Optimal Rule Enforcement[*]

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Abstract

While rules are often seen as rigid, their enforcement can be flexible. We develop a model to study the optimal enforcement of rules in an employment relationship, identifying two categories of relational contracts: manager-led approach and worker-led approach. The manager-led approach, involving cycles of rule enforcement, arises when enforcement costs are low. The worker-led approach, used when enforcement costs rise and surplus grows, relies on worker self-regulation, with the threat of termination motivating effort. In a subcategory of the worker-led approach, rules are enforced initially, before letting the worker to self-regulate.

"Knowing when to bend the rules is one of the hallmarks of an experienced decision maker."

— James G March, 1994. *A Primer on Decision Making*.

1   Introduction

The management literature is littered with criticisms of rules. They lead to rigidity, stifle innovation, and create unnecessary bureaucracy. Reed Hastings, the founder of Netflix, went so far as to famously advocate for a no-rule-rule approach, suggesting that abolishing rules unleashes creativity and autonomy within organizations (Hastings and Meyer, 2020).[1] Despite the criticisms, rules persist in most organizations because they fulfill essential functions. Rules provide structure, ensure consistency, and create a framework that aligns actions with organizational goals. Without rules, organizations risk descending into disorder (Turco, 2016).

Although rules are often thought of as rigid and hard constraints, in practice they are often more flexible than they appear. The enforcement of rules is rarely automatic or uniform; rather, it is carried out by managers who exercise discretion in deciding when and how to apply them. Importantly, enforcing rules involves both tangible and intangible costs. Managers must deploy resources to monitor and ensure compliance and often face psychological and relational costs when disciplining employees. Any parent who has enforced a rule with their children can attest to the emotional toll involved.

The dilemma that managers (or any rule enforcers) face is that they prefer not to enforce the rule as long as the workers provide good behavior. But if the rule is not enforced, then the workers have incentive to shirk and lower their performance. The key challenge is to exercise discretion (to lower the enforcement cost) while maintaining a functioning organizational environment.

An example of selective rule enforcement is described in the classic work of Gouldner (1954), who studies the behaviors of workers and managers in a mining company. The company had a "no-floating around" rule, specifying that "workers must stay at their work-place, except to go to the washroom or to eat". But managers did not strictly follow this rule. When they felt that everything was going smoothly, they would allow workers to walk around to smoke or talk to a friend. Only when the manager felt that the worker was not performing well did the manager invoke the rule. In Goulder's framework, "formal

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[1]An earlier famous example of minimal rules is Nordstrom, which states in its employee handbook that "Rule #1: Use good judgment in all situations. There will be no additional rules" (Spector and McCarthy, 2012).

rules gave supervisors something with which they could 'bargain' in order to secure informal cooperation from workers" (Gouldner, 1954, p. 173). In other words, the actual enforcement of rules arise out of a relational contract between the manager and the workers.

In this paper, we formally examine the dynamics of rule enforcement through the lens of a repeated interaction between a middle manager (she) and a worker (he). At the beginning of each period, the manager has the option to enforce a rule that requires the worker to exert effort. However, enforcing the rule comes at a cost to the manager[2]. If the manager chooses not to enforce the rule, the worker is free to decide whether to put in effort. The worker's effort cost fluctuates over time and is determined by the state of the world, which is only known to him. When the worker's effort cost is high, it is efficient that the worker does not put in effort. Finally, each party can choose to leave the relationship at the end of each period.

We characterize the optimal relational contracts, which fall into two distinct categories. The first category can be described as the "manager-led" approach. In this case, the manager actively manages the relationship by enforcing rules after the worker's behavior has deteriorated. However, this enforcement is not permanent. After a period of strict rule enforcement, the manager eventually relaxes the rules, allowing the worker to return to his previous behavior: exerting effort only when his (privately observed) effort cost is low. Over time, the worker's performance will naturally decline again due to the stochastic nature of the effort cost, causing the manager to enforce the rule. Thus, under the manager-led approach, the relationship cycles between periods of strict rule enforcement, which limits flexibility and adaptability, and periods of relaxed enforcement, during which the worker may slack off. This cyclical pattern reflects the inherent trade-off between maintaining control through rules and allowing for adaptation and discretion.

The cyclical pattern of rule enforcement is closely aligned with observations from various organizational settings. For example, in the mining company studied by Gouldner (1954), managers only enforced rules after a noticeable decline in worker performance. This approach to management, where rules are imposed when productivity or behavior slides, mirrors the "manager-led" pattern we describe. Managers allow for a certain degree of flexibility until performance dips below acceptable levels, at which point enforcement becomes necessary to restore order.

This cyclical pattern also resonates with the governance model in China. Scholars have documented a phenomenon known as "campaign-style mobilization" as a mechanism of governance, wherein the state periodically mobilizes resources and intensifies enforce-

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[2]A familiar example for many readers might be that a professor displaying a "No Phones Allowed" slide at the start of each class.

ment ([Zhou, 2022]). These mobilization periods can roughly be understood as periods of strict rule enforcement, followed by phases of relaxation.[3] Much like in organizational settings, this ebb and flow of enforcement in governance reflects an adaptation to fluctuating circumstances.

Although scholars have long criticized this pattern, described in Chinese as *yi-guan-jiu-si, yi-fang-jiu-luan*, meaning "control leads to stagnation, freedom leads to disorder", these patterns are simply unavoidable. Enforcing rules too rigidly stifles flexibility, while relaxing them too much leads to disorder. The adherence to either strict control or relaxed flexibility is difficult to maintain over the long run, but this cyclical approach may, in fact, be the best that managers or governments can achieve under the constraints they face. The cyclical pattern thus reflects an ongoing negotiation between these two extremes, allowing for a dynamic, if imperfect, equilibrium.

The second category of relational contracts is the "worker-led" approach. In this case, managers do not rely on rule enforcement in the long run to maintain order. Instead, the primary mechanism for ensuring effort from the worker is the threat of termination, or *exit*. The possibility of being fired serves as a disciplinary tool, motivating the worker to manage their own behavior without the need for constant oversight or rule enforcement by the manager.

Under this approach, the worker may initially choose not to exert effort when the cost of doing so is high, knowing that there is some tolerance for this in the short term. However, after a period of lower effort - due to high effort costs - the worker enters a phase where they begin to exert effort again, even when the cost of effort remains high. This change in behavior stems from the worker's understanding that prolonged slacking will eventually lead to the termination of the relationship. Hence, the fear of exit leads the worker to self-regulate and proactively put in effort to avoid termination.

In essence, the worker-led approach does not require managers to actively enforce rules in the way they would in a manager-led system. Instead, the threat of exit creates an incentive for the worker to maintain their productivity. The worker internalizes the potential consequences of sustained underperformance, effectively self-managing through a balance between the current cost of effort and the future risk of termination. This dynamic makes the worker-led approach more hands-off for managers, as they do not need to

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[3][Brandt and Zhu (2000)] presents an empirical study on the "boom-bust" feature of Chinese economy since 1978, showing that this is the result of government's cyclical control on credit allocation. During financial decentralization, state-owned banks divert resources to more productive private sectors, making the government to finance it through creating money. However, this leads to inflation, which forces the government to go back to centralization and retake control on credit allocation. [Brandt and Zhu (2001)] develops a macro-dynamic model to explain this cyclical pattern of Chinese economy.

intervene frequently. Instead, the relationship is governed by the implicit understanding that continued employment is contingent on the worker's ability to maintain adequate effort, even in challenging circumstances when the cost is high.

Our analysis allows us to clearly delineate when each of the two approaches–manager-led and worker-led–comes into play. Naturally, when the cost of enforcing rules is relatively low, the manager-led approach is more likely to be used. Specifically, we show that there exists a cutoff enforcement cost: the manager-led approach is employed if and only if the enforcement cost falls below this threshold. In this scenario, the manager finds it worthwhile to enforce rules actively, as the cost of doing so is manageable and the benefits (i.e., improved worker effort) outweigh the enforcement cost.

When the enforcement cost exceeds this threshold, the worker-led approach is used. Our analysis further reveals two distinct subcategories within the worker-led approach, depending on the size of the enforcement cost. First, when the enforcement cost is sufficiently high–that is, above a second, higher threshold the manager never enforces the rules throughout the relationship. In this case, the cost of enforcing effort is prohibitively expensive, so the manager relies entirely on the threat of termination to motivate the worker. The relationship is thus governed purely by the exit mechanism, with no rule enforcement involved.

Interestingly, when the enforcement cost lies between the two thresholds, a different dynamic emerges within the worker-led approach. In this middle range, the manager will enforce rules at the beginning of the relationship for a limited period of time, even though this enforcement is not necessarily optimal for the overall long-term value of the relationship. This initial use of enforcement reflects the manager's own short-term incentive: she prefers that the worker puts in effort.

This feature of early enforcement is closely related to the idea of deferred rewards in the dynamic game literature. By enforcing the rules at the outset of the relationship, the manager effectively increases the worker's future payoff. Once the initial enforcement period is over, the worker gains more flexibility of not putting in effort when the cost of effort is high. In other words, the initial phase of rule enforcement functions as a way to build up the worker's "credit" or trust within the relationship, allowing for greater discretion in the future. This early enforcement period, therefore, acts as an upfront cost the worker must bear, where high effort early on is effectively "paid" in exchange for more autonomy and flexibility later in the relationship.

In addition to the effects of enforcement costs, we also show that the worker-led approach is more likely to be adopted when the players are more patient, or equivalently, when there is greater surplus in the relationship. Patience, in this context, means that both

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the manager and the worker place a higher value on future payoffs relative to immediate rewards. For the worker, this translates into a greater appreciation of the ongoing relationship, which in turn makes the threat of exit more potent. The worker is less likely to risk termination because they recognize the future benefits of maintaining the relationship, even if doing so requires more effort or self-discipline in the present.

As a result, the management of the relationship increasingly relies on proactive self-regulation by the worker rather than direct enforcement of rules by the manager. The worker, motivated by the desire to preserve the long-term relationship, takes on the responsibility of adjusting their behavior to meet performance expectations, even in the absence of strict supervision. This shift in responsibility reflects a deeper level of trust within the relationship, where the worker is entrusted to manage their own effort levels based on the implicit understanding that their future within the organization depends on it.

This finding is consistent with existing management literature, which suggests that rules and strict enforcement mechanisms are used less frequently in high-performing organizations–those with greater surplus (see Gibbons and Henderson, 2012, for instance, and see Ichniowski and Shaw, 2003 for review). In such organizations, workers are typically granted more autonomy and flexibility, as the focus shifts from rigid rule enforcement to self-management. By transferring the responsibility for regulating behavior to the workers, these organizations cultivate a culture of accountability and self-motivation, where employees actively sustain their contributions to the relationship without the need for constant managerial oversight. However, this autonomy comes with a price: workers may still need to exert effort even when the cost is high, as maintaining their role in the organization sometimes requires short-term sacrifices for long-term benefits.

2 Related Literature

It is widely acknowledged that ultimate decisions should be made by those who can adapt their actions to local information without strict control from rules (Hayek, 1945). There is a growing literature studying the cost of control. The empirical study by Falk and Kosfeld (2006) shows that workers respond negatively to rule enforcement and perceive that as lack of trust and limitation of autonomy. Following their study, there are some theoretical models explaining the hidden cost of control from the perspective of signaling (Sliwka, 2007; Ellingsen and Johannesson, 2008) or reciprocity (Von Siemens, 2013). Li, Mukherjee and Vasconcelos (2023) study a dynamic setting where the rule cannot be taken away once established and show that the adoption of new rules will incur a dynamic cost and make organizations more rigid over time. Despite the cost of rules, the economics and

the management literature still provide the reasons for the wide-spread use of rules in practice. Rule serves as the bargaining chip for management to induce desired outcome (Gouldner, 1954). Work routines can help organizations to achieve less misunderstanding and better coordination (Nelson and Winter, 1985). Sticking to rules can help transaction parties to preserve trust and maintain reputation in unforeseen circumstances (Kreps et al., 1990). Relatedly, there are some papers studying how to motivate lower managers to acquire local information and truthfully report to top management (Alonso, Dessein and Matouschek, 2008, Rantakari, 2008, Rantakari, 2012, also see Gibbons, Matouschek and Roberts, 2013 for a survey).

In contrast to Li, Mukherjee and Vasconcelos (2023), we study a setting where the rule can be enforced or ignored in every period. We contribute to this literature by investigating when should the manager enforce the rule to regulate the worker and how this is affected by enforcement cost. We highlight how enforcement cost can affect the manager's choice between the manager-led approach and the worker-led approach. In particular, when the cost is sufficiently high, it is optimal for the manager not to implement the rule at all and use the threat of exit instead.

The literature of rule is closely related to the incomplete contracting literature on delegation. There are two fundamentally different control systems: ex post performance control and ex ante action planning (Mintzberg, 1989). Both rule and delegation can be a format of ex ante action planning. Starting from the seminal work by Aghion and Tirole (1997), most of the literature on delegation assumes principals can commit to various allocations of control rights through contracts and examines the formal allocation of those control rights (see, e.g., Dessein, 2002, and, for a survey, Bolton and Dewatripont, 2013). However, typically courts do not enforce contracts when transaction parties are in the same organization (see, e.g., Bolton and Dewatripont, 2013, and Aghion, Bloom and Van Reenen, 2014). Given this fact, there are some papers studying the informal allocation of control rights when top management commits through noncontractual means (see, e.g., Aghion and Tirole, 1997, Baker, Gibbons and Murphy, 1999 and Alonso and Matouschek, 2007). A closely related work is Li, Matouschek and Powell (2017), which models power as a relational contract and explores a setting where the optimal allocation of power is not stationary. We follow this paper in studying a relational contract with dynamic setting. In contrast to it, however, we introduce the rule by modeling it as an instruction for the worker to strictly follow and explore how manager's decision on rule enforcement changes over time.

Another element of our paper that aligns with the delegation literature is that we rule out monetary transfer. In our setting, middle manager will not pay the worker. Instead, the

worker is paid a fixed wage by the firm. Usually middle managers do not have the discretion to pay the workers. The literature on mechanism design without transfers explores the optimal design of contracts when parties among the same organization are constrained by managerial or legal issues (see Holmström, 1984, Melumad and Shibano, 1991, and, in a dynamic context, Guo and Hörner, 2015 and Lipnowski and Ramos, 2020).

Our paper is also related to the growing literature on the economics of relationships; see Samuelson (2006) and Mailath and Samuelson (2006) for reviews. Many papers have shown that relationships can improve over time (Ghosh and Ray, 1996; Kranton, 1996; Watson, 1999; Mailath and Samuelson, 2001; Watson, 2002; Chassang, 2010; Yang, 2013; Halac, 2014). However, relationships may also deteriorate because of a worsening production environment (Garrett and Pavan, 2012; Halac and Prat, 2016) or limited allocation of authority constrained by past promises (Li, Matouschek and Powell, 2017). Finally, relationships can cycle between reward and punishment phases in the long run when parties have private information (Padró i Miquel and Yared, 2012; Li and Matouschek, 2013; Zhu, 2013; Fong and Li, 2017).[4] In our model, the relationship also oscillates between reward and punishment phases when players are sufficiently patient. Our focus is that during the punishment phase, the manager can choose between the manager-led action and the worker-led action.

Finally, our paper is also broadly related to the literature on the interaction between formal and informal incentives (see, e.g., Baker, Gibbons and Murphy, 1994; Schmidt and Schnitzer, 1995; Che and Yoo, 2001). This literature assumes that an agent's private action is reflected by both verifiable and non-verifiable signals.[5] Hence, the optimal incentive scheme should combine both formal and informal incentives, and the two forms of incentives can be substitutes as well as complements. We consider a setting where formal contracts are not available. When the rule is not enforced, the worker is driven by informal incentives through repeated interactions. When the rule is enforced, the manager can force the worker to exert effort instead of using continuation payoff to motivate him.

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[4]There is a growing literature on dynamic games with one-sided private information; see Mailath and Samuelson (2006) for a general review and Malcomson (1999) and Malcomson (2013) for surveys of applications in labor and organizational economics. In some models, long-run dynamics do not cycle between reward and punishment phases. Instead, they involve termination of the relationship or convergence to an efficient steady (see, e.g., Clementi and Hopenhayn, 2006; Biais et al., 2007; DeMarzo and Fishman, 2007).

[5]Note that an exception is Kvaløy and Olsen (2009), who study a setting with endogenous verifiability.

3 The Model

Consider a long-term relationship between a manager and a worker. Time is discrete and denoted as $t \in \{1, 2, \ldots, \infty\}$. In each period, the manager and the worker play a stage game characterized by three components: *technology*, *contract* and *payoffs*.

Technology: The worker chooses an effort level $e_t \in \{0, 1\}$. If $e_t = 1$, he generates an output of $Y_t = y$. Otherwise, if $e_t = 0$, the output is zero. Both effort and output are publicly observable. However, the cost of effort is private. It depends on an underlying state $\theta_t \in \{G, B\}$, known only to the worker, and is given by $c(e_t) = c\mathbf{1}_{\theta_t = G} + C\mathbf{1}_{\theta_t = B}$. Assume that $c < C$ so that the effort cost is lower in the good state (G) than in the bad state (B). Also assume that $c < y < C$ so that it is socially efficient to only exert effort in the good state. The state is independently drawn in each period with $\mathbf{P}(\theta_t = G) = p \in (0, 1)$.

Contract: At the beginning of each period, the manager decides whether to offer a contract and, if she offers one, whether to enforce a rule that requires the worker to exert effort. Denote the offer of the contract as $d_t^m \in \{0, 1\}$ with one meaning "yes" and zero meaning "no". Denote the decision of rule enforcement as $\gamma_t \in \{0, 1\}$. If $\gamma_t = 1$, the worker is forced to make $e_t = 1$ regardless of the state θ_t, because otherwise he would be severely punished according to the prescribed rule. In contrast, if $\gamma_t = 0$, the worker is free to make effort conditional on the state. To enforce the rule, the manager must incur a cost $D \geq 0$. This cost can be interpreted as the physical expense of close monitoring or the manager's mental cost that results from the tension between her and the worker.

After receiving the contract offer and knowing the manager's decision on rule enforcement, the worker decides whether to accept them. Denote his decision as $d_t^w \in \{0, 1\}$, where $d_t^w = 0$ means rejection and $d_t^w = 1$ means acceptance.

Payoffs: In each period, if the manager does not offer a contract or the agent declines it, the period ends with both parties receiving their outside option payoffs $(\underline{u}, \underline{\pi})$. We normalize $\underline{u}$ to zero for simplicity. Instead, if a contract is offered and accepted, production occurs according to the previously specified technology. The worker receives a fixed wage w, while the manager obtains the output. To focus on the dynamics of rule enforcement, we abstract from monetary incentives by assuming that the wage is exogenous and not paid by the manager. This setup reflects scenarios where middle managers have limited control over wage-setting. Taking production, the worker's effort cost, and the manager's enforcement cost into account, we express their stage payoffs as follows:

$$\hat{u}_t = d_t^m d_t^w [w - c(e_t)], \text{ and } \hat{\pi}_t = d_t^m d_t^w (Y_t - \gamma_t D).$$

At the end of each period, the manager and the worker observe the realization $x_t \in [0, 1]$ of a public randomization device. We assume that they can also observe a realization of the randomization device at the beginning of period 1. We denote this realization by x_0. The randomization device guarantees that the set of equilibrium payoffs is convex, which is commonly used in the literature. The timing of the stage game is summarized in Figure 1.
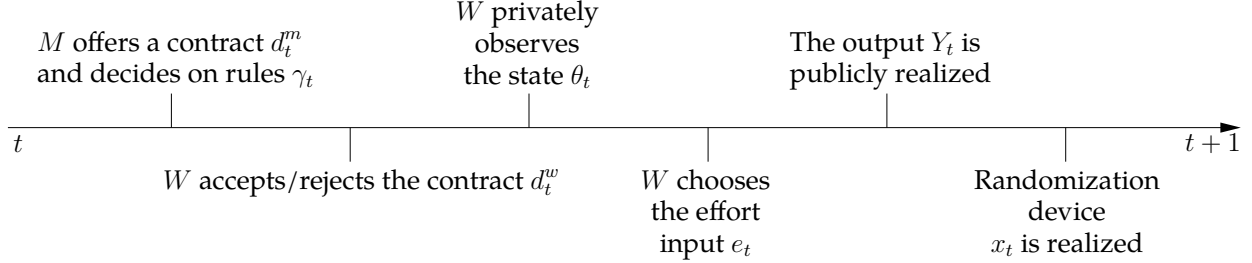

Figure 1: Timeline of the Stage Game

The stage game repeats in each period, with the manager and the worker sharing a common discount factor $\delta \in (0, 1)$. Thus, at the beginning of each period, the expected payoffs for the worker (u_t) and the manager π_t are given by

$$u_t = (1 - \delta) \sum_{\tau=t}^{\infty} \delta^{\tau-t} \hat{u}_t, \text{ and } \pi_t = (1 - \delta) \sum_{\tau=t}^{\infty} \delta^{\tau-t} \hat{\pi}_t.$$

Note that these payoffs are normalized to per-period average values through multiplication by $1 - \delta$.

Following Levin (2003), we define a relational contract as a pure strategy Perfect Public Equilibrium (henceforth PPE). This restriction is without loss of generality because our game has only one-sided private information, and is therefore a game with product monitoring structure. In this case, every sequential equilibrium outcome is also a PPE outcome (see Mailath and Samuelson, 2006, p. 330).

Formally, denote the public history at the beginning of period $t + 1$ as h_{t+1}, where $h_{t+1} = \{d_\tau^m, \gamma_\tau, d_\tau^w, e_t, x_t\}_{\tau=1}^t$. Let $\mathcal{H}_{t+1} = \{h_\tau\}_{\tau=1}^{t+1}$ be the set of public histories of period $t + 1$. Note that $\mathcal{H}_1 = \phi$. A public strategy of the manager is a sequence of functions $\{D_t^m, \Gamma_t\}_{t=1}^\infty$, where $D_t^m : \mathcal{H}_t \to \{0, 1\}$ and $\Gamma_t : \mathcal{H}_t \to \{0, 1\}$. Similarly, a public strategy of the worker is a sequence of functions $\{D_t^w, E_t\}_{t=1}^\infty$, where $D_t^w : \mathcal{H}_t \cup \{d_t^m, \gamma_t\} \to \{0, 1\}$, and $E_t : \mathcal{H}_t \cup \{d_t^m, d_t^w, \gamma_t, \theta_t\} \to \{0, 1\}$. Their strategies compose a PPE if they compose a Nash Equilibrium given any public history $h_t \in \mathcal{H}_t$.

A relational contract is called *optimal* if it is a PPE that maximizes the manager's payoff in the first period. Our goal is to characterize the set of optimal relational contracts.

4 Preliminaries

This section characterizes the set of perfect public equilibrium (PPE) payoffs, denoted as $\mathcal{E}$. Following Abreu, Pearce and Stacchetti (1990), we observe that any equilibrium payoff pair $(u, \pi) \in \mathcal{E}$ can be supported by pure actions or by randomization among equilibrium payoff pairs that are generated by pure actions. When a pure action is used, the players receive a pair of flow payoffs generated in the stage game and expect to receive a pair of associated continuation payoffs in the future. On the other hand, when an equilibrium payoff pair is supported by randomization, the players select a pure action after observing the realization of the randomization device at the end of the previous period. We proceed by first introducing the available pure actions, then specifying the constraints for a pure action to support an equilibrium payoff. Finally, we formulate the maximization problem that characterizes $\mathcal{E}$ and its frontier.

Actions. In each period, if the manager offers a contract and the worker accepts it (i.e., $d_t^m d_t^w = 1$), they can choose from four actions:

1. Forced Effort (F): The manager enforces the rule, compelling the worker to exert effort regardless of the state.
2. Proactive Effort (P): The manager does not enforce the rule, but the worker still exerts effort in all states.
3. Adaptive Effort (A): The manager does not enforce the rule, and the worker exerts effort only in the good state.
4. Shirking (S): The manager does not enforce rule, and the worker makes no effort.

Alternatively, either party can opt out of the contract ($d^m = 0$ or $d^w = 0$), denoted as action O. We characterize $\mathcal{E}$ using these five actions: O, F, P, A, and S. Note that we exclude the case where the manager does not enforce the rule and the worker exerts effort only in the bad state, as this is not incentive-compatible for the worker.

Constraints. Any action $j \in \{O, F, P, A, S\}$ supporting an equilibrium payoff must satisfy three constraints:

1. Promise-keeping constraint: The equilibrium payoff decomposes into a flow payoff from the action j and a continuation payoff (u_j, π_j). The continuation payoff represents the discounted value of future actions.
2. No-deviation constraint: Players have no incentive to deviate from the action j. This ensures that the worker is willing to exert effort in line with the action.

3. Self-enforcing constraint: The continuation payoff must belong to the PPE payoff set, i.e., $(u_j, \pi_j) \in \mathcal{E}$. This constraint, combined with the no-deviation constraint, ensures that the supported payoff is indeed an equilibrium payoff.

The details of these constraints are omitted here and can be found in Appendix **??**.

The Maximization Problem. Now we formulate our maximization problem that characterizes $\mathcal{E}$ and, in particular, its frontier. Let $\bar{u} := \max\{u : (u, \pi) \in \mathcal{E}\}$, i.e., $\bar{u}$ is the highest PPE payoff to the worker. Define the PPE payoff frontier as

$$\pi(u) := \max\{\pi' : (u, \pi') \in \mathcal{E}\}.$$

This frontier is well defined as $\mathcal{E}$ is compact, following Abreu, Pearce and Stacchetti (1990). Furthermore, since the players can randomize their behavior with the randomization device x_t, $\mathcal{E}$ is convex. This implies that $\pi(u)$ is a concave function. To characterize $\pi(u)$, we need to pin down how the continuation payoffs evolve on the frontier.

Lemma 1. *For any $(u, \pi(u))$ that is supported by action $j \in \{O, F, P, A, S\}$, the continuation payoffs $(u_j(u), \pi_j(u))$ are also on the frontier, i.e., $\pi_j(u) = \pi(u_j(u))$. In particular, the worker's continuation payoff has the following properties:*

(i) *If $(u, \pi(u))$ is supported by forced effort, then*

$$u_F(u) = \frac{1}{\delta}u - \frac{1 - \delta}{\delta}[w - pc - (1 - p)C] > u.$$

(ii) *If $(u, \pi(u))$ is supported by proactive effort, then*

$$u_P(u) = \frac{1}{\delta}u - \frac{1 - \delta}{\delta}[w - pc - (1 - p)C] > u.$$

Moreover, $u_P(u) \geq \frac{1-\delta}{\delta}C$ and $u \geq (1 - \delta)[w + p(C - c)]$.

(iii) *If $(u, \pi(u))$ is supported by adaptive effort, then*

$$u_{A,l}(u) = \frac{1}{\delta}u - \frac{1 - \delta}{\delta}w < u$$

and

$$u_{A,h}(u) = \frac{1}{\delta}u - \frac{1 - \delta}{\delta}(w - c),$$

where $u_{A,h}(u) > u$ if and only if $u > w - c$.

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(*iv*) *If* $(u, \pi(u))$ *is supported by shirking, then*

$$u_S(u) = \frac{1}{\delta}u - \frac{1-\delta}{\delta}w < u.$$

(*v*) *If* $(u, \pi(u))$ *is supported by outside option, then*

$$u_O(u) = \frac{1}{\delta}u > u.$$

Lemma 1 characterizes the continuation payoffs for each equilibrium payoff and its supporting action. First, it shows that for any payoffs on the PPE payoff frontier, the associated continuation payoffs also stay on the frontier. This is because the manager's actions are publicly observable, and there is no need to punish her by moving below the frontier (see, e.g., Spear and Srivastava, 1987; Levin, 2003). We can therefore trace out the entire equilibrium action sequences on the frontier without worrying about payoffs below the frontier.

Second, the lemma gives detailed characterization of the worker's continuation payoff. For actions F, P, S, and O, the results follow directly from their respective promise-keeping constraints. For action A, the result is derived as follows. On one hand, to incentivize the worker to exert effort in the good state, the continuation payoff conditional on effort must be sufficiently higher than that of no effort. On the other hand, however, the concave function $\pi(u)$ is maximized by minimizing the gap between the two possible continuation payoffs. Consequently, the worker's incentive constraint binds at the optimal gap. The continuation payoffs are then determined by solving the promise-keeping constraints.

For any u, define the manager's highest payoff as $f_j(u)$ if it is supported by action $j \in \{F, P, A, S, O\}$. With Lemma 1, we can express $f_j(u)$ as:

$$f_F(u) = (1 - \delta)(y - D) + \delta\pi(u_F(u)),$$

$$f_P(u) = (1 - \delta)y + \delta\pi(u_P(u)),$$

$$f_A(u) = (1 - \delta)py + \delta[p\pi(u_{A,h}(u)) + (1 - p)\pi(u_{A,l}(u))],$$

$$f_S(u) = \delta\pi(u_S(u)), \text{ and}$$

$$f_O(u) = \delta\pi(u_O(u)).$$

Since the PPE payoff frontier gives the highest payoff for the manager by using some pure action or randomizing between different pure actions, it is characterized by the following

constrained maximization problem:

$$\pi(u) = \max_{\alpha_j \geq 0, u_j \in [0, \bar{u}]} \sum_{j \in \{F,P,A,S,O\}} \alpha_j f_j(u_j)$$

$$s.t. \sum_{j \in \{F,P,A,S,O\}} \alpha_j = 1$$

$$\sum_{j \in \{F,P,A,S,O\}} \alpha_j u_j = u$$

If any of the weight α_j equals one, $(u, \pi(u))$ is supported by a pure action from $\{F, P, A, S, O\}$. Otherwise, it is generated by randomization. We will characterize the PPE payoff frontier by choosing these weights. For our analysis, we make three sets of assumptions.

Assumption 1. (i) $c < w < pc + (1 - p)C$; (ii) $w > \frac{c}{p} - C$.

Assumption 2. (i) $\delta > \frac{C}{w+C-c}$; (ii) $\delta w \geq \frac{c}{\delta} + (1 - \delta)p(C - c)$.

Assumption 3. (i) $\frac{\pi}{y} < \frac{c}{pc+(1-p)C}$; (ii) $\frac{\pi}{y} < \max\{\frac{\delta p}{1+\delta p}, \frac{\delta(w+C)-C}{\delta[pc+(1-p)C]}\}$.

Part (i) of Assumption 1 indicates that, in the stage game, the worker prefers the outside option over proactive effort but prefers adaptive effort to the outside option. Part (ii) of Assumption 1, together with part (i) of Assumption 2, ensures that proactive effort can be made within the relational contract and implies that the manager prefers initiating an equilibrium with proactive effort rather than adaptive effort. Part (ii) of Assumption 2 guarantees that forced effort and proactive effort are only considered when the worker underperforms. Assumption 3 serves as a simplifying condition, allowing our focus to remain on rule enforcement rather than worker rewards.

5 Optimal Relational Contract

How can a manager induce effort from an under-performing worker? Two main approaches are commonly considered: the *manager-led* approach and the *worker-led* approach. The manager-led approach involves the manager enforcing rules to force the worker to exert effort (action F). In contrast, the worker-led approach relies on the worker's proactive effort (action P), which is motivated by the threat of termination.

This section examines the optimal choice between the manager-led approach and the worker-led approach. We begin with a proposition that provides an overview of the preferred approach, followed by a detailed analysis of the dynamics under each strategy.

Proposition 1. *There exists a cutoff $\underline{D}(\delta) \geq 0$, such that:*

(i) *When $D < \underline{D}(\delta)$, the manager adopts the manager-led approach (i.e., any payoff on the PPE payoff frontier is not supported by proactive effort).*[6]

(ii) *When $D \geq \underline{D}(\delta)$, the manager adopts the worker-led approach (i.e., some payoffs on the PPE payoff frontier are supported by proactive effort).*

The choice between the two approaches essentially boils down to the choice between forced effort and proactive effort. Both actions will deliver the same output as the worker will exert effort regardless of the state. The downside of the forced effort is that the manager has to pay a fixed cost to enforce the rule. Hence, ceteris paribus, proactive effort is preferred by the manager.

Nevertheless, proactive effort is not always feasible as the worker will not be motivated when his payoff is too low. To provide enough incentive for the worker to proactively exert effort, sufficient rent must be allowed for the worker. In contrast, with the forced effort, the manager can simple pay a cost and force the worker to put in effort even if the worker's payoff is minimal. Thus, the manager can resort to forced effort when the worker's utility is very low and proactive effort is not feasible. This requires lower continuation payoff for the worker and deters future inefficient actions for the manager like adaptive effort or shirking.

When considering rule enforcement, the manager has to balance the trade-off between the enforcement cost and the benefit from deterring inefficient actions. As is shown in Proposition 1, when the enforcement cost is sufficiently low, the benefit of forced effort dominates. Consequently, the manager will adopt the manager-led approach to regulate the worker. Conversely, when the enforcement cost is high, the manager will opt for the worker-led approach, relying on the worker to proactively behave well.

In the following part, we examine these two approaches by characterizing the optimal relational contract, specifically, the PPE that maximizes the manager's expected payoff. To achieve this, we first characterize the PPE payoff frontier by solving the aforementioned constrained maximization problem, and then describe the optimal relational contract.

5.1 Manager-led Approach

The following lemma characterizes the PPE payoff frontier when the enforcement cost is sufficiently low.

Lemma 2. *When $D < \underline{D}(\delta)$, there exist cutoffs $0 < \underline{u}^A < \overline{u}^A < w$, such that:*

(i) *For $u \in [0, \underline{u}^A)$, the payoff frontier is linear and supported by randomization between $(0, \pi(0))$ and $(\underline{u}^A, \pi(\underline{u}^A))$. We have $\pi(0) > 0$ and the payoff $(0, \pi(0))$ is supported by force effort.*

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[6]When there is a tie between the two approaches, we break the tie by favoring the worker-led approach.

(ii) For $u \in [\underline{u}^A, \overline{u}^A]$, $\pi(u) = f_A(u)$ (i.e., the payoff frontier is supported by adaptive effort).

(iii) For $u \in (\overline{u}^A, \overline{u}]$, the frontier is linear and supported by randomization between $(\overline{u}^A, \pi(\overline{u}^A))$ and $(\overline{u}, \underline{\pi})$. We have $\pi(\overline{u}) = \underline{\pi}$ and the payoff $(\overline{u}, \underline{\pi})$ is supported by shirking action.
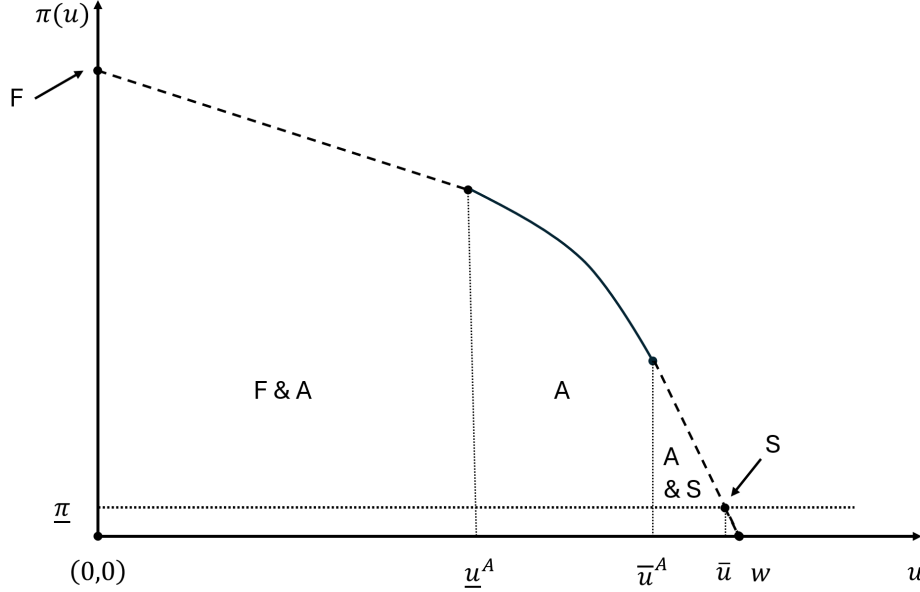

Figure 2: PPE Payoff Frontier: $D < \underline{D}(\delta)$

Figure 2 illustrates the three regions described in Lemma 2. In the middle region, the payoffs at the frontier are supported by playing pure action adaptive effort. Also, the $(0, \pi(0))$ payoff pair is the only point on the frontier that is supported by playing forced effort, and the $(\overline{u}, \underline{\pi})$ payoff pair is the only point on the frontier that is supported by playing shirking action. In the other two regions, the payoffs are sustained through randomization. Without loss of generality, we assume that in the regions where randomization is used, the players randomize only between the endpoints of the two adjacent regions that are sustained by pure actions.[7]

One important feature of the frontier is that the socially efficient action, namely adaptive effort, is only used when the worker's continuation payoff is moderate. When the worker's continuation payoff is sufficiently low, especially to the left of $\underline{u}^A$, he lacks the credibility to persist in using adaptive effort. In such cases, the manager will enforce the rule to regulate the worker's performance. Conversely, when the worker's continuation payoff is sufficiently

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[7]There can be other implementations for the randomization regions. For example, when $u = \underline{u}^A - \varepsilon$, where ε is a sufficiently small positive number, we can also use pure action A to support the frontier. The frontier is still a straight line, and this will not change the PPE payoff pairs on the frontier.

high, especially to the right of $\overline{u}^A$, the manager cannot leverage future compensation to incentivize the worker to exert effort in good states. As a result, shirking action has to be adopted.

Now we can describe the optimal relational contract when enforcement cost is sufficiently low.

Proposition 2. *When $D < \underline{D}(\delta)$, the optimal relational contract satisfies the following.*

First period: The worker's and manager's payoffs are given by $(0, \pi(0))$. The parties engage in forced effort. The worker's continuation payoff is given by $u_F(0)$.

Subsequent periods: The agent's and the principal's expected payoffs are given by $u \in \{0\} \cup [\underline{u}^A, \overline{u}^A] \cup \{\overline{u}\}$ and $\pi(u)$. Their actions and continuation payoffs depend on what region u is in.

(i) *If $u = 0$, the parties choose forced effort. The worker's continuation payoff is given by $u_F(0) > 0$.*

(ii) *If $u \in [\underline{u}^A, \overline{u}^A]$, the parties choose adaptive effort. If the worker puts in effort, his continuation payoff is given by $u_{A,h} \geq u$. If, instead, he shirks, his continuation payoff is given by $u_{A,l} < u$.*

(iii) *If $u = \overline{u}$, the parties engage in shirking action. The worker's continuation payoff is given by $u_S(\overline{u}) < \overline{u}$.*

The proposition demonstrates that players initially engage in forced effort. Specifically, the worker is compelled to exert effort by rule. Later, adaptive effort is employed to motivate the worker to deliver the desired output. In this phase, the manager increases the worker's continuation payoff when effort is exerted and decreases it when shirking occurs.

To understand how the manager optimally increases the worker's continuation payoff, consider the scenario where forced effort is used. The worker is compelled to exert effort, causing his continuation payoff to increase. At the end of this period, the parties engage in randomization to determine their actions for the subsequent period. Depending on the randomization outcome, they either continue with forced effort or switch to adaptive effort. Once adaptive effort is employed, the worker exerts effort only in good states. If the state remains good for several consecutive periods, the worker keeps putting in effort. During this time, the worker's continuation payoff increases steadily until it exceeds the threshold $\overline{u}^A$. At the end of this period, randomization occurs again to determine the actions for the following period. Based on the outcome, the parties either persist with adaptive effort or transition to shirking.

Conversely, to understand how the manager optimally decreases the worker's continuation payoff, consider the scenario where shirking is employed. The worker exerts no effort, causing his continuation payoff to decrease. At the end of this period, the parties

engage in randomization to decide their actions for the subsequent period. Depending on the randomization outcome, they either continue with shirking or switch to adaptive effort. Once adaptive effort is employed, the worker shirks in bad states. If the state remains bad for several consecutive periods, the worker continues to shirk. During this time, the worker's continuation payoff decreases steadily until it drops below the threshold $\underline{u}^A$. At the end of this period, randomization occurs again to determine the actions for the following period. Based on the outcome, the parties either persist with adaptive effort or move to forced effort.

The above proposition describes the optimal relational contract and how it evolves over time. However, it leaves an open question about the long-run outcome of the relationship. The following corollary answers this question.

Corollary 1. *Suppose that $D < \underline{D}(\delta)$. Then, in the long run, the relationship will alternate between punishment phase (using forced effort) and reward phase (using adaptive effort or shirking action).*

This corollary shows that when enforcement cost is sufficiently low, the manager will frequently use rule to regulate the worker in the long run. It is easier for the manager to enforce the rule than provide enough future incentive to motivate the worker. Hence, we refer to this as "manager-led" approach.

The worker will be forced to exert effort if he was not performing well, while he can adapt his effort to the sate when he did a great job. This pattern is consistent with what Gouldner (1954) found in his case study. In the company he investigated, there was a "No-floating" rule, which required workers to stay at their workplace unless they needed to go to the washroom or eat. However, managers selectively enforced this rule in practice. Workers were allowed to walk around if the manager thought everything was smooth. But the manager would invoke the rule when workers were not performing well.

The optimal relational contract exhibits a long-term pattern of oscillation between punishment and reward phases, a phenomenon commonly observed in literature on dynamic games with one-sided private information (see, e.g., Padró i Miquel and Yared, 2012; Li and Matouschek, 2013; Zhu, 2013, and Fong and Li, 2017). It is important to note that Li, Matouschek and Powell (2017) study a game similar to ours, but the relationship in their model can end up with punishment or reward forever. This long-run outcome is not optimal in our model. Given that the manager's outside option is positive, the worker cannot shirk indefinitely. Since the manager can enforce the rule, she does not use exit as a form of punishment.

Another important feature of optimal relational contract is that it usually involve Pareto-inefficient play on the equilibrium path (see, e.g., Green and Porter, 1984, the second part of

Levin, 2003, Li and Matouschek, 2013; Li, Matouschek and Powell, 2017, and Fuchs, Green and Levine, 2022). However, in our model, such Pareto-inefficient actions do not occur along the equilibrium path since the outside option is not utilized. When punishment occurs, the manager's payoff strictly increases through rule enforcement. Conversely, when shirking is adopted as a reward, the manager's payoff strictly decreases.

5.2 Worker-led Approach

The following lemma characterizes the PPE payoff frontier when the enforcement cost is sufficiently high.

Lemma 3. *When $D \geq \underline{D}(\delta)$, there exist cutoffs $0 < \underline{u}^P \leq \overline{u}^P \leq \underline{u}^A < \overline{u}^A < w$, such that:*

(i) *For $u \in [0, \underline{u}^P)$, the payoff frontier is linear and supported by randomization between $(0, \pi(0))$ and $(\underline{u}^P, \pi(\underline{u}^P))$. We have $\pi(0) \geq 0$ and the payoff $(0, \pi(0))$ is supported by F or O.[8]*

(ii) *For $u \in [\underline{u}^P, \overline{u}^P]$, $\pi(u) = f_P(u)$ (i.e., the payoff frontier is supported by proactive effort).*

(iii) *For $u \in (\overline{u}^P, \underline{u}^A)$, the frontier is linear and supported by randomization between $(\overline{u}^P, \pi(\overline{u}^P))$ and $(\underline{u}^A, \pi(\underline{u}^A))$.*

(iv) *For $u \in [\underline{u}^A, \overline{u}]$, the frontier is the same as that in part (iii) of Lemma 2.*

Figure 3 illustrates the five regions described in Lemma 3.[9] In the second and fourth regions, the payoffs at the frontier are supported by playing pure actions, proactive effort and adaptive effort respectively. Also, the $(0, \pi(0))$ payoff pair is the only point on the frontier that is supported by playing forced effort or outside option, and the $(\overline{u}, \underline{\pi})$ payoff pair is the only point on the frontier that is supported by playing shirking action. In the other three regions, the payoffs are sustained through randomization between endpoints of the two adjacent regions.

One notable feature of the frontier is that $(\underline{u}^P, \pi(\underline{u}^P))$ is the left-most point supported by proactive effort. As is discussed at the beginning of this section, proactive effort is not always feasible. To incentivize the worker to exert proactive effort, the worker's payoff must be sufficiently large. When the worker's continuation payoff drops below the threshold $\underline{u}^P$, forced effort or even outside option should be involved to support the frontier.

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[8] When D is large enough, $\pi(0) = 0$ and $(0,0)$ is supported by players taking outside option. Otherwise, $\pi(0) > 0$ and $(0, \pi(0))$ is supported by using forced effort.

[9] This figure only shows the case when $(0, \pi(0))$ is supported by using forced effort. The figure when $(0,0)$ is supported by O is the same except that the frontier is a straight line between $(0,0)$ and $(\underline{u}^P . \pi(\underline{u}^P))$. It is possible that $(0, \pi(0))$ gives the manager the highest payoff, which is not shown in this figure. We will talk about this case later.
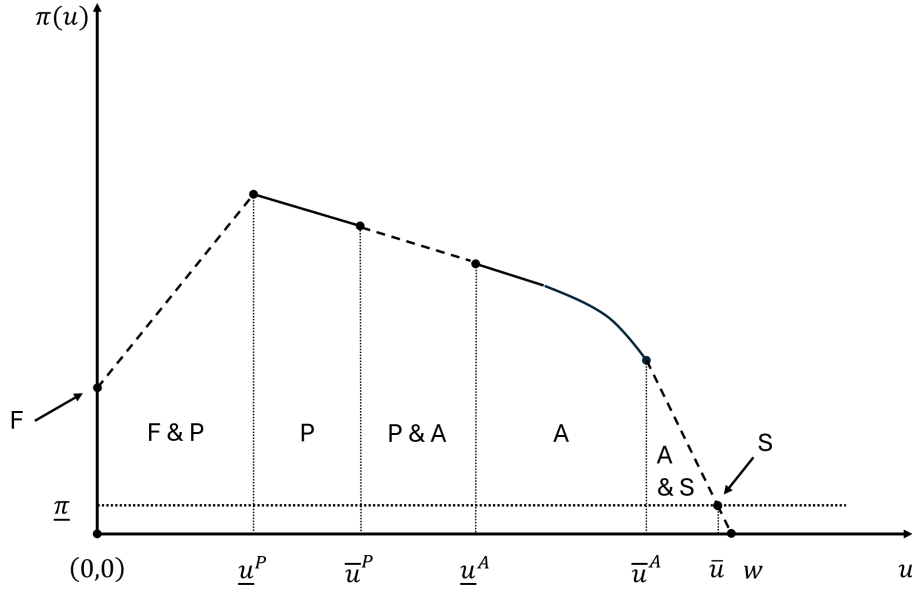
Figure 3: PPE Payoff Frontier: $D \geq \underline{D}(\delta)$

Before describing the optimal relational contract, it is essential to determine the action taken by the parties in the first period. The following lemma addresses this question.

Lemma 4. *Let $u^* = \mathrm{argmax}_{u \in [0,w]} \pi(u)$. There exists a cutoff $\overline{D}(\delta) > \underline{D}(\delta)$, such that:*

(i) When $D \geq \overline{D}(\delta)$, $u^* = \underline{u}^P$ and $(u^*, \pi(u^*))$ is supported by proactive effort.[10]

(ii) When $D < \overline{D}(\delta)$, $u^* = 0$ and $(u^*, \pi(u^*))$ is supported by forced effort.

This lemma shows that the enforcement cost plays an important role in determining the highest point on the PPE frontier, which affects the action taken in the first period, given that we are focusing on the relational contract favoring the manager. In particular, when the enforcement cost is sufficiently large, proactive effort is adopted in the first period. The following proposition describes the optimal relational contract under this scenario.

Proposition 3. *When $D \geq \overline{D}(\delta)$, the optimal relational contract satisfies the following.*

First period: The worker's and the manager's payoffs are given by $(\underline{u}^P, \pi(\underline{u}^P))$. The parties engage in proactive effort. The worker's continuation payoff is given by $u_P(\underline{u}^P)$.

Subsequent periods: The agent's and the principal's expected payoffs are given by $u \in [\underline{u}^P, \overline{u}^P] \cup [\underline{u}^A, \overline{u}^A] \cup \{\overline{u}\}$ and $\pi(u)$. Their actions and continuation payoffs depend on what region u is in.

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[10]When $(0, \pi(0))$ and $(\underline{u}^P, \pi(\underline{u}^P))$ deliver the same expected payoff to the manager, we choose $(\underline{u}^P, \pi(\underline{u}^P))$ since the worker's payoff is higher.

(*i*) *If $u \in [\underline{u}^P, \overline{u}^P]$, the parties choose proactive effort. The worker's continuation payoff is given by $u_P(u) > u$.*

(*ii*) *If $u \in [\underline{u}^A, \overline{u}^A] \cup \{\overline{u}\}$, the action and the continuation payoff are the same as those in part (*ii*) and (*iii*) of Proposition 2.*

This proposition shows that players initially engage in proactive effort when the enforcement cost is sufficiently high. The worker voluntarily exerts effort regardless of the state. To incentivize such behavior, the worker is rewarded with higher continuation payoff in the future. When the adaptive effort is used later on, the dynamics are quite similar to those in the previous scenario. The only difference is that when the worker's continuation payoff drops below the threshold $\underline{u}^A$, the parties randomize between proactive effort and adaptive effort.

Given that the enforcement cost is sufficiently high, the manager will not actively enforce the rule to regulate the worker. Instead, the worker will proactively behave well after several consecutive periods of no effort. Aware that he is not performing well, the worker worries about the possibility of being fired by the manager. Consequently, the worker will proactively exert effort even if the state is bad. Therefore, the long-run outcome differs from that observed when the enforcement cost is sufficiently low. The following corollary describes the long-run outcome under this scenario.

Corollary 2. *Suppose that $D \geq \underline{D}(\delta)$. Then, in the long run, the relationship will alternate between punishment phase (using proactive effort) and reward phase (using adaptive effort or shirking action).*

This corollary demonstrates that rule is not enforced in the long run. Although we observe a similar pattern to the previous scenario, namely oscillation between punishment and reward phases, the punishment is carried out through proactive effort instead of forced effort. After a number of consecutive periods of poor performance, the worker is motivated by the threat of termination of the relationship. Hence, we refer to this as "worker-led" approach.

As demonstrated in Lemma 4, forced effort is adopted in the first period when the enforcement cost is lower than the threshold $\overline{D}(\delta)$. We have already examined the scenario where the enforcement cost is below $\underline{D}(\delta)$ in the analysis of manager-led approach. Hence, we now turn our attention to the case where the enforcement cost is moderate, i.e., $\underline{D}(\delta) \leq D < \overline{D}(\delta)$.

Figure 4 illustrates the scenario where the enforcement cost is moderate. It is the same as that in Figure 3 when $u \geq \underline{u}^P$. The only difference is that the manager's highest payoff is
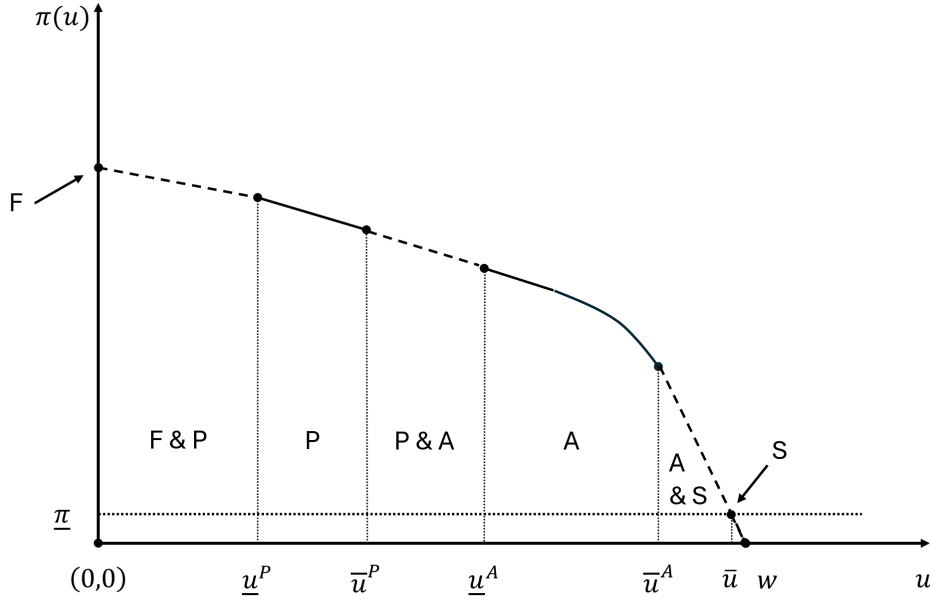
Figure 4: PPE Payoff Frontier: $\underline{D}(\delta) \leq D < \overline{D}(\delta)$

achieved at $(0, \pi(0))$. The following proposition describes the optimal relational contract and how it evolves under this scenario.

Proposition 4. *When $\underline{D}(\delta) \leq D < \overline{D}(\delta)$, the optimal relational contract satisfies the following.*

First period: The worker's and the manager's payoffs are given by $(0, \pi(0))$. The parties engage in forced effort. The worker's continuation payoff is given by $u_F(0)$.

Subsequent periods: The agent's and the principal's expected payoffs are given by $u \in \{0\} \cup [\underline{u}^P, \overline{u}^P] \cup [\underline{u}^A, \overline{u}^A] \cup \{\overline{u}\}$ and $\pi(u)$. Their actions and continuation payoffs depend on what regions u is in.

(i) *If $u = 0$, the parties engage in forced effort. The worker's continuation payoff is given by $u_F(0) > u$.*

(ii) *If $u \in [\underline{u}^P, \overline{u}^P] \cup [\underline{u}^A, \overline{u}^A] \cup \{\overline{u}\}$, the action and the continuation payoff are the same as those in Proposition 3.*

This proposition shows that forced effort is initially employed when the enforcement cost is moderate. Whenever forced effort is utilized, either the continuation payoff increases to exceed $\underline{u}^P$, or players randomize between using forced effort and proactive effort. Consequently, in the long run, the dynamics resemble those observed when the enforcement cost is sufficiently high; namely, the worker is still motivated by the threat of termination

of relationship when effort is inadequate. Hence, the "worker-led" approach prevails in this scenario.

Given that the enforcement cost is not excessively high, it is optimal for the manager to implement the rule at the outset of the relationship to extract more rent. Without forced effort, the relationship would commence with proactive effort, leading to the expected payoffs $(\underline{u}^P, \pi(\underline{u}^P))$ for the parties. With forced effort, the worker's payoff drops to zero while the manager's payoff increases to $\pi(0)$. This indicates that the rule is enforced at the beginning solely for rent extraction.

In summary, either manager-led or worker-led approach will be adopted in the long run, determined by the enforcement cost. To regulate the worker, the manager will not oscillate between forced effort and proactive effort. However, when the enforcement cost is moderate, these two actions can coexist at different stages of a relationship. In particular, forced effort is employed initially to extract rent, while proactive effort is adopted in the long run.

5.3   Effects of Patience

We have demonstrated that enforcement cost plays a crucial role in determining the actions adopted in the optimal relational contract. The two thresholds of enforcement cost are influenced by the patience of the players. The following proposition elucidates the effects of patience on these two thresholds.

Proposition 5. *When δ increases, both $\underline{D}(\delta)$ and $\overline{D}(\delta)$ will decrease.*

This proposition shows that rule is less likely to be adopted when players are more patient. From our previous discussion, we understand that $\underline{D}(\delta)$ determines whether rule will be used in the long run to regulate worker, while $\overline{D}(\delta)$ determines whether rule will be used in the short run to extract rent.

As players become more patient, they place greater importance on future payoffs. Hence, the worker values the relationship more, enhancing the potency of the threat of termination. Therefore, given the same enforcement cost, it is more advantageous for the manager to motive the worker through the threat of termination rather than by enforcing the rule at a cost. As a result, rule is less likely to be used to regulate the worker in the long run.

At the outset of the the relationship, the worker can be motivated to exert proactive effort for longer periods due to increased patience. Proactive effort yields the same output for the manager as forced effort, but without the enforcement cost. Thus, employing forced effort will extract less rent when the worker becomes more patient. As a result, rule is also less likely to be used for rent-extraction in the short run.

6 Discussion

6.1 Interim Rule Enforcement

An inherent feature of our main model is that the manager announces rule enforcement before the worker decides to accept the contract. As the worker may decline the contract after knowing the enforcement decision, the manager's discretion in the rule enforcement is limited. However, in practice, managers often enforce rules after workers have agreed to the contracts. To capture this alternative scenario, we adjust our model by allowing the manager's rule enforcement decision (γ_t) to occur after the worker's participation decision (d_t^w). We term this setup *interim rule enforcement*, in contrast to *ex-ante rule enforcement* (Section 3).
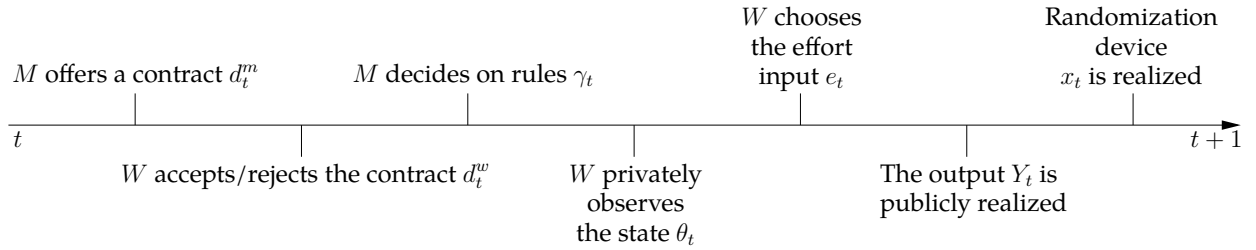

Figure 5: New Timeline of the Stage Game

Figure 5 illustrates the timeline under interim rule enforcement. The following lemma describes the direct consequence of such a change.

Lemma 5. *Under interim rule enforcement, the manager's payoff on the PPE payoff frontier satisfies* $\pi(u) \geq (1 - \delta)(y - D)$ *whenever it is supported by a pure action other than the outside option.*

Lemma 5 shows that interim rule enforcement allows the manager to guarantee a payoff of $(1 - \delta)(y - D)$ when selecting a pure action other than the outside option. This is because, after the worker accepts the contract, the manager retains the option to enforce the rule. By enforcing the rule, the manager incurs a cost of D but obtains y from the worker's forced effort. As a result, this managerial option imposes the lower bound on the manager's payoff. The following proposition characterizes the effect of this option.

Proposition 6. *Compared with ex-ante rule enforcement, interim rule enforcement (weakly) decreases the manager's payoff from the optimal relational contract.*

Proposition 6 shows that interim rule enforcement actually damages the manager's payoff. Recall from Corollaries 1 and 2 that under ex-ante rule enforcement, the optimal relational contract features cyclical dynamics between the punishment phase and the

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reward phase. In particular, the worker is willing to exert adaptive effort during the reward phase only because the manager promises rewards in the subsequent periods. However, interim rule enforcement obstructs such future rewards, thereby undermining the value of the relationship.

Specifically, when the manager and the agent enter the reward phase, promising higher continuation payoffs for the worker reduces the manager's continuation payoff (see Figures 2, 3, and 4). Since the manager's payoff is bounded below by $(1 - \delta)(y - D)$, the range of continuation payoffs for the worker is restricted by interim rule enforcement. As a result, a payoff that is supported by adaptive effort under ex-ante rule enforcement may have to be supported by shirking or randomization involving shirking under interim rule enforcement. This diminishes the manager's payoff on the frontier.

An important message from Proposition 6 is that constraints on the manager's discretion can be beneficial even for the manager herself. This message complements our analysis of the relationship between selective rule enforcement and organizational performances. While our main results in Section 5 demonstrate that selective rule enforcement fosters a more effective organization than blind rule enforcement, Proposition 6 indicates that managerial discretion should still be limited to a certain extent.

6.2 Public Information: the Impact of AI

So far, we have assumed that the effort cost is the worker's private information. This assumption is particularly relevant in industries where effort costs fluctuate due to turbulent environments (e.g., see the mining firm studied by Gouldner 1954). However, advancements in artificial intelligence (AI) now provide the manager with better opportunities to estimate these effort costs by analyzing relevant data. It remains unclear how the growing use of AI may influence rule enforcement in the manager-worker relationship. In this subsection, we consider the scenario where effort costs are public information and examine the role of AI in shaping the dynamics. We first analyze the impact of AI on the enforceability of adaptive effort and then explore its broader implications for rule enforcement.

Lemma 6. *Suppose that the worker's effort cost is public information. Then, adaptive effort (i.e., action A) is self-enforcing.*

Lemma 6 shows that public information about effort costs significantly improves the enforceability of adaptive effort. Recall the scenario where the effort cost is privately known to the worker. To enforce adaptive effort, the manager must ensure that the continuation payoff for exerting effort must exceed that for not exerting effort. This additional payoff can be interpreted as an "information rent"—compensation the manager effectively pays due

to the worker's informational advantage. However, if the manager observes the worker's effort cost, this information rent becomes unnecessary. When observing that the effort cost is low, the manager can induce the worker to exert effort through the threat of termination. Thus, as long as both players are sufficiently patient, adaptive effort can be enforced even if the continuation payoffs remain the same as the flow payoff of the action.

7 Conclusion

This paper explores the optimal enforcement of rules in employment relationships. Optimal relational contracts fall into two categories: manager-led approach and worker-led approach. When enforcement costs are low, the manager-led approach is used, characterized by cycles of rule enforcement and relaxation. In this setting, the manager plays an active role in maintaining the worker's performance by enforcing the rule when necessary to ensure effort. However, as enforcement costs increase and the surplus of the relationship grows, the worker-led approach will be chosen. Here, the threat of termination serves as the motivator, causing the worker to self-regulate and maintain effort without managerial supervision in the long run.

Furthermore, we identify a subcategory within the worker-led approach where rules are enforced at the beginning of the relationship. This temporary enforcement helps establish future flexibility. Our findings align with empirical studies that suggest that high-performing organizations, which typically have greater surplus, rely less on rigid rules and more on worker autonomy.

For future research, it would be valuable to explore how managerial characteristics, which influence enforcement costs, interact with the production environment and the surplus of the relationship. This could provide further insight into when and how organizations transition between different enforcement strategies, potentially linking management styles to specific industry or market conditions.

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