Don't Fear the Meter: How Longer Time Limits Bias Managers to Prefer Hiring with Flat Fee Compensation

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Abstract

Time limits and deadlines are pervasive in organizational settings. Managers work under time limits themselves and also manage time limits for others. While the motivational effect of time limits on individual and group performance has been studied, little is known about how time limits shape people's consequential decisions that involve reasoning about others' behavior. We investigate the effect of time limits on managers' choice of compensation schemes for hiring temporary workers in games with financial consequences. We find a biased preference among managers for flat fees over timemetered fees, particularly under longer time limits, resulting in lost earnings for managers. The sub-optimal choices occur because managers over-estimate task completion time, which in turn is driven by both beliefs about workers' behavior and about the perceived scope of the task. The bias is accordingly eliminated only when both workers' incentives are decoupled from time limits and managers are provided with information about the scope of work. The robust effect of longer time limits on preference for flat fees, even when the time limits are irrelevant and non-informative, is observed regardless of whether task quality is fixed or variable, and persists among actual managers.

Keywords: Deadlines; Temporal Judgments; Employment Compensation; Flat Fee Bias

1. Introduction

Time limits and deadlines are not only pervasive in our personal lives, but also play a key role in work settings. While researchers have extensively studied the motivational effect of time limits (or deadlines) on the performance of individuals and groups (Bryan & Locke, 1967; Amabile, DeJong, & Lepper, 1976; Ariely & Wertenbroch, 2002; Waller, Zellmer-Bruhn, & Giambatista, 2002), little is known about the indirect effects that deadlines might have on how people make consequential economic choices. In this paper, we investigate how deadlines affect choices between two different pervasive types of hiring schemes, via beliefs about how long other people will take to complete tasks.

In organizational settings, managers often need to acquire and allocate the resources necessary to complete projects on time. Estimates of completion time are a key input for such allocation decisions. Underestimating the necessary resources could delay or even preclude project completion. At the same time, overestimation can also be problematic, because providing for ultimately unnecessary resources is often costly. Consider a manager who is deciding between paying temporary workers a flat fee (e.g., piece-rate) or a metered fee (e.g., per-hour, per-minute, etc.) to complete a project. If the manager underestimates the amount of time workers will take, the total cost under a metered fee may turn out to be more than expected. On the other hand, overestimating the amount of time workers will take may lead the manager to prefer an expensive flat fee¹, potentially "over-paying" compared to the metered fee option.

¹ The flat fee payment scheme used in this paper is similar to piece-rate payment schemes used in industrial production systems. However, we limit our investigation to workers completing just one task rather than the multiple tasks typically observed in industrial production systems.

We propose that managers tend to excessively rely on flat-fee compensation, due to systematic overestimation of workers' completion time, particularly when deadlines are longer. Across fifteen experiments (six described in detail in the paper, and another nine in the Online Appendix), we demonstrate this effect of deadlines on choices of compensation schemes. We generalize our findings to different types of tasks (e.g., both fixed vs. variable work quality) and among different populations (e.g., both general population and experienced managers). Using workers' actual task completion times, we document economic losses for managers stemming from their over-reliance on flat fees when hiring workers under longer (versus shorter) external deadlines.

The bias in time estimation arising from different time limits is potentially multiply determined. The bias is consistent with managers' lay motivational theories about how metered fees perversely incentivize "slacking" behavior, that is, workers strategically taking more time under longer time limits to earn more. While little empirical work has studied such managerial beliefs about slacking, similar strategic worker behavior has been discussed in the literature as "holding-back," "soldiering," or "goldbricking" (e.g., Pendleton, Lupton, Rowe, & Whittle, 2019; Roy, 1952; Taylor, 1896). However, we find that managers' beliefs about slacking contribute to but are not sufficient to explain the observed effect.

The bias is also consistent with managers' reliance on a cognitive heuristic, such that they perceive the scope of the work as being more extensive under longer time limits. We find evidence suggesting that an effect of time limits on perceptions of both slacking and scope of work contribute to the findings. In particular, the bias persists when workers' motivation is not relevant to decision making (suggesting a cognitive scope

inference route) and when additional information about project scope is provided (suggesting a motivational process route). Overall, we find an extremely robust bias in the choice of simulated employment compensation schemes – a domain in which little evidence for non-normative decisions has been previously demonstrated.

2. Theoretical Development

Prescriptive forward-looking models of cost-benefit analysis assume that managers can either accurately estimate relevant inputs, such as workers' time, or can at least estimate an unbiased probability distribution of the time needed (Dumond & Mabert, 1988; Sugden & Williams, 1978). Foundational work in industrial and organizational psychology invested a great deal of effort into defining and timing the steps in industrial processes (e.g., Lowry, Maynard, & Stegemerten, 1940), specifically because of the importance of having accurate inputs into such decisions. While this approach is well suited for the manufacturing assembly line, it is a much more difficult task for managers in the modern economy, where tasks are often highly variable in type and scope and rely more on worker flexibility and initiative.

2.1. Biases in Time Estimation

Estimates of task completion time are duration judgments of a *prospective* (usually non-experienced) event, and such judgments are often biased (over or underestimated) and highly malleable (see Halkjelsvik & Jørgensen, 2012 and Roy, Christenfeld, & Jones, 2013 for comprehensive reviews). The susceptibility to bias in prospective duration judgments has even been documented among professionals making estimates about a familiar task (Jørgensen, Teigen, & Moløkken, 2004) and among successful time managers (Francis-Smythe & Robertson, 1999). Biased estimation can

persist because it is difficult for decision-makers to learn from experience (Meyvis, Ratner, & Levav, 2010). Indeed, while *retrospective* time judgments of experienced events may seem easier to estimate, even such estimates are systematically affected by factors such as how long ago the event occurred (Neter, 1970), availability of attentional resources (Block, 1992), and retrieval of cues from memory (Zauberman, Levav, Diehl, & Bhargave, 2010). Therefore, even experienced decision-makers with access to accurate feedback may fail to effectively utilize past information (Buehler, Griffin, & Ross, 1994; Gruschke & Jørgensen, 2008) in making prospective completion time estimates.

Perhaps as a result of these inherent difficulties in making time judgments, time estimates are sensitive to contextual cues, such as self-generated time goals in lab studies (König, 2005; Thomas & Handley, 2008), naturally occurring and experimentally manipulated deadlines (Buehler et al., 1994), as well as customers' expected times among experienced professionals (Aranda & Easterbrook, 2005; Grimstad & Jørgensen, 2007; Jørgensen & Sjøberg, 2001). One particularly pervasive contextual cue is the time available, such as an external deadline. Managers may incorporate such cues into their estimates of workers' task completion times, and then base their subsequent decisions on those estimates. When this occurs, the economic efficiency of their decisions, such as choices between compensation schemes to hire workers, will depend on the degree to which incorporating the deadline affects the accuracy of their estimates.

2.3 Effect of Deadlines on Choices of Compensation Schemes

In many labor-intensive industries like retail, hospitality, machine shops, and auto services (MacPherson, 2014) managers face a choice between hiring workers with a perunit-time compensation scheme (e.g., payment is based on amount of time spent

working) or a flat-fee compensation scheme (where the fixed or salaried payment is based on completing a given task, regardless of time spent). Employer preferences for such types of hiring schemes have been found to depend on a host of rational factors, including the extent to which effort or output can be monitored (Hölmstrom, 1979), transactional costs of performing such monitoring and controlling activities (Williamson, 1981), uncertainty in the environment (Prendergast, 2000), stage in the organizational life cycle (Madhani, 2010), and the potential for sorting and self-selection of employees into an organization (Lo, Ghosh, & Lafontaine, 2011).

Research in non-employment contract settings has, however, documented systematic biases favoring flat rate payment. For example, non-optimal preferences for flat fees (generally allowing unlimited use or access to a service) over metered payment plans have been documented in the domains of cell-phone services, internet tariff plans, and gym-memberships (DellaVigna & Malmendier, 2006; Lambrecht & Skiera, 2006; Train, McFadden, & Ben-Akiva, 1987). Multiple explanations for such biased behavior have been proposed, including risk aversion (Lambrecht & Skiera, 2006), pain of paying (Prelec & Loewenstein, 1998), and pre-commitment for self-control (DellaVigna & Malmendier, 2006).

In this paper, we study when, in the context of employment compensation, employers' choices between flat fee and metered compensation options may be nonoptimal. In particular, we identify deadlines as a key influence on managers' choices and find that longer deadlines lead to non-optimal choices.

Deadlines can influence contract choices by affecting managers' judgments about how deadlines change others' (e.g., workers') task-completion times. We examine two

mental processes that we believe may affect completion time estimates regarding others and underlie the preference for flat-fee contracts under long time limits. First, manager's estimates may be based on a belief that workers will work faster when the deadline is closer, either because having less time available may increase efficiency (Parkinson, 1955) or because being subjectively closer to the completion goal motivates more effort investment (Gjesme, 1975; Hull, 1932; Kivetz, Urminsky, & Zheng, 2006) and reduces procrastination (Ariely & Wertenbroch, 2002). Relatedly, managers may believe that workers are likely to engage in "slacking," intentionally delaying completion when wages are a function of time spent doing the job, which would have more of an effect on completion time under longer time limits. Second, deadlines could also affect completion time estimates on account of a perceptual mechanism that associates scope of work with length of time limits. Both these psychological processes would make flat fee contracts more preferable under longer external time limits. In the next two sections, we elaborate on the antecedents and the consequences of these cognitive and motivational processes that might bias managers to overestimate others' completion times.

2.3. Biased Beliefs about Slacking

When time-based compensation schemes are used, workers may have a perverse incentive to delay task completion so that they earn more total wages. Industrial sociologists have found that piece-rate workers engage in "goldbricking" (also referred to as "holding-back" or "soldiering"; Taylor 1896; Roy 1952), by strategically limiting production to ensure that the quota set by the management is not exceeded. According to this research, workers engage in such behavior because they are concerned that managers might reduce the piece-rate price if the quota is exceeded (p. 430, Roy, 1952).

While this concern is not relevant to the experimental design used in this paper, managers might be concerned about a related strategic "holding-back" behavior that workers could engage in to earn more money. In particular, managers might be concerned that when metered fees are used, workers would intentionally delay completion up to the deadline to earn higher total wages. We refer to this potential worker behavior as "slacking," and we investigate managers' beliefs about slacking as a potential explanation for their time estimates and compensation choices. Extant literature does not provide empirical evidence on the incidence of the kind of slacking behavior that we study in this paper. However, based on normative principal-agent theories that expect workers to be effort-averse and shirk whenever they can (Alchian & Demsetz, 1972; Fehr & Goette, 2007), workers could be predicted to slack. In repeated interactions, the motivation to accrue reputational capital and the possibility of retaliation may limit the extent of workers' strategic slacking, but given that we focus on one-shot interactions, incentives against slacking are reduced.

Research in psychology also suggests that decision-makers often overestimate the importance of self-interest (Ferraro, Pfeffer, & Sutton, 2005) and undervalue the role of intrinsic motivation (Heath, 1999) in others' behavior. Therefore, it is also possible that managers underestimate the extent to which workers might internally highlight the importance of finishing the task, even if it means *not* claiming maximal compensation. Whenever managers overestimate the degree of slacking, time-based compensation schemes will be less attractive, particularly so when there are longer external time limits, which provide greater opportunities for workers to engage in such strategic behavior.

2.4. Biased Beliefs about Task Scope

In people's everyday experiences, tasks involving more work often have longer time limits. The prevalence of this *directional rule* in everyday life can give rise to an over-generalized belief about a *bi-directional association* between time limits and scope of work. Such a generalized association could lead to over-learned judgments about task scope based on time limits. Over-learned responses have been found in everyday judgments, in a variety of domains, even when cues are not informative (e.g., distance based on visual clarity, Brunswik 1943; frequency based on subjective value, Dai, Wertenbroch, & Brendl, 2008; the value of services based on their duration, Yeung & Soman, 2007).

Furthermore, research on attribute substitution (Kahneman & Frederick, 2002) suggests that decision-makers sometimes automatically substitute highly salient information for other factors in a decision, reframing the question posed to them and remaining unaware of having done any such substitution. When deliberating about completion time for a task (a less accessible target attribute), people may, therefore, draw inferences from a seemingly diagnostic cue - the total time available (a more accessible related attribute).

Longer (vs. shorter) external time limits might either spontaneously bring to mind aspects of explicit task scope (e.g., number of completion steps, difficulty, or complexity), or just prompt a general sense that the task takes longer independent of time limits (i.e., implicit task scope). Consequently, even when the time limit is not normatively informative, people may more readily imagine a scope of work consistent with the time limit, based on an over-learned association between time limit and amount of work. This could result in a higher estimate of task completion time when time limits are longer (Goswami & Urminsky, 2019).

In a typical demonstration of the "Scope Perception Bias" (Goswami & Urminsky, 2019), when judges were told that deadlines were not known to the workers (and therefore, could not affect workers' effort or motivation), the judges nevertheless estimated a longer task completion time when these "hidden" (and therefore objectively irrelevant) deadlines were longer. This psychology of scope perception is consistent with recent research showing that longer (vs. shorter) imposed deadlines for achieving a goal might lead to inferences about greater goal difficulty (Zhu, Bagchi, & Hock, 2018).

Across fifteen studies, we test the effects of deadlines on consequential one-shot choices between metered (e.g., paying per unit of time) and flat-fee employee compensation schemes and document a strong non-optimal preference for flat-fee compensation schemes. In our studies, we control for information leakage (e.g., managers assuming that the focal time limit represents a reasonable upper bound) by showing all the time limits and informing managers that workers were randomly assigned to one of the time limits. We also control for the role of incidental anchoring (Critcher & Gilovich, 2008; Wilson et al., 1996) by having managers make their compensation choice before, and even without, making numerical time estimates and by exposing participants to all possible time limits.

We demonstrate a preference for paying flat fee compensation, resulting in lower earnings when hiring an actual worker to do either a task in which the quality of the outcome is fixed (e.g., solving jigsaw puzzles) (Study 1) or when task quality (and the resulting value of the completed task to managers) varies (Study 2). Post-choice self-

reports find evidence for both a concern about slacking as well as beliefs consistent with an implicit scope of work account (Study 3).

We replicated the effect of time limits on contract choices when the workers were all paid a flat fee (eliminating the workers' slacking incentives), but managers have the option of being charged either a per-minute or flat fee (Study 4, pre-registered). Conversely, we also replicate the effect when managers are informed about the scope of work (i.e., given the full distribution of workers' completion time without time limits)in Study 5 (pre-registered). These results show that neither slacking beliefs (Study 4) or scope perception (Study 5) alone can fully explain the biased contract preference. The bias is only eliminated when beliefs about slacking are made irrelevant, *and* information about the scope of work is provided (Study 6, pre-registered). We conclude that the effect of time limits on completion time misestimation and consequent biased preferences for paying flat fee compensation are jointly determined by the combination of slacking concerns and scope perception being influenced by time limits.

We report all studies conducted, sample sizes and exclusions were determined in advance, all data collected are reported and made publicly available via OSF, and details of all stimuli are provided in Online Appendix A.

3. Study 1: The Effect of Deadlines on Contract Choices when Both Potential Deadlines are Known

Participants played a consequential game, either as a "worker" completing a task with a specific time limit (phase 1) or as a "manager" making contract choices about workers, under different time limits (phase 2). "Workers" were given a standardized task (a digital jigsaw puzzle) in which completed work does not vary in quality or in value to

the manager. "Managers" could maximize their earnings by simply choosing the hiring plan that minimized the expected cost of their hired worker.

3.1. Method – Phase 1: Workers

3.1.1. Participants

Participants (N=55) were recruited in a research lab in a large Midwestern city and played the role of workers. Workers were randomly assigned to one of two conditions (time limit: shorter = 5 minutes vs. longer = 15 minutes) and were paid a rate of 25 cents per minute (rounded up to the nearest minute) for the time taken to solve the puzzle. Before starting work, workers were informed about their compensation scheme and time limit and then read about the puzzle-solving interface. Workers were also told that they could either move on to participate in other studies in the lab or leave the lab as soon as they were done with the puzzle and had answered a few follow-up questions that were part of the survey. This instruction was given to correct any mistaken inferences workers might have made about reasons to delay finishing the task (e.g., that they needed to be doing the work for the entire assigned time limit).

The jigsaw puzzle was then administered using a computer interface from the website *www.jigzone.com*. The interface showed a timer that started counting immediately after the first piece was moved and stopped when all the pieces were in place. All participants solved the same puzzle, but each participant started off with a different initial random arrangement of the puzzle pieces (see Figure 1).

As participants moved the puzzle pieces on the screen, the pieces snapped together only when the two pieces were the correct fit. As a result, it was not possible to solve the puzzle incorrectly, and thus the quality of outcome was held constant across

workers. After each worker finished the puzzle, they answered questions about their experience and familiarity with jigsaw puzzles. A research assistant recorded the completion time (from the stopped clock on the screen) and paid the participants based on their actual time spent.



Figure 1: Interface used to administer the Jigsaw Puzzle task (Study 1).

1.2.Results – Phase 1: Workers' Completion Times

Workers took only a little longer to solve the puzzle when time limits were longer, a non-significant difference ($M_{Shorter}=2.81$ vs. $M_{Longer}=3.59$, t(53)=1.35, $p=.183)^2$. As a result, there was no significant difference in the workers' earnings between the two time-limits; even though the workers with longer time limits could have earned more if they had delayed completion to use more time (i.e., had intentionally slacked).

 $^{^2}$ Three workers took over 5 minutes in the shorter time-limit condition, and these were truncated to 5 minutes. The results are the same using the untruncated numbers (see Online Appendix C for additional analysis for all studies including the complete distribution of workers' time).

Next, we investigate how well-calibrated managers are about the effect of the compensation scheme on workers' completion times under different time limits, and how that affected their choices.

3.3. Method – Phase 2: Managers

3.3.1 Participants

Amazon Mechanical Turk participants (N=178) played the role of managers in a consequential hiring game and were randomly assigned to one of two time-limit conditions (shorter = 5 minutes, longer = 15 minutes). All managers were informed that there were two potential time limits and that workers had been *randomly* assigned to either the 5 minute or 15 minute time limit (which was, in fact, the case). This was done to eliminate potential inferences that managers could have made about the time limit revealing information about how much time is "reasonable" to complete the work. This also addresses the possibility that providing only a single time limit could serve as an implicit anchor (Critcher & Gilovich, 2008). Nearly all the managers (84%) confirmed that workers were randomly assigned to a time limit, and the results are robust to excluding the managers who gave an incorrect response (see Online Appendix C).

		If Flat Fee Selected:		If Per-minute Fee Selected:		
Time	Terms	Cost of	Profit earned	Cost of	Profit earned	
Limit		hiring	by manager	hiring	by manager	
		worker	(fixed)	worker	(variable)	
No Recruitin	g Fee Conditions:					
5 minutes	Budget = $$2;$	\$1	\$1		\$0.75 to \$1.75	
(shorter	Flat Fee = $$1;$			25¢ per		
time limit)	Per-Unit-Time rate =			minute		
	\$0.25/min			worked		
15 minutes	Budget = $4;$	\$1.50	\$2.50		\$0.25 to \$3.75	
(longer	Flat Fee = $$1.50;$					
time limit)	Per-Unit-Time rate =					
	\$0.25/min					

Table 1: Managers' potential profits in different conditions in Study 1.

Managers were allotted a lump sum budget for getting a jigsaw puzzle completed, but they needed to "hire" and pay a worker to do the task for them. They could choose between hiring a per-minute worker or a flat-fee worker. When a manager opted for a flat-fee worker, the cost of hiring was fixed. However, if the manager opted for a perminute worker, a real worker from phase 1 was randomly picked and paired with the manager, and the manager's cost of hiring the worker was based on the worker's actual time to complete the task. After deducting the cost of hiring from the allotted budget, the remaining money was paid to the manager as their profit.

The cost of hiring workers (and the resulting potential profit) in each condition is shown in Table 1. The total budget available to the managers was either \$2.00 (shorter time limit) or \$4.00 (longer time limit). The cost of hiring a worker with a per-minute plan was the same in all four conditions: 25 cents per minute, rounded up to the nearest minute, for the time taken by the worker to solve the puzzle. Therefore, the total cost of hiring a per-minute worker ranged from \$0.25 to \$1.25 in the shorter time-limit condition, and from \$0.25 to \$3.75 in the longer time-limit condition. The cost of hiring a flat-fee worker was either \$1.50 (longer time limit) or \$1 (shorter time limit). Thus, managers in these conditions faced a tradeoff between a known fixed amount of profit if they chose the flat fee, or an unknown variable profit if they chose the per-minute fee. The profit from paying per-minute compensation could be either higher or lower than that from paying a flat fee, depending on how long the per-minute worker took to complete the task.

3.4 Results

Based on the actual completion times of workers paid per-minute in phase 1, unknown to the managers, the expected value of managers' earnings was significantly higher for choosing per-minute compensation than the fixed earnings from flat-fee compensation, in both the shorter time-limit (M_{Per-minute Fee} = \$1.16 vs. \$1.00 flat fee; Δ = \$0.16; *t*(27)=2.93, *p*=.007) and the longer time-limit conditions (M_{Per-minute Fee} = \$2.97 vs. \$2.50 flat fee; Δ = \$0.47, *t*(26)=3.41, *p*=.002; see the right-hand panel in Figure 2). Furthermore, the expected advantage of per-minute compensation was significantly higher in the longer time-limit condition (*t*(53)=2.12, *p*=.038). Thus, well-calibrated managers would be expected to choose to pay per-minute compensation, particularly in the longer time-limit condition.



Figure 2: Choice of flat fee compensation (left-panel) and differences in expected bonuses from choosing different compensation options (right-panel) in Study 1. The vertical lines are 95% CI.

Nevertheless, most managers preferred to pay a flat fee (81%), and they were more likely to choose the flat fee in the longer time-limit condition than in the shorter time-limit condition (94% vs. 68%, $\chi^2(1)=19.68$, p<.001; see the left-hand panel in Figure 2). Given that managers were less likely to choose the optimal per-minute option in the longer time-limit condition, they actually left significantly more money on the table (based on realized profits after being matched to a random per-minute worker) in the longer time-limit condition (M_{Per-minute Fee} = \$3.35, M_{Flat Fee} = \$2.50; Δ = -\$0.85, t(4)=8.50, p=.001), compared to the shorter time-limit condition (M_{Per-minute Fee} = \$1.13, M_{Flat Fee} = \$1.00; Δ = -\$0.13; t(27)=2.49, p=.019); difference t(31)=5.32, p<.001).

The suboptimal compensation scheme choices are largely explained by the managers' estimates of completion time. Managers who chose to pay a flat fee estimated a longer completion time for a typical per-minute worker, both for shorter time limits $(M_{Chose Flat Fee} = 4.74 \text{ vs. } M_{Chose Per-minute Fee} = 2.93; t(87)=11.86, p<.001)$ and marginally more so for longer time limits $(M_{Chose Flat Fee} = 11.89 \text{ vs. } M_{Chose Per-minute Fee} = 7.60; t(87)=2.63, p=.009; difference <math>F(1,174)=3.59, p=.059)$. In fact, managers' choices were largely rationalized by their estimates of workers' completion times. Most participants chose the option that would have provided a higher profit had their time estimates been correct (96% in the shorter time-limit condition; 89% in the longer time-limit condition), and the estimated time for per-minute workers fully mediated the effect of deadlines on compensation scheme choices (indirect effect bootstrapped 95% CI= [0.31, 0.73]).

Might managers' preferences for paying a flat fee be explained by a general preference for avoiding risk (e.g., Grund & Sliwka, 2010), particularly in the longer time limit, where the payoffs for per-minute workers have high variance? To test this, we had the managers make a hypothetical choice between a fixed amount (equal to the profit from the flat-fee option) and a gamble equivalent to the actual distribution of payoffs

from the per-minute compensation option (i.e., calculated from workers' times in phase 1, see Online Appendix B). The choice was presented as a separate hypothetical gamble, in order to measure risk preferences in an equivalent choice without managers' awareness that the gamble and earlier choices were equivalent, to avoid consistency motives.

Managers were much less likely to choose the certain amount than to make the equivalent choice of the flat fee compensation scheme both in the shorter time-limit condition (45% vs. 68%; McNemar's $\chi^2(1) = 12.60$, p < .001) as well as in the longer time-limit condition (58% vs. 94%; $\chi^2(1) = 28.44$, p < .001). This suggests that the hiring-choice findings are not explained by managers' general risk aversion when facing a choice between certain and variable outcomes.

3.5 Discussion

Using a consequential hiring game, we find that lay people playing the role of managers show a preference for paying a flat fee (vs. time-metered compensation schemes), particularly under longer time limits, because of a deadline-induced bias in their estimates of other's task completion time. In our study, all managers were exposed to the same set of potential time limits, and therefore the results are contrary to the predictions of an informational or an implicit-anchoring account.

The bias for paying a flat fee was not explained by general risk aversion and was robust to other factors, including depth of processing (as measured by the Cognitive Reflection Test or CRT; Frederick, 2005), self-reported knowledge about, and experience with jigsaw puzzles.

In this study, workers' actual times did not differ significantly by time limits, but managers incorrectly believed that they would, resulting in biased compensation scheme

choices. The workers' limited sensitivity to the deadline, contrary to the managers' beliefs, is not inconsistent with mixed predictions from the literature. While principalagent theories expect workers to extract as much wage as possible (Alchian & Demsetz, 1972; Fehr & Goette, 2007), research in psychology suggest that the importance of others' self-interest is often overestimated (Ferraro et al., 2005) and the importance of others' intrinsic motivation is often underestimated (Heath, 1999).

Nevertheless, workers' completion times can be affected by time limits (as we shall see in Studies 2 and 5). Our claim is that deadlines create a *potential* for managers to be systematically biased about workers' times in a specific direction, tending to overestimate the degree to which longer deadlines yield longer task completion times. When completion times are overestimated, the bias can affect consequential decisions, as demonstrated in this study.

The bias reported here is highly robust, including to different incentive schemes (Study A1, Online Appendix D), to choices involving hiring multiple workers (which provides risk-reduction benefits due to lower variance in cost when relying on multiple workers rather than a single worker; Study A2), and to prior expertise and experience (i.e., among MBA students – a majority of whom had prior experience making decisions involving hiring and compensation; Study A3).

In the next study, we test the generalizability of this finding across types of tasks. In Study 1, we tested contract choices involving a fixed-quality task, which makes it easy for workers to tell when they have completed the task, potentially reducing the effect of time limits on their actual completion times. This, in turn, also makes it simple for

managers, at least in theory, who only need to take into account the task completion times and minimize labor costs in order to maximize profits.

However, in many employment contexts, the quality of the workers' final output may vary substantially, with consequences for the employers' revenue. In these settings, workers may take longer when given more time, in order to try to do a better job. Managers, in turn, need to consider the possibility that faster workers might do a worse job in such settings. Thus, when profits are dependent on the final quality of the completed task, the choice of compensation scheme might involve a tradeoff between speed and quality. If this is the case, managers facing longer time limits might view perminute fees as not merely costlier, but also as incentivizing higher quality work, potentially countering the bias for paying a flat fee that we have documented thus far. We investigate this possibility in the next study, using a spelling task in which the quality of the workers' output could vary with time spent, with a direct impact on managers' earnings.

4. Study 2: Contract Choices When Worker Error is Costly

As in Study 1, this study was also conducted in two phases. In phase 1, online participants assigned to be "workers" completed a proofreading task. In phase 2, a separate sample of "managers," drawn from the same online population, played a consequential hiring game. The managers' earnings depended on the productivity of the workers' proofreading (i.e., the number of correct answers), as well as on how long the worker took if the per-minute option was chosen.

4.1. Method – Phase 1: Workers

4.1.1. Participants

Online participants from Amazon Mechanical Turk serving as workers (N=429) were randomly assigned to one of eight conditions in a 2 (time limit: shorter = 5 minutes vs. longer = 15 minutes) x 2 (compensation: flat fee vs. per-minute fee) x 2 (task difficulty: easy vs. difficult) design. Workers in the flat fee conditions were paid either \$1 (in the shorter time-limit condition) or \$1.50 (in the longer time-limit condition), regardless of how long it took them. Workers in the per-minute conditions were paid a rate of 25 cents per minute (rounded up to the nearest minute) for the time taken to do the task. Workers' compensation in all conditions was independent of their accuracy in the task. The workers read about their compensation scheme and time limit before starting the task and were told that they could end the study as soon as they were done with the task and answered a few follow-up questions.

A list of 24 words was presented as an image (i.e., text that could not be copied and pasted) and separate open-ended text-boxes were provided on the same screen, in which the workers were asked to type the correct spelling of each word (see Online Appendix A). The workers were told to move on to the next page when they were finished. The online interface automatically advanced to the next page when the time limit was reached. Thus, workers could not take longer than the allotted time. The workers were randomly assigned to proofread either a set of 24 easy words (e.g., "arround") or 24 difficult words (e.g., "concensus"). Task difficulty was varied to test the possibility that managers would be more concerned about workers' quality, and therefore more reluctant to hire flat-fee workers when the task is more difficult.

4.2 Results – Phase 1: Workers' Completion Times and Productivity

When assigned to proofread easy words, per-minute workers, averaging across time limits, took longer than flat fee workers ($M_{Flat Fee} = 1.49$ vs. $M_{Per-minute Fee} = 3.22$, t(206)=5.16, p<.001). The longer time they chose to spend was sufficient for the per-minute workers to earn more (\$0.92 vs. \$1.24, t(206)=3.72, p<.001), although they could have earned even more if they had taken even longer.

Unlike Study 1, there was also a main effect of time limits when the task was easy, with workers taking more time when deadlines were longer ($M_{Shorter}$ = 1.91 vs. M_{Longer} = 2.70, *t*(206)=2.25, *p*=.026). In particular, workers spent more time while working under a per-minute fee compared to a flat fee, specifically when the time limit was longer (Shorter time limit: $M_{Flat Fee}$ = 1.43 vs. $M_{Per-minute Fee}$ = 2.48, Longer time limit: $M_{Flat Fee}$ = 1.56 vs. $M_{Per-minute Fee}$ = 4.01; interaction *F*(1, 204)=4.49, *p*=.035; see Figure 3).

When assigned to proofread difficult words, per-minute workers, across time limits, also took longer than flat fee workers ($M_{Flat Fee} = 3.58$ vs. $M_{Per-minute Fee} = 4.55$, t(219)=2.68, p=.008), but not long enough to earn more (\$1.24 in both conditions, t(219)<1). Workers also took longer to finish the task when the time limit was longer ($M_{Shorter}= 3.35$ vs. $M_{Longer}= 4.85$, t(219)=4.26, p<.001), but unlike the case of easy words, compensation type did not moderate the effect of time limits on the time taken by workers proofreading difficult words (F(1,217) = 1.25, p=.265).



Figure 3: Time taken by workers to do the proofreading task under different time limits and compensation schemes in Study 2. The vertical lines are 95% Confidence Intervals.

The fact that workers took longer when they had longer time limits and when they were paid via per-minute contracts in this setting is useful because it enables us to test the efficiency of managers' compensation scheme choices when workers are affected by these factors, unlike what we found in Study 1. These differences can be interpreted either as evidence of slacking behavior or as workers taking more time in trying to do a better job.

As intended, there was a difference in accuracy (i.e., total correct answers) between the easy (96% correct) and difficult (74% correct; p<.001) tasks. Longer time limits did not lead to a higher number of successful completions for easy proofreading tasks (22.87 vs. 23.04, t(206)=0.44, p=.658), but did increase the number of successes for difficult proofreading tasks (18.46 vs. 17.19; t(219)=2.03, p=.044; interaction of time limit and difficulty F(1,425)=3.79, p=.052). Compensation type had little effect on

productivity for either easy ($M_{Flat Fee} = 22.68 \text{ vs. } M_{Per-minute Fee} = 23.29, t(206)=1.73,$ *p*=.085), or difficult tasks ($M_{Flat Fee} = 17.48 \text{ vs. } M_{Per-minute Fee} = 18.12, t(219)=1.01, p=.313;$ difference *F*(1,425)<1).

4.3 Method – Phase 2: Managers

4.3.1. Participants

An adult online sample (N=438), recruited from the same Amazon Mechanical Turk pool, played the role of managers in an incentivized hiring game. In the game, participants would earn revenue for getting the proofreading task completed, but they needed to hire a worker to do the task for them and pay the cost of hiring out of their revenue. The managers earned the remaining profit as an actual bonus payment for participating in the study. Managers were randomly assigned to one of four conditions in a 2 (time limit: shorter = 5 minutes vs. longer = 15 minutes) x 2 (proofreading task difficulty: low vs. high) experimental design. The managers were informed that the workers had been randomly assigned to one of the two contract types, were only doing the one task in the allotted time, and would finish the study as soon as they completed the proofreading task and answered a few follow-up questions. The managers then read about the compensation schemes and chose which compensation (flat fee or per-minute fee) to use for hiring the worker.

In the shorter time-limit condition, managers earned \$1.20 plus 10 cents for every correct word. They could either pay 25 cents per minute for a metered worker or pay a flat fee (the \$1 earned by the worker plus either a 30 cents "recruiting fee" in the easy-task condition or a 10 cents recruiting fee in the difficult-task condition; see Table 2).

In the longer time-limit condition, managers earned \$3.70 plus 10 cents for every correct word. If they chose the metered contract, they paid 25 cents per minute that the worker they were paired with spent on the task. Managers who instead chose to pay a flat fee paid for the \$1.50 earned by the worker, as well as either an additional 50 cent recruitment fee (easy condition) or 40 cent recruitment fee (difficult condition).

Time Limit	Task	Revenue	Cost of hiring worker			
	Difficulty		Flat Fee Selected	Per-minute Fee Selected		
5 mins. (shorter time limit)	Easy	\$1.20 fixed plus 10 cents for every correct word	\$1 earned by the worker plus 30 cents "recruiting fee"	25 cents/minute		
5 mins. (shorter time limit)	Difficult	\$1.20 fixed plus 10 cents for every correct word	\$1 earned by the worker plus 10 cents "recruiting fee"	25 cents/minute		
15 mins. (longer time limit)	Easy	\$3.70 fixed plus 10 cents for every correct word	\$1.50 earned by the worker plus 50 cents "recruiting fee"	25 cents/minute		
15 mins. (longer time limit)	Difficult	\$3.70 fixed plus 10 cents for every correct word	\$1.50 earned by the worker plus 40 cents "recruiting fee"	25 cents/minute		

Table 2: Managers' potential revenue and costs in different conditions in Study 2.

In this study, the bonus the managers earned included an additional variable payment that depended on the number of correct answers (i.e., was based on the worker's performance in the task). Thus, the managers had an incentive not to sacrifice work quality while attempting to minimize costs. To help ensure that the managers understood the potential for quality problems, the list of 24 words, along with the proportion of actual workers who got the spelling correct, was shown to the managers (Figure 4).

After managers indicated their choice, they were asked to estimate the workers' completion time and productivity (i.e., the total number of correct answers), both under

the hiring scheme they had chosen and under the unchosen alternative scheme. Managers answered a few follow-up questions on their general risk preferences (see Online Appendix B), knowledge of English spelling, and experience with proofreading.

Easv P	roofrea	ading	Words
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Difficult Proofreading Words

1) didn't (87%) 2) arround (92%) 3) allways (91%) 4) tride (71%) 5) finaly (92%) 6) meny (95%) 7) people (92%) 8) children (93%)	 9) somtimes (92%) 10) prety (94%) 11) animals (93%) 12) recieved (74%) 13) boght (92%) 14) mony (91%) 15) when (89%) 16) said (94%) 	 17) asked (91%) 18) because (91%) 19) wile (92%) 20) intresting (91%) 21) again (94%) 22) once (92%) 23) untill (93%) 24) thought (92%) 	1) 2) 3) 4) 5) 6) 7) 8)	embarrass (49%) bellweather (31%) discipline (84%) twelfth (66%) miniture (72%) memento (68%) medeval (67%) firey (52%)	9) 10) 11) 12) 13) 14) 15) 16)	innoculate (27%) harass (64%) imediate (82%) questionnaire (57%) noticeable (73%) concensus (40%) reference (83%) amature (49%)	17) 18) 19) 20) 21) 22) 23) 24)	resteraunt (67%) existance (63%) guage (69%) playwright (69%) believe (85%) personell (44%) conscience (75%) foreign (79%)
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Figure 4: Words used in easy and difficult proofreading tasks in Study 2. The proportion of actual workers in phase 1 of Study 2 who answered correctly (in parentheses) was shown to the managers.

4.4 Results – Phase 2: Managers' Compensation Choices

Based on the workers' completion times in phase 1, paying per-minute compensation was a better deal, particularly when the time limit was longer. Averaging across task difficulty conditions, the expected value of managers' earnings was significantly higher when paying per-minute than when paying a flat fee, in both the shorter time limit (M_{Per-minute Fee} = \$2.35 vs. M_{Flat Fee} = \$1.98, *t*(219)=4.73, *p*<.001) and the longer time limit (M_{Per-minute Fee} = \$4.45 vs. M_{Flat Fee} = \$3.79, *t*(206)=5.58 *p*<.001) conditions. The expected advantage of paying per-minute over a flat fee was significantly higher in the longer time-limit condition (Δ = \$0.29, *F*(1,425)=4.29, *p*=.038). The relative advantage of per-minute fees held for both easy and difficult tasks (see the right-hand panel in Figure 5).

Notwithstanding the actual advantage of choosing to pay workers per-minute, many managers instead chose the flat fee (63%) and were more likely to do so in the longer time-limit than shorter time-limit condition (83% vs. 44%, $\chi^2(1) = 71.09$, *p*<.001), consistent with prior results, despite the fact that the relative advantage of the per-minute fee was *higher* in the longer-time limit. The preference for paying a flat fee when the time limit was longer was robust to task difficulty, occurring both when the task was easy (78% vs. 29%, $\chi^2(1) = 56.64$, *p*<.001), as well as when the task was difficult (87% vs. 59%; $\chi^2(1) = 20.76$, *p*<.001). In fact, there was no significant difference in the preference for flat fees under longer time limits based on task difficulty (interaction $\beta = 0.664$, *z*=1.41, *p*=.158; see the left-hand panel in Figure 5).



Figure 5: Choice of flat fee compensation (left-panel) and differences in expected bonuses from choosing different compensation options (right-panel) in Study 2. The vertical lines are 95% CI.

The preference for paying a flat fee was costly. For easy tasks, managers who chose flat fee earned significantly lower profits, as in the previous study, both in the shorter time-limit condition (M_{Per-minute Fee} = \$2.77, M_{Flat Fee} = \$2.12; Δ = -\$0.65; t(112)=7.64, p<.001), and even more so in the longer time-limit condition (M_{Per-minute Fee} = \$4.97, M_{Flat Fee} = \$3.98; Δ = -\$0.99, t(111)=7.88, p<.001; difference F(1,223)=4.91, p=.027). Likewise, for difficult tasks, the profits earned by the managers were smaller

when choosing the flat fee option, both in the shorter time-limit condition (M_{Per-minute Fee} = $$1.93 \text{ M}_{\text{Flat Fee}} = $1.78; \Delta = -$0.15; t(108)=1.37, p=.172$), and more so in the longer time-limit condition (M_{Per-minute Fee} = \$4.18, M_{Flat Fee} = \$3.63; $\Delta = -$0.55, t(99)=3.75, p<.001$; difference *F*(1,207)=4.79, *p*=.029).

Do incorrect beliefs about worker productivity (i.e., the expected number of total correct answers) explain the effect of time limits on compensation choices? Managers who chose to pay per-minute (vs. those who chose the flat fee) expected per-minute workers to complete more tasks than flat-fee workers, both when the time limit was shorter (M_{Chose Per-minute Fee} =20.53 vs. M_{Chose Flat Fee} = 12.32, Δ = 8.21; *t*(222)=16.56, *p*<.001) and somewhat less so when the time limit was longer (M_{Chose Per-minute Fee} =19.29 vs. M_{Chose Flat Fee} =13.60, Δ = 5.69; *t*(212)=8.34, *p*<.001; difference *F*(1,434)=9.01, *p*=.003). However, logistic regression analysis confirmed that managers' preference for paying a flat fee when time limits were longer persisted (β = 1.18, *z*= 2.52, *p*=.012) even controlling for the expected difference in productivity between per-minute workers and flat fee workers (β = -0.45, *z*= -10.53, *p*<.001). Therefore, the effect of time limits on choices of compensation schemes was not explained by beliefs about productivity.

Managers' worker-compensation choices were also not explained by general risk aversion, time spent reading instructions or making choices, knowledge of proofreading, and experience with proofreading tasks, none of which moderated the results. Instead, consistent with Study 1, the estimated time for per-minute workers partially mediated the effect of deadlines on compensation scheme choices (indirect effect bootstrapped 95% CI= [.56, .78]; see Online Appendix C for these additional analyses).

4.5 Discussion

The results of Study 2 suggest that our findings generalize to tasks in which managers' incentives depend not only on containing labor costs but also on the quality of the final output. This study also generalizes our findings to a setting in which workers' actual completion times did differ by time limits, unlike workers in Study 1. These findings are highly robust, replicated in two other consequential studies using the same task (Studies A4-A5, Online Appendix D), and with a sample of MBA students (Study A6), most of whom had prior managerial experience.

Thus far, we have demonstrated a robust and costly preference for paying workers a flat fee under relatively longer time limits, and this bias is explained by managers' overestimation of worker completion times. But, what drives managers' misestimations of completion time?

Next, we consider two types of psychological mechanisms, involving either managers' beliefs about the workers' behavior (i.e., slacking), or their beliefs about the task scope. First, managers might be miscalibrated about the extent to which workers under longer time limits will strategically slack, taking longer when paid per-minute in order to earn more. Alternatively, managers may overestimate completion times if they associate longer time limits with tasks that involve a greater scope of work. This could occur because managers simply associate longer time limits with tasks that generally involve greater scope of work, or because managers draw inferences about specific characteristics of the task (e.g., difficulty, effort required, thoroughness, etc.) based on the longer external time limit, and consequently infer a greater scope of work.

In the next study, we use a different worker task (i.e., a math task) and a withinsubjects design to elicit managers' preferences between hypothetical compensation

schemes under different external time limits. A within-subjects design provides a conservative test, as it increases evaluability and prompts managers to examine the consistency of their preferences (i.e., for the two deadlines), potentially attenuating any biases. Then, in an exploratory analysis, we examine post-choice beliefs suggested by the above two potential accounts.

5. Study 3: What Drives Managers' Misestimates?

5.1. Method

5.1.1. Participants

A sample of online participants (N=140) was recruited from Amazon Mechanical Turk and played the role of managers. Managers were shown hiring game scenarios and decided which compensation to use for hiring a worker to complete a simple math task. The math task required workers to search for five pairs of numbers, such that each pair added to ten, from a 5 x 5 number grid that contained eight such valid pairs. Managers were shown an example number grid, and a valid pair of boxes were highlighted to explain the task (see Figure 6; details of instructions and stimuli are available in Online Appendix A).

Managers made two hiring decisions for two different tasks, one for each worker time limit (5 and 15 minutes). The two tasks were created by randomly shuffling the box numbers that contained the eight valid pairs in the grid. Both the time limit and task order were counterbalanced, resulting in a four-cell mixed design. As in the previous studies, managers were told that workers' time limits were randomly selected between the two potential deadlines.

In the hiring scenario, the manager would earn a fixed amount of revenue (i.e., \$4.00) from a completed task, and the cost of hiring the worker would be deducted from the revenue to compute the (hypothetical) net profit Managers had two options: hire the worker with a flat fee (\$1.00 in the 5 mins condition; \$1.50 in 15 mins) or pay at a rate of 25 cents per minute, with the maximum determined by the assigned time limit. Managers were informed that the game would only be played once, and they would not need to build a long-term relationship with the hired worker. Finally, managers were also told that workers only knew about their own hiring terms (i.e., time limit and flat fee or perminute fee) before starting their work.



Figure 6: Example task (extreme left) and the two actual tasks (Task 1 and Task 2) used in Study 3. The two actual tasks were created by randomly shuffling the position of the valid pairs of correct responses.

After making compensation choices for both time limits, managers answered a series of follow-up questions on 7-point bipolar scales indicating which of the two tasks they thought took a longer time to complete, was more difficult, resulted in workers intentionally working slower (to measure slacking), was more interesting and enjoyable (as a measure of intrinsic motivation), and inspired a higher achievement motivation. After the managers answered these questions, they were asked to indicate how much work (i.e., the scope of work) they thought there was in each of the two tasks using a slider (1= a little work; 100= a lot of work). To directly capture concerns about slacking, managers were asked directly, for each task, if they were worried that workers would take longer than necessary to make more money at their expense when they made their contract choices. Details of both tasks (e.g., time limits, revenue, costs of flat fees, and per-minute contracts) were displayed on the same screen as the follow-up questions.

Finally, managers also answered a 7-item empathy scale that captured individual differences in perspective-taking (Davis, 1983) to examine if managers who scored high on this trait made better contract choices. Specifically, if managers who tend to put themselves in the workers' shoes are able to better predict the workers' behavior, they may exhibit a weaker preference for flat fees, particularly when times limits are longer.

5.2. Results

Estimates from a hierarchical regression strongly replicated the effect of external time limits on compensation decisions. More participants (83%) preferred the flat fee in the longer time-limit condition than in the shorter time-limit condition (60%; $\beta = 1.15$, z= 3.89, p<.001). The results were not moderated by the order of time limits or by the order of the two math tasks used in the study (see Online Appendix C).

Mid-point tests revealed that managers perceived the two tasks differently. Managers thought that workers would require more time to complete the 15-minute deadline task than the 5-minute deadline task (M=+0.68, t(139) = 5.24, p<.001), a belief consistent with the time mis-estimation results in the prior studies. Thus, we replicate the prior findings in a within-subjects study, even when managers evaluated both time limits in the same study and did not make numerical estimates of the time taken.

Managers were more concerned about workers slacking in the 15-minute condition. They thought that in the 15-minute task, workers would be more likely to intentionally work slower and take longer than necessary (M=+0.99, t(139) = 6.72, p<.001), and were more likely to indicate a concern about slacking in the 15-minute deadline task (76%) than in the 5-minute deadline task (46%; McNemar's $\chi^2(1) = 25.81$, p<.001). Managers also rated a significantly higher scope of work for the task (using the slider scale) that was assigned a random time limit of 15 minutes (M_5 = 60.32 vs. M_{15} = 65.54; paired t(139)=3.01, p=.003), consistent with inferring the scope of work from the deadline.

While we found evidence that deadlines impact both beliefs about slacking and scope inferences, none of the self-report measures significantly mediated (or moderated) the effect of a deadline on the choice of compensation schemes. There was no difference in managers' judgments of workers' intrinsic motivation as a function of time limits, and likewise, perspective taking did not moderate the effect of time limits on contract choices (see Online Appendix C).

5.3. Discussion

Study 3 demonstrates that the effect of deadlines generalizes to managers making repeated compensation choices in a within-subjects design. This indicates that managers do not recognize their preference for flat fees under longer time limits as a bias (in the absence of factual feedback), even when the comparison is made highly evaluable.

Participants' self-reported beliefs are broadly consistent with inferences about both slacking and task scope. In two additional studies (Studies A7 and A8 in Online Appendix D), we replicate the within-subjects effect of deadlines on contract choices and

document effects of time limits on beliefs about both slacking and scope. However, none of the beliefs mediate the effect on compensation choices, potentially due to limitations in measurement (e.g., some participants only updating their beliefs when prompted with the questions after making contract choices). In the remaining studies, we instead investigate the underlying process by testing the diverging predictions of the slacking and scopeperception accounts about how contextual factors would moderate the observed effects.

Next, we test whether the slacking account alone can explain the findings. For beliefs about slacking to determine managers' contract preferences, the time limits must be relevant for workers' incentives. In Study 4, we had managers make choices involving "time limits" that were only relevant to the managers and invisible to the workers. In this setting, if the effect of time limits on compensation choices replicates, the findings cannot be explained solely by beliefs about workers slacking.

We use the same math task as in Study 3, but have actual workers complete the task so that we can identify any bias in time estimation and choice, as we did in Studies 1 and 2. In addition, we control for a potential self-generated validity confound due to order (Feldman & Lynch, 1988), and we include a context-specific test of risk aversion as an alternative explanation.

6. Study 4: Contract Choices When Workers Do Not Have Deadlines

In this study, we simulated a real-world situation in which the manager, choosing a compensation option, faces incentives (related to time limits) that do not affect the workers, in order to disassociate the manager's preference from the workers' motives. Consider an intermediary firm (such as a temp-agency, law firm, or subcontractor) that has a full-time staff of workers. These workers may be paid a flat rate (e.g., as salaried

employees), regardless of how long they spend on given tasks. However, the firm may contract the services of its workers to clients either at a flat rate (i.e., per task) or based on the time the workers spend on a client's project (e.g., billable hours). Thus, a manager who is in the market for such work may make decisions about whether to enter into a flatfee or per-time billing arrangement, but this would not affect how the workers are paid. In particular, the arrangement may include time limits (e.g., the maximum amount of time billed to the client) that can affect the clients' perceptions of work scope, but are irrelevant to the workers' compensation, and therefore cannot affect slacking.

6.1. Method – Phase 1: Workers

6.1.1. Participants

In phase 1, online participants (N=102) from Amazon Mechanical Turk were recruited for a pre-registered study (<u>http://aspredicted.org/blind.php?x=as83nb</u>). The participants were assigned to the role of "workers" and were all asked to complete the same math task as in Study 3 at their own pace and were paid a flat fee (see Figure 7).

6.2 Results – Phase 1: Workers' Completion Times

All workers completed the task. Overall, 77% of the workers took five minutes or less to complete the task (the complete distribution of time taken is presented in Online Appendix C). The median completion time was 3.55 minutes. We used this distribution of workers' completion times to compute Managers' payoffs in phase 2.

1	2	3	4	5	Please indicate the box nun	nber pairs (box# 1 and box# 2) below. Th	ne box numbers could be in any order.		
6.78	3.69	5.50	1.29	7.31	Remember: Every box number pair is unique. In other words, the same box# is NOT part of any two				
6	7	8	9	10	valid pairs.				
2.89	8.70	2.30	1.30	8.87		box# 1	box# 2		
11	12	13	14	15	Pair 1				
6.31	3.35	7.11	3.50	7.50	Pair 2				
16	17	18	19	20	Pair 3				
3.22	9.71	5.45	7.34	4.55	Pair 4				
21	22	23	24	25	Pair 5				
1.13	1.50	2.66	5.55	4.45	Pair 6				

Figure 7: Interface used to administer the Math task (Study 4).

6.3 Method – Phase 2: Managers

6.3.1. Participants

In phase 2, a sample of online participants (N=287) was recruited from the same Amazon Mechanical Turk population as the workers and played the role of managers in a pre-registered study (<u>http://aspredicted.org/blind.php?x=wm6wx3</u>). The workers' terms in phase 1 were described to the "managers," who then decided how to hire a worker from an "agency" to get the math task completed. In particular, the managers were told that the agency recruited multiple workers from Amazon Mechanical Turk, and all of them were paid the same fixed amount. Managers were also told that the agency measured the time workers took to complete a task, but there were no time limits imposed on the workers, and workers were not informed about the time they had taken.

The agency offered the managers a consequential choice between paying either a flat fee or a per-minute metered fee that was capped by a maximum time limit (between subjects; shorter time = 5 minutes, longer time=15 minutes). As in the previous studies, managers were told that the time cap in their condition was chosen at random from one of two potential time caps: 5 minutes and 15 minutes.

		If Flat Fee	Selected:	If Per-minute Fee Selected:		
Time Limit	Terms	Cost of	Profit	Cost of	Profit earned	
		hiring	earned by	hiring	by manager	
		worker	manager	worker	(variable)	
			(fixed)			
5 minutes	Budget = $$2.50$	\$1.75	\$0.75		\$0.50 to	
version 1	Flat Fee = $$1.75$				\$2.10	
(shorter time	Per-Unit-Time rate =					
limit)	\$0.40/min					
5 minutes	Budget = \$6.00	\$1.75	\$4.25	40¢ per	\$4.00 to	
version 2	Flat Fee = $$1.75$			minute	\$5.60	
(shorter time	Per-Unit-Time rate =					
limit)	\$0.40/min					
15 minutes	Budget = 6.50	\$2.25	\$4.25		\$0.50 to	
(longer time	Flat Fee = \$2.25				\$6.10	
limit)	Per-Unit-Time rate =					
	\$0.40/min					

Table 3: Managers' potential profits in different conditions in Study 4.

When a manager opted for the flat fee, the cost of hiring was fixed. However, if the manager opted for a metered fee, the manager was randomly paired with a real worker from phase 1, and the manager's cost of hiring was based on the worker's actual time (rounded up) to complete the task, capped at the pre-determined time limit. Managers were allotted a lump sum budget from which the cost of hiring was deducted, and the remaining money was paid to the manager, as their profit. The exact cost of hiring workers (and the resulting potential profit) in each condition is shown in Table 3. As seen in the table, there were two versions of the shorter time-limit condition in order to equalize the worst-case per-minute outcomes³ (version 1) or the flat-fee profits⁴ (version 2) between the two time-limits. The equal flat-fee profits between the 15-minute and version 2 of the 5-minute conditions tests whether people satisfice, simplifying their

³ Minimum profit earnable with metered fee choice is 50 cents in both time-limit conditions

⁴ Maximum profit earnable with flat fee choice is \$4.25 in both time-limit conditions

decision by choosing flat-fees whenever the profits are sufficiently attractive (e.g., Nunes, 2000).

Unlike in the previous studies, half the managers first estimated the task completion time before (vs. after, as in the previous studies), indicating their preferred worker compensation option. This counterbalancing was done to test whether managers' biased completion time estimates were merely an attempt to rationalize their prior decision about the compensation scheme when asked after the choice. Managers were then asked a few recall questions about the scenario.

Managers were also presented with a second hiring scenario, which tested their risk preferences, specifically in an employment context (as opposed to the gambling context used in Studies 1 and 2). In this scenario, managers chose between a certain fixed cost or an uncertain cost (presented as a list of potential costs and associated probabilities) to recruit a worker (see online appendix B). Managers were told that the cost would be deducted from a fixed revenue to determine their profit. Unbeknownst to the managers, the costs were constructed from the results of phase 1 to match the actual distribution of profits under the per-minute fee. This question was included to examine if *context-specific* risk preferences (i.e., about employment specifically) could explain the pattern of compensation scheme choices.

6.4 Results – Phase 2: Managers' Choices

Based on the actual completion times of workers in phase 1, the expected value of managers' earnings was significantly higher from choosing to pay a per-minute fee than the fixed earnings from paying a flat fee, in all the conditions (Shorter time limit, version 1: M_{Per-minute Fee} = \$0.90 vs. \$0.75 flat fee; Δ = \$0.15; *t*(101)=3.92, *p*<.001; Shorter time

limit, version 2: M_{Per-minute Fee} = \$4.40 vs. \$4.25 flat fee; Δ = \$0.15; t(101)=3.92, p<.001; Longer time limit: M_{Per-minute Fee} = \$4.58 vs. \$4.25 flat fee; Δ = \$0.33; t(101)=3.27, p=.001; see left-hand panel of Figure 8). Averaging across the two shorter time-limit conditions, the expected advantage of per-minute fees was significantly higher in the longer time-limit condition (t(101)=2.27, p=.025).

Preferences for paying a flat fee differed across the three experimental conditions $(\chi^2(2)=109.36, p<.001)$. In the two shorter time-limit conditions, a similar proportion of participants chose the flat fee (25% and 38%; $\chi^2(1)=2.69, p=.100$). In contrast, when the time limit was longer, an overwhelming majority (91%) of managers chose the sub-optimal flat fee option, which was significantly higher than the corresponding choice in both the shorter time limit versions (both *ps* <.001; see the left-hand panel of Figure 8). The higher choice of flat fees in the longer time limit condition than in version 2 of the shorter time limit condition is inconsistent with a simplifying heuristic (Nunes 2000), which would predict similar choices of flat fees based on a "satisficing" choice of the sure bonus of \$4.25 in both cases.



Figure 8: Choice of flat fee compensation (left-panel) and differences in expected bonuses from choosing different compensation options (right-panel) in Study 4. The vertical lines are 95% CI.

Given that there was a higher actual expected payoff advantage of choosing to pay per-minute in the longer time-limit condition, managers actually left significantly more money on the table (based on realized profits after being matched to a random worker) in the longer time-limit condition (M_{Per-minute Fee} = \$4.93, M_{Flat Fee} = \$4.25; Δ = -\$0.68, *t*(12)=4.88, *p*<.001), compared to either of the shorter time-limit conditions: version 1(M_{Per-minute Fee} = \$0.81, M_{Flat Fee} = \$0.75; Δ = -\$0.06; *t*(50)=1.05, *p*=.298; difference vs. longer time *t*(62)=4.44, *p*<.001) and version 2(M_{Per-minute Fee} = \$4.41, M_{Flat Fee} = \$4.25; Δ = -\$0.16; *t*(45)=2.69, *p*=.009; difference vs. longer time *t*(57)=3.92, *p*<.001; see the right-hand panel of Figure 8).

The suboptimal compensation scheme choices are largely explained by the managers' estimates of task completion time. Managers who chose a flat fee estimated a longer task completion time in both the combined shorter time-limit conditions ($M_{Chose Flat}$ $F_{ee} = 4.93$ vs. $M_{Chose Per-minute Fee} = 3.57$; t(140)=3.25, p=.001) as well as in the longer time-limit condition ($M_{Chose Flat Fee} = 8.93$ vs. $M_{Chose Per-minute Fee} = 6.38$; t(143)=1.93, p=.055). Recall that unlike prior studies where managers' estimates of task completion times were elicited after they indicated their contract choice, in this study, half the managers provided their estimates before indicating their contract choices, and the other half afterward. However, their estimates were not significantly affected by the order of elicitation in any of the conditions (interaction p=.083 and .403 respectively in the shorter and longer time limit conditions), suggesting that managers' estimates of workers

completion time were not due to *ex-post* rationalization by managers of their preceding choices.

Indeed, managers' choices were largely rationalized by their estimates of workers' completion times, regardless of the question order. Most participants chose the option that would have provided a higher profit had their time estimates been correct (78% in the combined shorter time conditions; 72% in the longer time condition). These proportions did not vary based the order of elicitation of the contract choices in any of the time limit conditions (interaction β =0.07, *z*=.124, *p*=.901). Furthermore, the estimated time for per-minute workers partially mediated the effect of deadlines on managers' contract choices (indirect effect bootstrapped 95% CI= [0.03, 0.28]), and this held even when completion time estimates were made before choosing compensation schemes (indirect effect bootstrapped 95% CI= [0.02, 0.30]).

The observed contract choices were not explained by context-specific risk preferences. In the longer time-limit condition, managers were much less likely to choose the per-minute fee than the equivalent uncertain employment cost in the post-choice follow-up question (9% vs. 39%; McNemar's $\chi^2(1) = 40.33$, *p*<.001), although there was no difference in the shorter time-limit condition (*p*=.273). Further, preference for flat fees in the longer time limit persisted (β =3.27, *z*=8.28, *p*<.001) controlling for context-specific risk preferences (e.g., the equivalent employment cost; β =2.45, *z*=6.51, *p*<.001). This strongly suggests that the compensation scheme choices under the longer time limit cannot be explained by managers' context-specific risk aversion.

6.5 Discussion

In Study 4, we again strongly replicate our basic result, that managers prefer flat fees more under longer time limits because managers who see longer time limits estimate longer worker completion times. This finding cannot be explained by a concern that workers under longer time limits would slack more because, in this study, workers were all paid a flat fee and did not even know about the time limit, and therefore the time limit had no effect on the workers' incentives or opportunity to slack. Thus, the results of Study 4 rule out the possibility that the findings are explained solely by managers' beliefs about workers slacking.

The finding that judges were biased towards choosing flat fees when the external deadlines were longer, even without any difference in workers' incentives, is consistent with time limits affecting the perceived scope of the task (Goswami & Urminsky, 2019). In Study 4, even though the time limits in this context logically could not affect workers' motivation, longer external time limits could still prompt managers to perceive the work as larger in scope, and therefore as taking workers longer to finish. This, in turn, would make time-metered based compensation schemes less attractive to managers, particularly when time limits are longer.

In the next study, we test whether information about scope moderates the effect, as would be predicted if the results were solely due to scope perception effects of deadlines. We provide managers with the distribution of completion times among flat fee workers who are working without a deadline, which provides information about the scope of the task but is irrelevant to the degree of slacking that might occur when deadlines are present. If providing this scope information eliminates the effect of time limits, we can conclude that our findings are likely to be driven by scope perception alone. However, if

the effects of time limits persist when scope information has been provided, scope perception alone cannot explain the results.

7. Study 5: Choice with Full Information about Completion Time Distribution

In phase 1, online workers were paid per minute to complete the same math task used in Studies 3 and 4 with a known external time limit of either 5 minutes or 15 minutes. In phase 2, online participants, playing the role of managers, made a consequential decision to hire either a flat fee worker (whose completion time is irrelevant for their profits) or a per-minute worker (whose completion time is relevant for their profits) to get the work done under an assigned external deadline. To remove any uncertainty about workers not being able to complete the task in the assigned deadline, managers were further told that only workers who had successfully completed the task in the provided time limit were available for hire. Accordingly, we only include these workers in our analysis below, although all participating workers were paid, as promised, irrespective of whether they successfully completed the task.

7.1. Method – Phase 1: Workers

7.1.1. Participants

In phase 1, online participants (N=125) from Amazon Mechanical Turk were recruited for a pre-registered study (<u>http://aspredicted.org/blind.php?x=qm4es5</u>) and were paid a nominal base payment with the possibility of earning a bonus payment. The participants were assigned to the role of "workers" and were all asked to complete a simple math task. The task, along with the instructions, was the same as in Study 4 (i.e., find six valid pairs from eight valid pairs).

Workers were randomly assigned to either a shorter (5 minutes) or a longer (15 minutes) time-limit condition. All workers were told that they would get an additional payment (as a bonus) at a rate of 25 cents per minute (rounded up to the nearest minute) they took to complete the task, and confirmed the terms, including their time limit.

7.2. Results – Phase 1: Workers' Completion Times

Overall, 102 of the 125 workers (82%) completed the task in the assigned time limit. These successful workers took significantly more time when the time limit was longer (M_{Longer} = 6.05) than when it was shorter (M_{Shorter} = 3.56, t(100)=4.71, p<.001; see Online Appendix C for the complete distribution of completion times in the two timelimit conditions). Therefore, as in Study 2, per-minute workers indeed earned significantly more when they were assigned to do the task under a longer external time limit, potentially because of slacking.

7.3. Method – Phase 2: Managers

7.3.1. Participants

A sample of online participants (N=546) played the role of managers in a preregistered study (<u>http://aspredicted.org/blind.php?x=nr4py6</u>). Managers were told that they would play a hiring game and that the decisions of five randomly selected managers would be implemented, such that any profits earned by these managers, based on their decisions, would be given as additional bonuses at the end of the study.

Managers were shown both the example task and the exact task that the workers had seen in phase 1. Managers were then randomly assigned to a cell in a 2(Time Limit: Shorter =5 minutes, Longer =15 minutes) x 2(Scope Information: Yes, No) betweensubjects design. In particular, managers were told that workers had been randomly

assigned to one of three time-limit conditions: unlimited time (or no time limits), 5 minutes, and 15 minutes; and that they would only use workers who were randomly assigned to a maximum time of 5 or 15 minutes (depending on condition) and who had successfully completed the task.

Two compensation schemes for hiring workers were available: a flat fee (\$1.00 in the 5 minutes condition; \$2.00 in the 15 minutes condition) or a metered fee of 25 cents per minute worked (rounded to the nearest integer) up to the maximum determined by the time limit. Managers were allotted a lump sum budget (i.e., \$4.00) from which the cost of hiring was deducted, and the remaining money was accrued to the managers as their profit.

In the scope-information condition, the true distribution of flat-fee worker completion-times under no time limits (i.e., the information reported in phase 1of Study 4) was provided to managers in the form of a histogram before they made their choice. Five comprehension questions were asked in this information condition, on the same page where the chart was displayed, to ensure participants comprehended the additional completion-time information.

All managers then indicated their choice between a flat fee and a per-minute fee. After this, the managers estimated the task completion time of their workers under the chosen compensation scheme, as well as under the alternative compensation scheme. Finally, managers were asked a few recall questions.

7.4 Results – Phase 2: Managers' Choices

In the analysis below, we use the entire sample of managers. The results are substantively unchanged if we include only those managers who pass the various comprehension checks (see online Appendix C).

Based on the actual completion times of workers operating under a per-minute fee in phase 1, the expected value of managers' earnings was nearly identical for choosing to pay per-minute or a flat fee in the shorter time limit (\$3.00), but there was an advantage of choosing to pay per-minute in the longer time limit ($M_{Per-minute Fee} = $2.35 \text{ vs. } 2.00 flat fee; $\Delta = 0.35 , t(54)=3.01, p=.004), and consequently, a significant difference by time limit in the incentive to choose the per-minute fee (t(100)=2.65, p=.009).

In the no-information condition, managers were significantly more likely to choose the flat fee under the longer time limit (77%) than the shorter time-limit (60%; $\chi^2(1) = 8.59, p = .003$), replicating the prior studies. Accordingly, managers who chose to pay a flat fee left more money on the table (based on realized profits after being matched to a random per-minute worker), particularly when the time limit was longer (M_{Per-minute} Fee = \$2.33, M_{Flat Fee} = \$2.00; $\Delta = -$ \$0.33, *t*(28)=2.16, *p*=.039) though there was no difference in the shorter time-limit condition (*p*=.183). Therefore, like in previous studies, managers earned significantly less when time limits were longer (interaction *t*(81)=2.36, *p*=.020).

However, providing completion-time information, which informs the managers about the actual scope of the task, did not moderate the effect of time limits on choices of compensation schemes. In the scope-information conditions, the biased preference towards flat fees persisted, with more choices of flat fee compensation schemes under the longer than the shorter time limits (68% vs. 55%, $\chi^2(1) = 4.10$, p = .042), not significantly

different from the no-scope information conditions (interaction β =0.303, *z*=0.82, *p*= .412). Indeed, even when scope information was provided, managers choosing perminute fees earned significantly less in the longer time-limit condition (M_{Per-minute Fee} = \$2.45, M_{Flat Fee} = \$2.00; Δ = -\$0.45, *t*(45)=4.02, *p*<.001), although there was no significant difference in the shorter time-limit condition (*p*=.308). Therefore, even with information about scope, managers earned significantly less when time limits were longer (interaction: *t*(106)=3.95, *p*<.001). In fact, the two-way interaction of time limits and completion-time information on bonuses earned was not significant (β =0.125, *t*=0.77, *p*= .441), suggesting that, overall, the additional information regarding the scope of work did not eliminate the reduction in managers' earning when time limits were longer.

As in the prior studies, whether or not scope information was presented, longer time limits biased estimates of completion times, which explained compensation choices, which were mostly rationalized by participants' time estimates (see online Appendix C).

7.5. Discussion

We replicated our basic findings that time limits biased choices of compensation scheme, whether or not additional information about task scope was presented in this study, and again in Study A9 (Online Appendix D). This result is inconsistent with a purely scope-based account of the findings and supports the conclusion that time limits also affect beliefs about workers' slacking behavior when workers have the incentive to slack (e.g., when time limits are longer). Further evidence that beliefs about slacking contribute to the effect of time limits on contract choices in the current study can be seen by looking at the subset of managers (across conditions) who estimated no difference in completion times between per-minute workers and flat-fee workers (N=169). Among

this subset of managers who did not believe that workers would slack, external time limits had no effect on choices of compensation schemes (β =0.04, z=0.11, p=.909).

Studies 4 and 5, taken together, can be interpreted as suggesting that neither the slacking beliefs nor scope perception account explains the biasing effect of time limits on contract choices. Alternatively, however, the robust effect of time limits on misestimations of others' task completion times, and consequent choice of hiring schemes, may be multiply determined – driven jointly by both the effect of time limits on perceived scope of work *and* bbeliefs about how external time limits affect workers strategic slacking behavior. Study 6 was designed to provide a confirmatory test of this multiple-account hypothesis. In this study, we combine the manipulations used in Study 4 and Study 5 and compare the contract choices of managers who are informed that time limits are irrelevant for workers' incentives but do not have scope information with those of managers who are additionally provided information about the scope of work.

8. Study 6: Confirmatory test of the joint mechanism affecting contract choices8.1. Method

8.1.1. Participants

Online participants (N=393) from Amazon Mechanical Turk played the role of managers in a pre-registered study (<u>https://aspredicted.org/blind.php?x=vb32cn</u>). Managers participated in a hiring game and were randomly assigned to a 2(Time Limit: Shorter =5 minutes, Longer =15 minutes) x 2(Scope Information: Yes, No) between-subjects design. This study used the same scenario as in Study 4, in which the workers were paid a flat fee without any time limits, and the managers contracted with a third party (i.e., the "agency"). The "time limit" (that varied by condition) was used by the agency to determine the maximum amount they could be charged. As a result, managers' beliefs about workers' slacking behavior were irrelevant in this study (as in Study 4) because workers' compensation was decoupled from time limits, and time limits only had a bearing on managers' contracts with a third-party.

In this study, managers made two contract choices for two different tasks. Managers were randomly assigned to one of two maximum time limits (5 minutes or 15 minutes), which applied to both tasks. Managers were also randomly assigned to either the no-information or scope-information condition. After completing the first task, managers in the scope-information condition were provided with additional information on the scope of the task (i.e., a histogram with the true distribution of flat-fee worker completion-times under no time limits) before they made their second contract choice.

In each task, managers chose between paying either a flat fee or a per-minute metered fee that was capped by a maximum time limit (either 5 minutes or 15 minutes, specifying that the time limit was selected at random from the two options). The choice options facing the managers were taken from Study 4 (version 2 in the shorter time limit condition; see Table 3). All managers answered a few comprehension check questions before making their contract choices. Managers in the scope information condition answered a few comprehension questions regarding the information displayed in the histogram before they indicated their second contract choice.

8.2. Results

In the no-information condition, comparing the short vs. long deadlines, we replicated the results of Study 4. In particular, looking at the first choice, a significantly higher proportion of managers preferred the flat fee contract in the longer time limit

condition compared to the shorter time limit condition (77% vs. 42%, $\chi^2(1) = 22.82$, p < .001; see the left-hand panel in Figure 9). Managers' second choice under the same time limit yielded the same result as their first choice, with greater preference for the flat fee contract in the longer time limit condition (73% vs. 37%, $\chi^2(1) = 23.70$, p < .001). Thus, as expected, merely making two contract choices for two different but very similar tasks did not result in a revision of preferences for compensation schemes. The results replicated the bias for flat fee contracts under longer time limits, even when managers knew that workers have no incentives to "slack," suggesting, as in Study 4, that concerns about slacking alone do not explain our findings.





The managers in the scope-information condition were provided with additional information about task scope between their first and second contract choices. Therefore,

the first choice they faced was the same as in the no-information condition, and we again replicated the bias for flat fees under longer time limits in the first choice (15 mins: 76% vs. 5 mins: 51%, $\chi^2(1) = 11.76$, p < .001).

The results thus far have simply replicated our prior findings of a robust bias in contract choices induced by longer time limits. However, if this bias is due to the combination of both a greater concern about slacking and larger scope perception under longer time limits, the bias should be eliminated in the second choice in the scopeinformation condition. As we saw in Study 5, providing scope information alone was insufficient to debias the preference for flat fee contracts under longer time limits, when worker slacking was relevant to the decision. However, the second choice in the scopeinformation condition tests the effect of providing scope information when slacking is irrelevant, and therefore neither of the potential causes of the bias is present.

The results show that the combination of *both* eliminating slacking concerns *and* providing scope information eliminates the bias. In the scope-information condition, the managers'second choice (after being provided with scope information) did not manifest a biased preference in favor of flat fees under longer time limits (15 mins: 37% vs. 5 mins: 44%, $\chi^2(1) = 0.74$, p = .389; see the right-hand panel in Figure 9). Managers revised their decisions between the first choice and, after receiving scope information, the second choice, particularly when the external time limits were longer. After providing additional information about scope, significantly fewer managers indicated a preference for flat fee contracts in the longer time limit condition than in their first choice (37% vs. 76%, McNemar's $\chi^2(1) = 26.45$, p = <.001). The reduction was small and not significant in the shorter time limit condition (44% vs. 51%; McNemar's $\chi^2(1) = 0.92$, p = .337), suggesting

that additional scope information had a stronger effect in the longer time limit condition where the bias is more prevalent. Indeed, using an hierarchical regression, we find that the reduction in preference for a flat fee in the longer time limit condition was significantly larger compared to that in the shorted time limit condition (interaction β = 1.61, *z*= 3.35, *p*<.001).

Finally, controlling for managers' initial choices, scope information moderated the effect of time limits on preference for flat fee contracts (β = 1.88, *z*= 4.07, *p*<.001), further establishing the joint role of beliefs about slacking and about task-scope on biasing contract choices. These results are robust to using only the subset of managers who successfully recalled that workers were paid a fixed payment and that workers did not have any imposed external time limit (see Online Appendix C).

8.3. Discussion

Study 6 identifies the conditions under which the bias is eliminated, demonstrating that longer external deadlines affect contract choices jointly through increasing people's concern about slacking as well as their perceptions about the scope of work. Neither debiasing beliefs about slacking (e.g., Study 4) nor providing objective information about the scope of work (e.g., Study 5) alone were sufficient to eliminate the biased preference for flat fee contracts, particularly for longer time limits. However, a manipulation that jointly addressed both of these psychological mechanisms was successful in debiasing participants. The results of Study 6 also rule out an implicit anchoring account of our findings, which cannot explain the moderating effect of providing scope-information before the second choice.

9. General Discussion

In many employment contexts, hiring workers under temporary contracts is crucial to the bottom-line. How efficiently do managers make such decisions when faced with different time limits? In this paper, we investigated this question using consequential economic games and tests of psychological mechanisms. Our findings reveal that many managers prefer suboptimal flat-fee compensation schemes over higher expected-profit time-metered plans. In particular, managers show a more strongly biased preference for flat fees (i.e., a lump sum cost to get a task done) when external time limits are longer, even when the expected-profit advantage of time-metered fees is stronger for the longer time limits.

Across fifteen studies (six studies in the paper, nine in the Online Appendix), we show robust evidence for biased contract preferences, using both lay participants playing the role of managers as well as experienced managers with prior hiring experience (Studies A3 & A4 in Online Appendix D). The preference for flat-fee compensation schemes persists when profits are dependent on the quality of the finished task (Study 2, Studies A4-A6 in Online Appendix D) and when managers hire multiple workers under the same contract scheme (Study A2). The misestimation of completion times on account of time limits was found to be multiply determined, involving both managers' perception of task scope under longer time limits (Studies 3,4, & 6; Studies A7 & A8 in Online Appendix D) as well as their beliefs about workers strategically slacking under longer time limits (Studies 3, 5, & 6; Studies A7-A9 in Online Appendix D).

Prior research has documented flat fee biases for ongoing service usage, where decision-makers are shown to prefer a fixed payment schedule for unlimited service access, e.g., usage of telephone minutes (Train et al., 1987) and gym access (DellaVigna

& Malmendier, 2006). Such preferences have been attributed to risk aversion (Lambrecht & Skierra 2006), or the motivational benefits of pre-commitment (DellaVigna & Malmendier, 2006). In this paper, we document a parallel bias in the novel domain of employment contracts, which cannot be explained by any of these factors. Specifically, we provide evidence that managers' preference for flat fee employment contracts is due to misestimating completion time and cannot be explained by risk aversion, satisficing, or self-control motivations.

Instead, our evidence suggests that longer time limits overly affect managers' beliefs about how much time workers will take, due to their impact on both perceptions of task scope (Goswami & Urminsky, 2019) and concerns about strategic slacking (workers taking more time in order to earn more money, which makes time-based compensation schemes unattractive). Previous work on industrial psychology has documented examples of "holding back" behavior (e.g., "goldbricking") in order to restrict production to manage future quotas. However, in our studies, managers are concerned about an entirely different strategic response – per-minute workers "holding back" to increase their completion time and resulting wages. To the best of our knowledge, such slacking behavior and its managerial implications on judgment and decision making have not been previously studied empirically. Our evidence suggests that although such slacking behavior may happen in practice, people in the role of managers are not well-calibrated and tend to overestimate the incidence of such behavior. As a result, they might unnecessarily avoid paying metered compensation to hire temporary workers in one-shot interactions, and consequently, leave money on the table.

If the bias in contract choices is explained by biased time estimates, then we would expect the biased preference for flat-fee contracts to also be eliminated when the cost difference between flat fees and metered fees is large enough to compensate for the distorted expected values. In additional conditions run with Study A1 (reported in Appendix C), we doubled the cost of flat fees (from \$1.50 to \$3.00) in the longer timelimit condition, which significantly reduced the preference for flat fees to lower than that in the shorter time-limit condition, reversing the effect of time limits on compensationscheme choices. This suggests a conditionally rational interpretation: managers were largely basing their decision on expected profits conditional on their beliefs (rather than a more general avoidance of metered fees) and used per-minute fees when it seemed more profitable to do so. If the preference for flat fees that we observe was instead due to the risk aversion or motivational benefits, as studied in prior research, the preference should have persisted regardless of the cost of the flat fee. Thus, our findings should be seen as an existence proof - bias in time estimation results in biased evaluations of choice options, that can bias choices of compensation schemes under specific conditions.

More broadly, our results hint at a general problem that managers may face in contemporary employment settings, where complete control is often impossible, and success instead relies on conditional cooperation (Bewley & Brainard, 1995; Fehr & Falk, 2002). Managers may tend to overestimate the necessity of explicit control (such as constraining pay to be fixed) and underestimate the extent of workers' internal motives or indirect external incentives to perform well (Heath, 1999; Goswami & Urminsky, 2019). While we focus on a one-shot interaction between workers and managers in this research, it would be interesting to study how managers' behavior might change when there are

opportunities to interact with the workers repeatedly (Eriksson & Villeval, 2008). Would managers give sufficient weight to workers' motivation to build reputation capital for securing future opportunities?

Given the pervasiveness of deadlines in both our daily life as well as in the dayto-day workings of organizations, investigating how this environmental factor influences managerial and economic decisions is an important and underdeveloped research endeavor. While some research has looked at the effect of external deadlines on negotiations and settlements in managerial settings (Gneezy, Haruvy, & Roth 2003) and on auction outcomes (Katok & Kwasnica, 2008), to the best of our knowledge, this research is the first to identify effects of deadlines on the choice of hiring options in employment settings. The slacking and scope perception mechanisms through which this effect of deadlines on hiring-option preference operates provides a counterpoint to prior work on employment decisions, which has emphasized the role of rational factors (e.g., ease and cost of monitoring, uncertainty in the environment, workers' type) in contract choices. Our findings may provide a starting point for investigating other belief-based biases that can influence managerial choices of contracts under incomplete information, as well as the unintended consequences of pervasive time limits on other commonly observed managerial practices.

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