi^w)(\alpha - 1)x^{\alpha-2} + \left(\frac{n-1}{n} \right)^2 \theta^2 \psi(x, \rho) \right] (d/d\theta)x = 1 + \frac{n-1}{n}\gamma - 2 \left(\frac{n-1}{n} \right)^2 \theta \mathbb{E}[x(1 - \tau_i(x))], \quad (16)$$

so equilibrium intensity strictly decreases in θ if and only if

$$\mathbb{E}[x(1 - \tau_i(x))] > \frac{n[n + (n-1)\gamma]}{2(n-1)^2\theta}. \quad (17)$$

Because expected lost work is zero at $x = 0$ and strictly increases to infinity in x (Lemma 3), there is a unique intensity $\bar{x}$ at which (17) holds with equality at $\theta = \theta^m$. It suffices to show that $\bar{x} < x^*(\theta^m) < n\gamma/[(n-1)\theta^m]$ for suitable ρ and ϕ^w , since then (16) applies and (17) holds at θ^m , and the result follows on some interval $[\bar{\theta}, \theta^m]$ by continuity and Step 1.

Because $n/(n-1) < \gamma < \theta^m - 1$ and $n \geq 3$, the right-hand side of (17) at θ^m is less than $\min\{1, n\gamma/[(n-1)\theta^m]\}$. Because $\bar{x}$ equals this right-hand side plus $\mathbb{E}[\bar{x}\tau_i(\bar{x})] \leq c_\alpha \rho^{-1/\alpha}$, there exists $\bar{\rho}$ such that $\bar{x} < \min\{1, n\gamma/[(n-1)\theta^m]\}$ for all $\rho > \bar{\rho}$.

Lastly, fix $\rho > \bar{\rho}$. By (6), $x^*(\theta^m)$ is continuous and strictly decreasing in ϕ^w , satisfies $x^*(\theta^m) \geq (\theta^m)^{1/(\alpha-1)} > 1 > \bar{x}$ at $\phi^w = 0$, and converges to zero as $\phi^w \rightarrow \infty$. Therefore, there exist $0 \leq \underline{\phi}^w < \bar{\phi}^w$ such that $\bar{x} < x^*(\theta^m) < n\gamma/[(n-1)\theta^m]$ for all $\phi^w \in (\underline{\phi}^w, \bar{\phi}^w)$, as desired. $\square$

The next lemma, used for Propositions 1(iii) and 2(iii), constructs a technology level at which work intensity turns downward.

Lemma 5. *Suppose $\gamma > \bar{\gamma}_R$. There exists $\bar{\phi}^w > 0$ such that, if $\phi^w \in (0, \bar{\phi}^w)$ and $\rho > 1/\bar{\phi}^w$, there is a technology level $\bar{\theta}$, with $\bar{x} = x^*(\bar{\theta})$, for which:*

- (i) $\gamma > \frac{n-1}{n}\bar{\theta}\bar{x}$, and at $\bar{\theta}$, $(d/d\theta)x^* = 0$ and $(d^2/d\theta^2)x^* < 0$.
- (ii) $\mathbb{E}[\tau_i(\bar{x})] > \frac{n-1}{n}\bar{\theta}\bar{x} \text{Var}(\tau_i(\bar{x}))$.
- (iii) For fixed ϕ^w , $\bar{\theta} \rightarrow \infty$ as $\rho \rightarrow \infty$.

Proof. When $\gamma > \frac{n-1}{n}\theta x^*$, (16) gives $(d/d\theta)x^* = 0$ if and only if (17) holds with equality, in which case the

right-hand side of (12) equals $\theta[n + (n-1)\gamma]/(2n)$. By Lemma 3, $u\mathbb{E}[1 - \tau_i(x)]$ depends on x and ρ only through u and strictly increases in u , from 0 at $u = 0$ to infinity as $u \rightarrow \infty$. Let $\bar{x}$ be the unique intensity at which

$$u\mathbb{E}[1 - \tau_i(x)] = \frac{[n + (n-1)\gamma]^2}{4\alpha(n-1)^2(\phi^w + 1/\rho)}, \quad (18)$$

and set $\bar{\theta} = n[n + (n-1)\gamma]/\{2(n-1)^2\bar{x}\mathbb{E}[1 - \tau_i(\bar{x})]\}$, so that (17) holds with equality at $(\bar{x}, \bar{\theta})$. Using $(1 + \rho\phi^w)\bar{x}^\alpha = \alpha(\phi^w + 1/\rho)u$, (18) gives $(1 + \rho\phi^w)\bar{x}^{\alpha-1} = \bar{\theta}[n + (n-1)\gamma]/(2n)$, so $\bar{x}$ solves (12) at $\theta = \bar{\theta}$. Also, $\frac{n-1}{n}\bar{\theta}\bar{x} < \gamma$ if and only if $\mathbb{E}[1 - \tau_i(\bar{x})] > [n + (n-1)\gamma]/[2(n-1)\gamma]$, where the right-hand side is less than one because $\gamma > n/(n-1)$.

By (18), $u \geq [n + (n-1)\gamma]^2/[4\alpha(n-1)^2(\phi^w + 1/\rho)]$ at $\bar{x}$, and $\frac{n-1}{n}\bar{\theta}\bar{x} \leq [n + (n-1)\gamma]/(n-1)$ whenever $\mathbb{E}[1 - \tau_i(\bar{x})] \geq 1/2$. Because $\mathbb{E}[1 - \tau_i(x)] \rightarrow 1$ and $\text{Var}(\tau_i(x))/\mathbb{E}[\tau_i(x)] \rightarrow 0$ as $u \rightarrow \infty$ (Lemma 3), there exists $\bar{\phi}^w > 0$ such that, whenever $\phi^w + 1/\rho < 2\bar{\phi}^w$, we have $\mathbb{E}[1 - \tau_i(\bar{x})] > [n + (n-1)\gamma]/[2(n-1)\gamma]$ and $\mathbb{E}[\tau_i(\bar{x})] > \frac{n-1}{n}\bar{\theta}\bar{x}\text{Var}(\tau_i(\bar{x}))$. Suppose $\phi^w < \bar{\phi}^w$ and $\rho > 1/\bar{\phi}^w$, so that $\phi^w + 1/\rho < 2\bar{\phi}^w$. Then $\gamma > \frac{n-1}{n}\bar{\theta}\bar{x}$, so $\bar{x} = x^*(\bar{\theta})$ and $(d/d\theta)x^* = 0$ at $\bar{\theta}$. Differentiating (16) with respect to θ at $\bar{\theta}$ then gives

$$\left[(1 + \rho\phi^w)(\alpha - 1)\bar{x}^{\alpha-2} + \left(\frac{n-1}{n}\right)^2 \bar{\theta}^2 \psi(\bar{x}, \rho) \right] (d^2/d\theta^2)x^* = -2 \left(\frac{n-1}{n}\right)^2 \mathbb{E}[\bar{x}(1 - \tau_i(\bar{x}))] < 0.$$

Lastly, fix ϕ^w . As $\rho \rightarrow \infty$, the value of u solving (18) converges to a finite positive value, so $\bar{x} = (\alpha u/\rho)^{1/\alpha} \rightarrow 0$ and $\bar{\theta} \geq n[n + (n-1)\gamma]/[2(n-1)^2\bar{x}] \rightarrow \infty$. $\square$

Proof of Proposition 1. (i). At $\rho = 0$, no employee burns out, and the private cost is x^α/α , the limit of $c(x, \rho)$ as $\rho \rightarrow 0$. By (6), $x^* = \{[1 + (n-1)\gamma/n]\theta\}^{1/(\alpha-1)}$, so $(d/d\theta)x^* = x^*/[(\alpha-1)\theta]$. Relative pay is zero, so $W = n[\theta x^* - (x^*)^\alpha/\alpha]$, and using $(x^*)^{\alpha-1} = [1 + (n-1)\gamma/n]\theta$, we obtain $(d/d\theta)W = nx^*\{1 - (n-1)\gamma/[n(\alpha-1)]\}$, which has the sign of $\bar{\gamma}_W - \gamma$, as claimed.

(ii). Fix $\gamma > 0$ and $\phi^w > 0$. When $\gamma > \frac{n-1}{n}\theta x$, Lemma 4 gives $W/n = \theta\mathbb{E}[x\tau_i(x)] - c(x, \rho) - \frac{n-1}{2n}\theta^2\text{Var}(x\tau_i(x))$. Differentiating W along $x = x^*(\theta)$, using $(\partial/\partial x)c = (1 + \rho\phi^w)x^{\alpha-1}(1 - \psi)$, (12), and Lemma 3, gives

$$\frac{1}{n}(d/d\theta)W = \mathbb{E}[x\tau_i(x)] - \frac{n-1}{n}\theta\text{Var}(x\tau_i(x)) - \frac{n-1}{n}\theta(1 - \psi) \left[\gamma + \frac{\theta}{n}\mathbb{E}[x(1 - \tau_i(x))] \right] (d/d\theta)x, \quad (19)$$

where the first two terms are the direct technology effect and the last term is the strategic work-intensity effect.

Set $\theta = 1$. By (6), $(x^*)^{\alpha-1} \leq [1 + (n-1)\gamma/n]/(1 + \rho\phi^w)$, so $x^* \rightarrow 0$ and $\rho(x^*)^\alpha \rightarrow 0$ as $\rho \rightarrow \infty$. By Lemma 3, it follows that $\mathbb{E}[x^*\tau_i(x^*)]/x^* \rightarrow 1$, $\text{Var}(x^*\tau_i(x^*)/x^*) = x^*\text{Var}(\tau_i(x^*)) \rightarrow 0$, and $\psi \rightarrow 0$. In particular, $\gamma > \frac{n-1}{n}x^*$ for large ρ , and because expected lost work is at most x^* , both $(1 + \rho\phi^w)(x^*)^{\alpha-1}$ and the right-hand side of (16) converge to $1 + (n-1)\gamma/n$. Using these limits in (16) gives $(1/x^*)(d/d\theta)x^* \rightarrow 1/(\alpha-1)$, as in part (i).

Now suppose $\gamma > \bar{\gamma}_W$. Substituting these limits into (19) at $\theta = 1$ and dividing by x^* , we have $(1/(nx^*))(d/d\theta)W \rightarrow 1 - (n-1)\gamma/[n(\alpha-1)]$, as in part (i), and this limit is negative. The same limits imply that the direct technology effect is positive and $(d/d\theta)x^* > 0$ at $\theta = 1$. For sufficiently large ρ , these signs and $(d/d\theta)W < 0$ therefore hold at $\theta = 1$, and by continuity, they hold on $[1, \theta_1]$ for some $\theta_1 \in (1, \theta^m)$, proving part (ii).

(iii). Fix $\gamma > \bar{\gamma}_W$, which exceeds $\bar{\gamma}_R$ because $\alpha > 2$, let $\bar{\phi}^w$ be the threshold in Lemma 5, and fix $\phi^w \in (0, \bar{\phi}^w)$.

For $\rho > 1/\bar{\phi}^w$, let $\bar{\theta}$ and $\bar{x} = x^*(\bar{\theta})$ be as in that lemma. At $\bar{\theta}$, the strategic effect in (19) is zero, and the direct effect equals $\bar{x}\{\mathbb{E}[\tau_i(\bar{x})] - \frac{n-1}{n}\bar{\theta}\bar{x}\text{Var}(\tau_i(\bar{x}))\} > 0$. Because $(d^2/d\theta^2)x^* < 0$ at $\bar{\theta}$, by continuity there exist θ_2 and θ^m with $\bar{\theta} < \theta_2 < \theta^m$ such that, on $[\theta_2, \theta^m]$, $\gamma > \frac{n-1}{n}\theta x^*$, $(d/d\theta)x^* < 0$, and the direct effect is positive. On this interval, both the direct and strategic effects in (19) are positive, so W strictly increases while x^* and ψ^* strictly decrease.

Lastly, for sufficiently large ρ , Lemma 5 gives $\bar{\theta} > 1$, and part (ii) gives $(d/d\theta)W < 0$ on $[1, \theta_1]$ for some $\theta_1 \in (1, \bar{\theta})$. Continuity gives a minimum of W on $[1, \theta^m]$, and the derivative signs at the endpoints ensure that every minimum is interior. $\square$

Proof of Proposition 2. (i). In the absence of burnout, relative pay is zero, (6) gives $x^* = \{[1 + (n-1)\gamma/n]\theta\}^{1/(\alpha-1)}$, and profit is $\Pi = n(v-1)\theta x^*$. Therefore, $(d/d\theta)\Pi = n\alpha(v-1)x^*/(\alpha-1) > 0$, which strictly increases in θ because x^* does.

(ii). Fix $\gamma > 0$ and $\phi^w > 0$, write $x = x^*(\theta)$, and consider $\theta = 1$ as $\rho \rightarrow \infty$, with the limits in the proof of Proposition 1(ii). Differentiating (16) with respect to θ and using these limits, it can be shown that $(1/x)(d^2/d\theta^2)x \rightarrow (2-\alpha)/(\alpha-1)^2$ at $\theta = 1$, which is the same limit as in the absence of burnout.

Next, expected output per employee is $\mathbb{E}[y_i] = \theta\mathbb{E}[x\tau_i(x)]$. By Lemma 3,

$$\begin{aligned} (d/d\theta)\mathbb{E}[y_i] &= \mathbb{E}[x\tau_i(x)] + \theta(1-\psi)(d/d\theta)x, \\ (d^2/d\theta^2)\mathbb{E}[y_i] &= (1-\psi) \left[2(d/d\theta)x + \theta(d^2/d\theta^2)x - \rho\theta x^{\alpha-1}((d/d\theta)x)^2 \right], \end{aligned}$$

so at $\theta = 1$, $(1/x)(d/d\theta)\mathbb{E}[y_i] \rightarrow \alpha/(\alpha-1) > 0$ and $(1/x)(d^2/d\theta^2)\mathbb{E}[y_i] \rightarrow \alpha/(\alpha-1)^2 > 0$. Fix sufficiently large ρ . By continuity, both derivatives are positive and $\gamma > \frac{n-1}{n}\theta x$ on $[1, \theta_1]$ for some $\theta_1 \in (1, \theta^m)$. On this interval, Lemma 4 gives $\Pi/n = (v-1)\mathbb{E}[y_i] - \phi^f\psi(x, \rho) + \frac{n-1}{2n}\theta^2\text{Var}(x\tau_i(x))$. Because x does not depend on v , the burnout-cost and variance terms have bounded first and second derivatives independent of v . The corresponding derivatives of $\mathbb{E}[y_i]$ have positive minima on $[1, \theta_1]$. Therefore, $(d/d\theta)\Pi > 0$ and $(d^2/d\theta^2)\Pi > 0$ on $[1, \theta_1]$ for sufficiently large v , proving part (ii).

(iii). Fix $\gamma > \bar{\gamma}_R$, let $\bar{\phi}^w$ be the threshold in Lemma 5, and fix $\phi^w \in (0, \bar{\phi}^w)$. For $\rho > 1/\bar{\phi}^w$, let $\bar{\theta}$ be as in that lemma. Because $(d/d\theta)x^* = 0$ and $(d^2/d\theta^2)x^* < 0$ at $\bar{\theta}$, the derivative formulas in part (ii) give $(d/d\theta)\mathbb{E}[y_i] > 0$ and $(d^2/d\theta^2)\mathbb{E}[y_i] < 0$ at $\bar{\theta}$. Choose ρ large enough that $\bar{\theta} > 1$ and the argument in part (ii) applies on $[1, \theta_1]$ for some $\theta_1 \in (1, \bar{\theta})$. By continuity, there exist θ_2 and θ^m with $\bar{\theta} < \theta_2 < \theta^m$ such that, on $[\theta_2, \theta^m]$, $\gamma > \frac{n-1}{n}\theta x^*$, $(d/d\theta)\mathbb{E}[y_i] > 0$, $(d^2/d\theta^2)\mathbb{E}[y_i] < 0$, and $(d/d\theta)x^* < 0$, so that ψ^* also strictly decreases. As in part (ii), choosing v sufficiently large gives $(d/d\theta)\Pi > 0$ on both intervals, $(d^2/d\theta^2)\Pi > 0$ on $[1, \theta_1]$, and $(d^2/d\theta^2)\Pi < 0$ on $[\theta_2, \theta^m]$. Lastly, continuity gives a maximum of $(d/d\theta)\Pi$ on $[1, \theta^m]$. Every maximum is interior because $(d/d\theta)\Pi$ increases near 1 and decreases near θ^m . $\square$

The next two lemmas characterize implementable intensities and the firm's optimal intensity.

Lemma 6. (i) Equation (20) defines a unique $\gamma(x, \theta, \rho) \geq 0$ if and only if $x \geq [\theta/(1 + \rho\phi^w)]^{1/(\alpha-1)}$:

$$\mathbb{E} \left[\left(\gamma - \frac{\theta}{n} \sum_{j=1}^{n-1} x[1 - \tau_j(x)] \right) \right]_+ = \frac{n[(1 + \rho\phi^w)x^{\alpha-1} - \theta]}{(n-1)\theta}. \quad (20)$$

If $x = [\theta/(1 + \rho\phi^w)]^{1/(\alpha-1)}$, then $\gamma(x, \theta, \rho) = 0$. If $x > [\theta/(1 + \rho\phi^w)]^{1/(\alpha-1)}$, then $\gamma(x, \theta, \rho) > 0$ and $(\partial/\partial x)\gamma(x, \theta, \rho) > 0$.

(ii) If

$$(1 + \rho\phi^w)x^{\alpha-1} > \theta + \left(\frac{n-1}{n}\right)^2 \theta^2 \mathbb{E}[x\tau_i(x)], \quad (21)$$

then $\gamma(x, \theta, \rho) > \frac{n-1}{n}\theta x$.

Proof. Rearranging (6) gives (20). The left-hand side of (20) equals zero at $\gamma = 0$, converges to infinity as $\gamma \rightarrow \infty$, and for $\gamma > 0$ has derivative $\Pr(\frac{\theta}{n} \sum_{j=1}^{n-1} x[1 - \tau_j(x)] < \gamma) > 0$ with respect to γ , because no coworker burns out with positive probability. Therefore, (20) has a unique solution $\gamma \geq 0$ if and only if its right-hand side is nonnegative, and this solution is zero if and only if the right-hand side is zero. For $x > [\theta/(1 + \rho\phi^w)]^{1/(\alpha-1)}$, the right-hand side strictly increases in x , whereas the left-hand side weakly decreases in x (Lemma 3), so implicitly differentiating (20) gives $(\partial/\partial x)\gamma(x, \theta, \rho) > 0$.

Lastly, let $\hat{\gamma}$ solve (12) for γ . Using $\mathbb{E}[x(1 - \tau_i(x))] = x - \mathbb{E}[x\tau_i(x)]$, we have $\hat{\gamma} - \frac{n-1}{n}\theta x = \frac{n}{(n-1)\theta}[(1 + \rho\phi^w)x^{\alpha-1} - \theta - (\frac{n-1}{n})^2\theta^2\mathbb{E}[x\tau_i(x)]]$. If (21) holds, then $\hat{\gamma} > \frac{n-1}{n}\theta x$, so $\hat{\gamma}$ solves (20). By uniqueness, $\gamma(x, \theta, \rho) = \hat{\gamma}$. $\square$

We say that an intensity x is *implementable* if $x \geq [\theta/(1 + \rho\phi^w)]^{1/(\alpha-1)}$, in which case the incentive $\gamma(x, \theta, \rho)$ induces x as the equilibrium intensity (Lemma 6). By Lemma 3, $(\partial/\partial x)\tilde{P}(x; \theta, \rho) = [1 - \psi(x, \rho)]G(x; \theta, \rho)$, where

$$G(x; \theta, \rho) = (v-1)\theta + \frac{n-1}{n}\theta^2\mathbb{E}[x(1 - \tau_i(x))] - \phi^f \rho x^{\alpha-1}. \quad (22)$$

By Lemma 4, profit per employee at an implementable intensity x is at most $\tilde{P}(x; \theta, \rho)$, with equality when $\gamma(x, \theta, \rho) \geq \frac{n-1}{n}\theta x$. Consequently, if $\tilde{P}(\cdot; \theta, \rho)$ has a unique maximizer $\hat{x}$ that satisfies (21), then $\hat{x}$ is implementable, $\gamma(\hat{x}, \theta, \rho) > \frac{n-1}{n}\theta\hat{x}$ (Lemma 6), and $\hat{x}$ uniquely maximizes profit over implementable intensities.

Lemma 7. (i) *There exists $\kappa > 0$, depending only on α , v , and θ^m , such that if $\phi^f \max\{\rho, \rho^{1/\alpha}\} < \kappa$, then for every $\theta \in [1, \theta^m]$, $G(\cdot; \theta, \rho)$ has a unique root x^* , at which $(\partial/\partial x)G < 0$. This root uniquely maximizes profit over implementable intensities, and the corresponding incentive satisfies $\gamma^* > \frac{n-1}{n}\theta x^*$.*

(ii) *For fixed θ and ϕ^f , as $\rho \rightarrow 0$, $\rho^{1/(\alpha-2)}x^* \rightarrow [(n-1)\theta^2/(n\phi^f)]^{1/(\alpha-2)}$ and $(\rho/x^*)(d/d\rho)x^* \rightarrow -1/(\alpha-2)$.*

Proof. *Step 1.* Fix $\theta \in [1, \theta^m]$. Since $G(0; \theta, \rho) = (v-1)\theta > 0$ and $G(x; \theta, \rho) \rightarrow -\infty$ as $x \rightarrow \infty$, G has a root. At any root, $\phi^f \rho x^{\alpha-1} \geq (v-1)\theta \geq v-1$, so by Lemma 3,

$$x \geq \left[\frac{v-1}{\phi^f \rho}\right]^{1/(\alpha-1)}, \quad \frac{\mathbb{E}[x\tau_i(x)]}{x} \leq c_\alpha \left[\frac{\phi^f \rho^{1/\alpha}}{v-1}\right]^{1/(\alpha-1)}. \quad (23)$$

Neither bound depends on θ , and as $\phi^f \max\{\rho, \rho^{1/\alpha}\} \rightarrow 0$, the first diverges and the second converges to zero. At any root, $G = 0$ also gives $\phi^f \rho x^{\alpha-2} \geq \frac{n-1}{n}\theta^2\{1 - \mathbb{E}[x\tau_i(x)]/x\}$, so, because $\psi \leq 1$,

$$(\partial/\partial x)G = \frac{n-1}{n}\theta^2\psi - (\alpha-1)\phi^f \rho x^{\alpha-2} \leq \frac{n-1}{n}\theta^2 \left[1 - (\alpha-1) \left(1 - \frac{\mathbb{E}[x\tau_i(x)]}{x}\right)\right],$$

which is negative whenever $\mathbb{E}[x\tau_i(x)]/x < (\alpha-2)/(\alpha-1)$. By (23), this holds at every root when $\phi^f \max\{\rho, \rho^{1/\alpha}\}$ is small, so G changes sign only from positive to negative and has a unique root x^* , which uniquely maximizes $\tilde{P}$ because $(\partial/\partial x)\tilde{P} = (1 - \psi)G$.

Step 2. At $x = x^*$, divide both sides of (21) by x . The left-hand side is at least $x^{\alpha-2}$, and the right-hand side is at most $\theta^m/x + (\theta^m)^2 \mathbb{E}[x\tau_i(x)]/x$. By (23), as $\phi^f \max\{\rho, \rho^{1/\alpha}\} \rightarrow 0$, the former diverges and the latter converges to zero, with bounds that do not depend on θ . Thus, for sufficiently small $\phi^f \max\{\rho, \rho^{1/\alpha}\}$, Lemma 6 gives implementability and $\gamma^* > \frac{n-1}{n}\theta x^*$. Profit per employee is bounded above by $\tilde{P}$ and attains this bound at x^* , so x^* uniquely maximizes profit.

Step 3. Fix θ and ϕ^f , and let $\rho \rightarrow 0$. By (23), $x^* \rightarrow \infty$ and $\mathbb{E}[x^*\tau_i(x^*)]/x^* \rightarrow 0$, and $\rho(x^*)^\alpha \geq [(v-1)/\phi^f]^{\alpha/(\alpha-1)}\rho^{-1/(\alpha-1)} \rightarrow \infty$, so $\psi \rightarrow 1$ at $x = x^*$. Dividing $G(x^*; \theta, \rho) = 0$ by x^* then gives $\phi^f \rho(x^*)^{\alpha-2} \rightarrow \frac{n-1}{n}\theta^2$, which gives the intensity limit, and $(\partial/\partial x)G \rightarrow -(\alpha-2)\frac{n-1}{n}\theta^2$ at $x = x^*$. Implicitly differentiating $G(x^*; \theta, \rho) = 0$ with respect to ρ , and using these limits and $\rho(\partial/\partial \rho)\mathbb{E}[x\tau_i(x)]/x = \{1 - \psi - \mathbb{E}[x\tau_i(x)]/x\}/\alpha \rightarrow 0$ at $x = x^*$ (Lemma 3), gives $(\rho/x^*)(d/d\rho)x^* \rightarrow -1/(\alpha-2)$. $\square$

Proof of Proposition 3. (i). Fix $\gamma > 0$ and write $x = x^*(\theta, \rho, \gamma)$. At a fixed $x > 0$, increasing ρ strictly raises the left-hand side of (6) and weakly lowers the right-hand side, because coworkers' lost work is stochastically increasing in ρ (Lemma 3). Therefore, equilibrium intensity strictly decreases in ρ . As $\rho \rightarrow 0$, (6) gives $x \rightarrow \{[1 + (n-1)\gamma/n]\theta\}^{1/(\alpha-1)}$, and conditioning on which coworkers burn out shows that the expectation in (6) is continuously differentiable in (x, ρ) at $\rho = 0$, so by the implicit function theorem, $(d/d\rho)x$ remains bounded near $\rho = 0$. Therefore, $(d/d\rho)\psi(x, \rho) = (1 - \psi)[x^\alpha/\alpha + \rho x^{\alpha-1}(d/d\rho)x] \rightarrow \alpha^{-1}\{[1 + (n-1)\gamma/n]\theta\}^{\alpha/(\alpha-1)} > 0$, so burnout strictly increases in ρ near $\rho = 0$, proving part (i).

(ii). *Step 1.* For small ρ , Lemma 7 gives a unique optimal intensity $x^* = x^*(\theta, \rho)$ with $\gamma^* > \frac{n-1}{n}\theta x^*$, so Lemma 4 gives $W^*/n = \theta \mathbb{E}[x^*\tau_i(x^*)] - (1/\rho + \phi^w)\psi^* - \frac{n-1}{2n}\theta^2 \text{Var}(x^*\tau_i(x^*))$. Let $u^* = \rho(x^*)^\alpha/\alpha$ denote cumulative exposure, so that $\psi^* = 1 - e^{-u^*}$. The intensity and elasticity limits in Lemma 7 imply that $\rho^{2/(\alpha-2)}u^*$ converges to a positive constant as $\rho \rightarrow 0$ and

$$\frac{\rho}{u^*}(d/d\rho)u^* = 1 + \alpha \frac{\rho}{x^*}(d/d\rho)x^* \rightarrow -\frac{2}{\alpha-2}. \quad (24)$$

Because $\rho^{1/(\alpha-2)}x^*$ and $\rho^{2/(\alpha-2)}u^*$ both converge to positive constants, the product of $1 - \psi^* = e^{-u^*}$ with any fixed powers of x^* and ρ , or with the bounded elasticity in Lemma 7, converges to zero as $\rho \rightarrow 0$.

Step 2. Differentiating W^* with respect to ρ along $x^*(\theta, \rho)$ and multiplying by ρ^2/n , we have $(\rho^2/n)(d/d\rho)W^* = \psi^* + R(\rho)$, where

$$R(\rho) = \theta \rho^2 (d/d\rho) \mathbb{E}[x^*\tau_i(x^*)] - (1 + \rho \phi^w) \rho (d/d\rho) \psi^* - \frac{n-1}{2n} \theta^2 \rho^2 (d/d\rho) \text{Var}(x^*\tau_i(x^*)).$$

Expand the derivatives in $R(\rho)$ using Lemma 3. Terms containing $1 - \psi^*$ converge to zero by Step 1. The remaining terms are bounded by a constant multiple of $\rho \mathbb{E}[x^*\tau_i(x^*)] + \rho \mathbb{E}[(x^*\tau_i(x^*))^2] \leq 2c_\alpha \rho^{1-2/\alpha}$ for $\rho \leq 1$, which converges to zero because $\alpha > 2$. Therefore, $(\rho^2/n)(d/d\rho)W^* \rightarrow 1$, so W^* strictly increases in ρ near $\rho = 0$.

Step 3. Lemma 7 and (24) give $(d/d\rho)x^* < 0$ and $(d/d\rho)u^* < 0$ near $\rho = 0$, so x^* and $\psi^* = 1 - e^{-u^*}$ strictly increase as ρ decreases.

Step 4. Solving (12) for γ gives $\gamma^* = \frac{n-1}{n}\theta \mathbb{E}[x^*(1 - \tau_i(x^*))] + \frac{n(1+\rho\phi^w)(x^*)^{\alpha-1}}{(n-1)\theta} - \frac{n}{n-1}$. Because $x^* \rightarrow \infty$ and $\alpha-1 > 1$, dividing each term by $(x^*)^{\alpha-1}$ shows that $x^*/\gamma^* \rightarrow 0$ and $n(x^*)^{\alpha-1}/[(n-1)\theta\gamma^*] \rightarrow 1$. Differentiating γ^*

with respect to ρ , and using these limits, $|\rho(\partial/\partial\rho)\mathbb{E}[x\tau_i(x)]| \leq x/\alpha$ (Lemma 3), and $(\rho/x^*)(d/d\rho)x^* \rightarrow -1/(\alpha-2)$ (Lemma 7), gives $(\rho/\gamma^*)(d/d\rho)\gamma^* \rightarrow -(\alpha-1)/(\alpha-2)$. Therefore, γ^* strictly increases as ρ decreases near $\rho = 0$. Choosing $\bar{\rho}$ small enough that the signs in Steps 2–4 hold on $(0, \bar{\rho})$ proves part (ii).

(iii). Suppose $1 < (v-1)\phi^w/\phi^f < \alpha$. Because $\psi \leq \min\{\rho x^\alpha/\alpha, 1\} \leq (\rho x^\alpha/\alpha)^{(\alpha-2)/\alpha}$, (22) gives $(\partial/\partial x)G \leq x^{\alpha-2}[\frac{n-1}{n}\theta^2(\rho/\alpha)^{(\alpha-2)/\alpha} - (\alpha-1)\phi^f\rho] < 0$ for sufficiently large ρ . Because $G(0; \theta, \rho) > 0$ and $G(x; \theta, \rho) \rightarrow -\infty$ as $x \rightarrow \infty$, G has a unique root x , which uniquely maximizes $\tilde{P}$. At this root, $(v-1)\theta \leq \phi^f\rho x^{\alpha-1} \leq (v-1)\theta + \frac{n-1}{n}\theta^2 x$, so $x \rightarrow 0$ and $\phi^f\rho x^{\alpha-1} \rightarrow (v-1)\theta$ as $\rho \rightarrow \infty$. Consequently, the left-hand side of (21) minus the right-hand side converges to $\theta[(v-1)\phi^w/\phi^f - 1] > 0$, so by the paragraph preceding Lemma 7, for sufficiently large ρ , $x = x^*(\theta, \rho)$ is the firm's unique optimum and $\gamma^* > \frac{n-1}{n}\theta x$.

Next, $u = \rho x^\alpha/\alpha = x \cdot \rho x^{\alpha-1}/\alpha \rightarrow 0$. Because $0 \leq \rho(\partial/\partial\rho)\mathbb{E}[x(1-\tau_i(x))] \leq x/\alpha$ (Lemma 3), at the optimum we have $\rho(\partial/\partial\rho)G \rightarrow -(v-1)\theta$ and $x(\partial/\partial x)G \rightarrow -(\alpha-1)(v-1)\theta$. Implicit differentiation of $G(x; \theta, \rho) = 0$ therefore gives $(\rho/x)(d/d\rho)x \rightarrow -1/(\alpha-1)$ and $(\rho/u)(d/d\rho)u = 1 + \alpha(\rho/x)(d/d\rho)x \rightarrow -1/(\alpha-1)$, so work intensity and burnout strictly decrease in ρ for sufficiently large ρ . Lastly, by Lemma 4, $W^*/n = \theta\mathbb{E}[x\tau_i(x)] - \phi^w\psi - R$ with $R = \psi/\rho + \frac{n-1}{2n}\theta^2\text{Var}(x\tau_i(x))$. Because $u \rightarrow 0$, Lemma 3 and the preceding limits imply that $\mathbb{E}[x\tau_i(x)]$ and ψ both have elasticities with respect to ρ that converge to $-1/(\alpha-1)$ and that $\phi^w\psi/(\theta x) \rightarrow (v-1)\phi^w/(\alpha\phi^f)$, while $\psi/(\rho x) \leq x^{\alpha-1}/\alpha \rightarrow 0$ and the variance bounds in Lemma 3 give $(\rho/x)(d/d\rho)R \rightarrow 0$. Therefore,

$$\frac{\rho}{n\theta x}(d/d\rho)W^* \rightarrow -\frac{1}{\alpha-1} \left(1 - \frac{(v-1)\phi^w}{\alpha\phi^f}\right) < 0.$$

Choosing $\underline{\rho}$ sufficiently large that these signs hold on $(\underline{\rho}, \infty)$ proves part (iii). $\square$

Proof of Corollary 1. By Lemma 7, there exists $\bar{\rho} > 0$ such that, for every $\rho \in (0, \bar{\rho})$ and $\theta \in [1, \theta^m]$, the firm's optimal intensity x^* is the unique root of $G(\cdot; \theta, \rho)$ and $(\partial/\partial x)G < 0$ at x^* . Because $(\partial/\partial\theta)G = (v-1) + 2\frac{n-1}{n}\theta\mathbb{E}[x^*(1-\tau_i(x^*))] > 0$, the implicit function theorem gives $(d/d\theta)x^* > 0$. Because $(\partial/\partial x)\psi = \rho x^{\alpha-1}(1-\psi) > 0$ (Lemma 3), ψ^* also strictly increases in θ , as desired. $\square$

Lemma 8. *At any fixed exposure $\rho > 0$, the social design chooses*

$$x^S(\rho) = \max \left\{ \left[\frac{\theta}{1 + \rho\phi^w} \right]^{1/(\alpha-1)}, \left[\frac{v\theta}{1 + \rho(\phi^w + \phi^f)} \right]^{1/(\alpha-1)} \right\}. \quad (25)$$

Its incentive is zero if $\rho[\phi^f - (v-1)\phi^w] \geq v-1$, and strictly positive otherwise.

Proof. By Lemma 6, the implementable intensities are exactly those at least $[\theta/(1 + \rho\phi^w)]^{1/(\alpha-1)}$, and this lower bound is implemented by $\gamma = 0$. By Lemma 3, the derivative of the social objective per employee before mitigation spending, $v\theta\mathbb{E}[x\tau_i(x)] - (\phi^f + \rho^{-1} + \phi^w)\psi(x, \rho)$, with respect to x is $[1 - \psi(x, \rho)][v\theta - \{1 + \rho(\phi^w + \phi^f)\}x^{\alpha-1}]$, which changes sign once, from positive to negative, at $[v\theta/\{1 + \rho(\phi^w + \phi^f)\}]^{1/(\alpha-1)}$. Maximizing over implementable intensities gives (25). The maximizer equals the lower bound if and only if $\rho[\phi^f - (v-1)\phi^w] \geq v-1$, and the incentive claim follows because the implementation map in Lemma 6 strictly increases in x . $\square$

Proof of Proposition 4. (i). Fix θ and $\rho > 0$. We first show that $W(x, \theta, \rho, \gamma(x, \theta, \rho))$ strictly decreases in the implemented intensity x . Fix an implementable intensity $x > [\theta/(1 + \rho\phi^w)]^{1/(\alpha-1)}$ and let $\gamma = \gamma(x, \theta, \rho)$. At the symmetric equilibrium, each employee's own-intensity derivative is zero. For each coworker $j \neq i$, differentiating

expected relative pay conditional on the other employees' outputs, as in the proof of Lemma 1, gives $\partial u_i / \partial x_j = -\frac{\theta}{n}(1-\psi)\mathbb{E}[(\gamma - y_i + \bar{y})_+ \mid \tau_j(x) = 1] < 0$, where the inequality is strict because, with positive probability, employee i burns out while all coworkers remain productive, in which case $y_i - \bar{y} < 0$. Also, symmetry gives $\mathbb{E}[y_i - \bar{y}] = 0$, so differentiating (2) with respect to γ yields $\partial u_i / \partial \gamma = \mathbb{E}[(y_i - \bar{y}) - (y_i - \bar{y} - \gamma)_+] = -\mathbb{E}[(y_i - \bar{y} - \gamma)_+] \leq 0$. Because $(\partial / \partial x)\gamma(x, \theta, \rho) > 0$ by Lemma 6, we have $\frac{1}{n}(d/dx)W = \sum_{j \neq i} \partial u_i / \partial x_j + (\partial u_i / \partial \gamma)(d/dx)\gamma < 0$.

Next, $\pi = (\pi + W) - W$. If $\gamma^S(\rho) > 0$, then by the proof of Lemma 8, $\pi + W$ strictly increases for $x < x^S(\rho)$ and has zero derivative at $x^S(\rho)$, so π strictly increases on the implementable intensities up to $x^S(\rho)$ and has a positive derivative at $x^S(\rho)$. Every profit-maximizing intensity therefore exceeds $x^S(\rho)$. If $\gamma^S(\rho) = 0$, every implementable intensity is at least $x^S(\rho)$. A profit-maximizing intensity exists because, for sufficiently large x , (21) holds, so $\pi/n = \tilde{P}$, whose derivative $(1 - \psi)G$ is negative for large x . Lastly, the incentive and burnout rankings follow because both the implementation map and $\psi(x, \rho)$ strictly increase in x .

(ii). Set $\underline{\theta} = \min\{2, \theta^m\}$ and fix $\theta \in [1, \underline{\theta}]$.

Step 1. Choose the cost thresholds so that $(v - 1)\phi^w \geq \phi^f$ throughout the stated parameter region. By Lemma 8, the social design's preferred intensity at every exposure is then $x^S(\rho) = [v\theta / \{1 + \rho(\phi^w + \phi^f)\}]^{1/(\alpha-1)}$. Because $1 + \rho(\phi^w + \phi^f) \geq \max\{1, \rho\phi^w\}$, burnout under the social design satisfies $\psi^S \leq \rho x^S(\rho)^\alpha / \alpha \leq (v\theta)^\alpha / (\alpha-1) / (\alpha\phi^w)$. Because each coworker's lost work is at most x , the left-hand side of (20) is at least $\gamma - \frac{n-1}{n}\theta x$, so (20) and (25) give $\gamma^S \leq \frac{n-1}{n}\theta x^S + n[(1 + \rho\phi^w)(x^S)^{\alpha-1} - \theta] / [(n-1)\theta] \leq \frac{n-1}{n}\theta(v\theta)^{1/(\alpha-1)} + n(v-1)/(n-1)$. Lastly, at $\gamma = \gamma^S(\rho)$, the social value per employee before mitigation spending, $[\Pi(\theta, \rho, \gamma) + W(\theta, \rho, \gamma)]/n$, is at most $v\theta\mathbb{E}[x^S\tau_i(x^S)] \leq v\theta x^S(\rho)$.

Step 2. For every incentive γ and induced intensity x , Lemmas 3 and 4 give

$$\Pi(\theta, \rho, \gamma)/n \leq \tilde{P}(x; \theta, \rho) \leq (v-1)\theta\mathbb{E}[x\tau_i(x)] + \frac{n-1}{2n}\theta^2\mathbb{E}[(x\tau_i(x))^2] \leq c_\alpha \left[(v-1)\theta\rho^{-1/\alpha} + \theta^2\rho^{-2/\alpha} \right], \quad (26)$$

which does not depend on ϕ^w or ϕ^f and vanishes as $\rho \rightarrow \infty$. By Lemma 3 and Assumption 1, $\rho^{1/\alpha}\mathbb{E}[\tau_i(1)]$ converges to a positive constant and $\rho C(\rho) \rightarrow 0$ as $\rho \rightarrow \infty$, so there exists ρ_0 such that $C(\rho_0) < 2K_0$, where $K_0 = (v-1)\mathbb{E}[\tau_i(1)]/4$ with $\mathbb{E}[\tau_i(1)]$ evaluated at exposure ρ_0 . If $1 + \rho_0\phi^w \geq \underline{\theta} + \underline{\theta}^2$, then (21) holds at $(x, \rho) = (1, \rho_0)$, so by Lemmas 6 and 4, and because $\theta \geq 1$, $\psi \leq 1$, and $\text{Var}(x\tau_i(x)) \geq 0$, implementing $x = 1$ at exposure ρ_0 yields $\Pi/n - C(\rho_0) \geq 4K_0 - \phi^f - C(\rho_0) > K_0$ whenever $\phi^f < K_0$. Lastly, choose $\rho_1 \geq \rho_0$ such that the right-hand side of (26) at $\theta = \underline{\theta}$ is below K_0 for all $\rho > \rho_1$. Then every design with $\rho > \rho_1$ yields $\Pi/n - C(\rho) < K_0$. Note that ρ_1 depends only on $\underline{\theta}$, v , α , and C .

Step 3. For $\rho \in (0, \rho_1]$, we have $\phi^f \max\{\rho, \rho^{1/\alpha}\} \leq \phi^f \max\{\rho_1, \rho_1^{1/\alpha}\}$, so for sufficiently small ϕ^f , Lemma 7 implies that the firm's optimal intensity at exposure ρ is the unique root $x^F(\rho)$ of $G(\cdot; \theta, \rho)$, implemented by an incentive greater than $\frac{n-1}{n}\theta x^F(\rho)$, and that the maximized profit per employee, $\tilde{P}(x^F(\rho); \theta, \rho)$, is continuous in ρ because $(\partial/\partial x)G < 0$ at $x^F(\rho)$. By (26), $2/\alpha < 1$, and $\rho C(\rho) \rightarrow \infty$ as $\rho \rightarrow 0$, the maximized profit net of mitigation spending converges to $-\infty$ as $\rho \rightarrow 0$, and by Step 2 it exceeds K_0 at ρ_0 and is below K_0 for $\rho > \rho_1$. Therefore, a profit-maximizing design exists, with $\rho^F \leq \rho_1$ and $\gamma^F > \frac{n-1}{n}\theta x^F$. Lastly, $G(x^F; \theta, \rho^F) = 0$ gives $x^F \geq [(v-1)/(\phi^f \rho_1)]^{1/(\alpha-1)}$ and $\rho^F(x^F)^\alpha / \alpha \geq (v-1)x^F/(\alpha\phi^f)$, so both intensity and cumulative exposure under the profit-maximizing design diverge as $\phi^f \rightarrow 0$.

Step 4. For $\rho \leq \rho_1$ and $\gamma = \gamma^S(\rho)$, Step 1 and $x^S(\rho) \leq [v\theta/(\rho\phi^w)]^{1/(\alpha-1)}$ give $\rho[(\Pi+W)/n - C(\rho)] \leq K_1 - \rho C(\rho)$, where $K_1 = (v\theta)^{\alpha/(\alpha-1)}(\phi^w)^{-1/(\alpha-1)}\rho_1^{(\alpha-2)/(\alpha-1)}$. Because $\rho C(\rho)$ is positive, continuous, and diverges as $\rho \rightarrow 0$, it is bounded below by a positive constant on $(0, \rho_1]$, and because ρ_1 does not depend on ϕ^w , the right-hand side is negative for all $\rho \leq \rho_1$ when ϕ^w is sufficiently large. As $\rho \rightarrow \infty$, $x^S(\rho) \rightarrow 0$ and $\rho x^S(\rho)^\alpha \rightarrow 0$, so Lemmas 3 and 4 and (25) give $[(\Pi+W)/n]/[v\theta x^S(\rho)] \rightarrow 1 - 1/\alpha$ at $\gamma = \gamma^S(\rho)$, whereas $\rho x^S(\rho) \rightarrow \infty$ because $\alpha > 2$, and $\rho C(\rho) \rightarrow 0$. Therefore, $(\Pi+W)/n - C(\rho)$ at $\gamma = \gamma^S(\rho)$ is positive for large ρ and converges to zero as $\rho \rightarrow \infty$. Social optima therefore exist, all with $\rho^S > \rho_1 \geq \rho^F$, and they spend less on mitigation because C strictly decreases.

Step 5. By Step 3, $\gamma^F > \frac{n-1}{n}\theta x^F \geq \frac{n-1}{n}x^F$, which diverges as $\phi^f \rightarrow 0$, whereas the bound on γ^S in Step 1 does not depend on ϕ^f . Similarly, $\psi^S \leq (v\theta)^{\alpha/(\alpha-1)}/(\alpha\phi^w)$ by Step 1, which is small for large ϕ^w , whereas $\psi^F \rightarrow 1$ as $\phi^f \rightarrow 0$ by Step 3. Lastly, choose $\underline{\phi}^w$ sufficiently large and $\bar{\phi}^f$ sufficiently small, with $(v-1)\underline{\phi}^w \geq \bar{\phi}^f$, so that $\rho^S > \rho^F$, $\gamma^S < \gamma^F$, and $\psi^S < \psi^F$ throughout the stated parameter region, as desired. $\square$