Incentive Power and Knowledge Sharing among Employees: Evidence from the Field

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Abstract

There is consensus, both in the literature and in practice, about knowledge sharing within organizations being a key determinant of success. However, organizations struggle to sustain employees' engagement in knowledge sharing. One challenge lies in the fact that, while compensation contracts specify an explicit relation between performance on employees' main responsibilities (i.e., standard tasks) and monetary payoffs, knowledge sharing is a voluntary activity that is not explicitly included in employees' main responsibilities or formally assigned to them by their managers. This study examines how standard task incentive power (i.e. the elasticity of payoffs with respect to standard task performance) influences employee propensity to share knowledge. We show that high-powered incentives are associated with less knowledge sharing, in particular when shared knowledge aims to benefit a broader set of constituents than the proponent. Our findings are consistent with the notion that high-powered incentives, by fixating employees' attention on their standard tasks, signal a transactional psychological contract, which limits their contribution to exchanging time and tasks for pay. Low-powered incentives, instead, are more likely to signal a relational psychological contract, whereby employees contribute to the success of the firm in ways that go beyond their defined responsibilities. We contribute to the literature on incentives for knowledge sharing and on the unintended consequences of pay-for-performance compensation.

Keywords: organizational knowledge sharing; contract design; high-powered incentives; pay for performance; rank-and-file.

JEL Codes: J3, M12, M40, O31

1. Introduction

Knowledge sharing is an important driver of success for every modern organization (Chow et al. 2000; Govindarajan and Gupta 2001; Widener 2004). However, managers face considerable challenges to encourage employees to share knowledge among them. Research has explored several factors that influence knowledge sharing, including individual factors, such as extrinsic versus intrinsic motivation (Kankanhalli et al. 2005), interpersonal factors, such as team composition and social network ties (Ditillo 2004, 2012), organizational factors, such as norms (Balakrishnan and Letmathe 2013), culture and tone at the top (Elbashir et al. 2011) information technology (Banker et al. 2002), and incentive systems (Bartol and Srivastava 2002; Kankanhalli et al. 2005; Vera-Munoz, Ho and Chow 2006; Hwang et al. 2009). Whereas prior work has examined the impact on knowledge sharing of linking employee compensation to individual versus collective operational performance (Lee and Ahn 2007; Fey and Furu 2008; Hwang et al. 2009), we explore how incentive power (i.e. the sensitivity of compensation to performance) influences workers' propensity to engage in knowledge sharing.

One of the challenges associated with incentivizing knowledge sharing directly lies in the fact that opportunities to develop and share knowledge arise unplanned, thus making *ex-ante* contracting on knowledge sharing particularly difficult. Consequently, most incentive contracts define explicit relations between employee payoffs and one or more output-based metrics related to the employee's main responsibilities (hereafter: standard tasks), leaving out desirable discretionary activities like knowledge sharing (Cheng and Coyte 2014). It is therefore important to understand how the design of formal incentive contracts for standard tasks influences employees' engagement in knowledge sharing. Prior research finds that, while explicit incentives associated with specific metrics are likely to improve performance on the measured dimensions,

this may happen at the expense of other behaviors that are vital for the success of the company, but not explicitly recognised in the compensation contract (Wright et al. 1993, Cheng and Coyte 2014). We posit that higher sensitivity of compensation payoffs to explicit measures of performance exacerbates this effect, so that high-powered incentives are associated with *lower* propensity to engage in knowledge sharing.

Our prediction is motivated by prior research examining how employees form beliefs about their own and their employer's obligations (Rousseau 1995). Organizational behavior researchers have proposed that employees infer *psychological* contracts with their organization from explicit or implicit promises they receive via many sources of information, among which are compensation contracts (Argyris 1960; Blau 1964; Rousseau 1990; Millward and Hopkins 1998). The nature of these psychological contracts ranges along a continuum between *transactional* and *relational* (Rousseau 1989). Transactional psychological contracts are experienced as economic exchanges of time and tasks for pay, whereas relational psychological contracts are experienced as social exchanges involving a broader definition of the worker's relationship with the organization, whereby employees contribute to organizational effectiveness with activities and behaviors that go beyond their standard tasks (Blau 1964; Millward and Hopkins 1998). While knowledge sharing is valuable for the firm and actively encouraged by managers, it largely constitutes a discretionary act that is not defined as part of employees' assigned responsibilities (Jarvenpaa and Staples 2000; Cheng and Coyte 2014). Because high powered incentives fixate the employee's attention on the performance measures specified in the compensation contract (Wright et al. 1993), we posit that employees rewarded with high-powered incentives are more likely to infer transactional psychological contracts. In contrast, low-powered incentives define the relationship between the employee and the organization in a way that is less dependent on standard task output,

thereby signaling a relational psychological contract between employees and their organization. Therefore, we expect to observe a negative relation between incentive power and individual knowledge sharing.

We test our prediction using field data from a company that maintains a formal employee suggestion system. Suggestion tracking systems are one of the most common types of knowledge management systems (Bartol and Srivastava 2002). These systems provide opportunities to share knowledge and to record it in the organization's memory (Argote et al. 2003; Small and Sage 2006; Lee and Ahn 2007; Bedford 2015; Lyu and Zhang 2017).[1] We examine whether differences in the power of incentives related to employees' standard task are associated with differences in the likelihood to share their suggestions for improvement. Moreover, we explore the variability in the scope of the suggested ideas (i.e. ideas narrowly focused on the proponent's standard task versus ideas benefiting a broader or different set of constituents in the organization). We predict that the fixation on standard task introduced by high-powered incentives constrains employees' knowledge sharing to ideas that are associated with improvements in their standard task performance. In contrast, the relational nature of the psychological contract inferred from low-powered incentives is likely to be associated with suggestions benefiting a broader set of constituents. In summary, our empirical inquiry relates to whether the intensity of incentives for the prescribed standard

[1] The availability of opportunities to share knowledge is critical to support knowledge sharing (Argote et al 2003). In 2006, the Wall Street Journal published an article titled "Companies struggle to pass on knowledge that workers acquire," in which the reporter describes an encounter with a package-delivery courier in an elevator. Asked whether it would be more efficient to deliver parcels starting from the top or the bottom of the building, the courier had indicated how that would depend on the time of the day. The exchange led the journalist to reflect on the possibility that the courier might have identified a way to improve efficiency based on the pattern of elevator traffic in that area. If shared with all coworkers serving similar areas, such a practice could save time, energy, and cost to their organization. However, in absence of a medium and sufficient motivation to share their knowledge, that opportunity would remain unexploited. Source: ThurmStaff, S. 2006. "Companies struggle to pass on knowledge that workers acquire." The Wall Street Journal, Jan. 23, 2006. https://www.wsj.com/articles/SB113797285013053145 , retrieved on April 1, 2020.

execution task is associated with (1) the employee's propensity to share knowledge, and (2) the scope of the shared suggestions in relation to the proponent's standard task.

Our field setting provides powerful opportunities to test our predictions. First, the operations of the firm are labor intensive, and employees are hired exclusively based on expectations to perform their assigned standard task. These tasks are rewarded based on incentive contracts that can assume any one of the following three types: fixed pay, variable pay, or a combination of fixed and variable components. The variable component is based on output measures capturing employee performance with respect to their standard task. Second, management encourages employees at all organizational levels to submit ideas that may improve firm productivity, quality, working conditions, or reduce costs. Consistent with prior literature (Bartol and Srivastava 2002; Lee and Ahn 2007; Lyu and Zhang 2017), the company offers a rather symbolic monetary reward to motivate knowledge sharing. Third, we leverage on the firm's classification of submitted suggestions and group them into ideas pertaining to the proponent's standard task (hereafter, narrow scope) versus ideas that extend beyond the proponent's standard task (hereafter, broad scope).

Our statistical analyses produce two main findings. First, we find that, compared to fixed pay, variable pay contracts are associated with significantly lower employee propensity to submit improvement suggestions. This is consistent with high-powered incentives leading to transactional psychological contracts, whereby employees focus more on providing time and tasks for which they are hired and paid and ignore activities beyond their defined responsibilities (Wright et al. 1993). Second, we find that employees rewarded with variable pay propose broad scope ideas significantly less than their fixed-pay colleagues, whereas employees' propensity to propose narrow scope ideas is not significantly different across the different types of incentive contracts.

This result is consistent with the prediction that workers experiencing a relational psychological contract are more likely to perform activities that benefit other individual coworkers, groups or the organization as a whole (Blau 1964; Millward and Hopkins 1998). Our results are robust to accounting for potential differences in the task nature, and to including control variables capturing employee characteristics that may affect an individual's propensity to engage in knowledge sharing activities. In additional robustness tests, we adopt an instrumental variable approach leveraging institutional details to address the concern that the assignment of contract types may be endogenously determined. We also address the possibility that our results might simply be driven by multitasking, whereby the employee chooses to focus on the task that is more directly and saliently rewarded at the expense of any other tasks. Our results are inconsistent with this alternative explanation. Taken together, our findings suggest that high-powered incentives, by increasing employee fixation on the standard task specified in the contract, can inhibit employee engagement in knowledge sharing, especially with respect to suggestions that can benefit a broader set of constituents within the organization.

Our main analyses include time and department fixed effects to control for the influence of seasonal trends and for time-invariant unobservable characteristics linked to the organizational role of the workers and department-specific dynamics. In additional tests, we relax the fixed-effect model specification, and explore organizational factors that may further influence employees' propensity to engage in knowledge sharing. First, because organizational culture is a key determinant of knowledge sharing (Elbashir et al. 2011; Balakrishnan and Letmathe 2013; Bedford 2015; Lyu and Zhang 2017), we examine the moderating role of department managers in shaping the norms within their team. Consistent with this notion, we find that workers that operate under the supervision of managers who are very active in knowledge sharing tend, in turn, to share

knowledge more than colleagues operating in other departments. Yet, our analyses show that these leadership effects interact with the power of standard task incentives. For example, within departments supervised by managers who are very active in knowledge sharing activities, employees rewarded with variable pay are less likely to share knowledge than their fixed-pay colleagues. These results offer further support to our idea that the nature of the standard task compensation contract interacts with known drivers of knowledge sharing. Second, in exploratory fashion, we examine the possibility that increased pressure on standard task performance (e.g., production demands) may influence the relation between incentive power and employees' propensity to engage in knowledge sharing. We find that idea submissions are more common during busy production months, when process inefficiencies and opportunities for improvement are more salient to the workers. We continue to find evidence of interaction effects with incentive power.

This study responds to the call for field-based research on management accounting and control practices that cannot be solely understood through the lens of traditional agency theory (Abernethy and Campbell 2018). We provide the following contributions to the literature on management control systems and incentive design. First, we contribute to the research on motivating knowledge sharing within organizations by providing evidence of the influence that standard task incentive power exerts on the effectiveness of control systems fostering knowledge sharing. Despite the importance of knowledge sharing in the modern economy and the wide use of knowledge management systems in practice, there is relatively scant research that explores how management control systems can combine incentives for knowledge sharing incentives with incentives for standard tasks. Second, our findings extend the literature that documents potential downsides of monetary incentives that are tied to specific performance measures (i.e., pay-for-

performance). Prior research has associated high-powered incentives with dysfunctional behaviors (Burgess and Ratto 2003; Larkin et al. 2012), including short-termism (e.g. Cheng 2004; Bolton et al. 2006; Kothari et al. 2009) and gaming (Baker et al. 1988). Our results provide evidence of an additional potential downside of high-powered incentives, in that they hamper behaviors aimed at benefiting others and the organization. Our findings have important implications for practice.

2. Prior Literature

Many organizations rely on compensation contracts that tie monetary payoffs to one or more output-based metrics related to the employee's main responsibilities in an effort to maximize organizational performance. Yet, researchers and practitioners concur that such explicit incentive contracts are limited to incentivizing specific dimensions of performance and fail to consider other behaviors, such as knowledge sharing, that may have positive long-term consequences on performance such as knowledge-sharing (Wright et al. 1993; Cheng and Coyte 2014). Abernethy and Campbell (2018) highlight the importance of exploring complex contracting environments in which the effectiveness of control systems might not be fully explained by agency theory frameworks, whereby incentives are designed to drive employee effort and minimize agency costs to maximize standard task performance. In this study, we examine important consequences of using high-powered incentives to incentivize standard task performance, by studying how they interfere with other control systems aimed at encouraging knowledge-sharing—a discretionary but critical activity for firm success.

In its broad definition, knowledge sharing is the act of "sharing organizationally relevant information, ideas, suggestions, and expertise" among individuals (Bartol and Srivastava 2002, page 65). Govindarajan and Gupta (2001) state that "in the emerging era, every business must be considered a knowledge business" (page 2). Research shows that firms with more effective

knowledge sharing practices and culture experience higher productivity, innovativeness, and greater financial success (Simonin 1999; Govindarajan and Gupta 2001; Banker et al 2002; Lee and Ahn 2007; Van Wijk et al. 2008, Fey and Furu 2008). Widener (2004), Mouritsen and Larsen (2005), and Hwang et al. (2009) state that knowledge resides in individual members of the organization. It is management's task to create conditions for individual knowledge to be shared and crystallized into organizational knowledge (Mouritsen and Larsen 2005).

Yet, knowledge sharing is a discretionary act that lies outside of the employees' explicit responsibilities, making it difficult to incentivize directly (Jarvenpaa and Staples 2000; Burney et al. 2009; Cheng and Coyte 2014). Sandvik et al. (2020) posit that individuals face two types of costs (initiation costs and contracting costs) with respect to sharing knowledge with others. Initiation costs relate to the consumption of time, effort, and resources to create the opportunity to share knowledge with others. The provision of formal opportunities to transfer information is a key determinant of knowledge sharing (Argote et al. 2003). In many cases, opportunities are provided via knowledge codification systems, which allow for individual knowledge to be shared and recorded in the organizational memory (Banker et al. 2002; Kankanhalli et al 2005; Small and Sage 2006; Lee and Ahn 2007; Lyu and Zhang 2017). Additionally, codification systems provide managers with opportunities to observe and reward knowledge sharing behaviors (Bartol and Srivastava 2002). Contracting costs refer to the adequacy (or lack thereof) of rewards associated with the act of sharing knowledge (Sandvik et al. 2020). Several studies refer to the perception of individual knowledge as a source of power, competitive advantage, and benefits associated with the attainment of expert status, leading to high opportunity costs associated with sharing knowledge (Bartol and Srivastava 2002; Fey and Furu 2008; Wolfe and Loraas 2008). While Sandvik et al. (2020) find no material effect of contracting costs in their examination, other

scholars have stressed the importance of adequate rewards and recognition for knowledge sharing (Bartol and Srivastava 2002; Szulanski 1996; Wolfe and Loraas 2008).

Prior research has explored ways to incentivize knowledge sharing. Several scholars find evidence that linking individual rewards to collective performance induces knowledge sharing as a means to increase performance and thus the associated payoffs. For example, Ravenscroft and Haka (1996) compare the interaction of cooperative (i.e., based on collective performance) and competitive incentives (i.e., based on tournaments) for standard task performance with the provision of opportunity to share information and find that cooperative incentives lead to greater productivity and knowledge sharing. Fey and Furu (2008) find that rewards linked to group targets in multinational corporations is associated with knowledge transfer between subunits. In contrast, Lee and Ahn (2007) find that direct rewards for individual knowledge contributions to an organization's codification system (i.e., input measures) are superior to indirect incentives to share knowledge by linking compensation to collective performance (i.e., output measures). Lyu and Zhang (2017) also support the use of rewards for individual contributions to knowledge codification systems. More extremely, Quigley et al. (2007) recommend against the use of incentives associated with standard task performance to motivate knowledge sharing. Hwang et al (2009) theorize and support empirically that the use of individual versus collective metrics in the determination of performance-related payoffs, as well as the relative weight of input (i.e., contributing knowledge) versus output measures (i.e., standard task performance) in compensation contracts depends on the extent of employees' specific knowledge and the organizational value associated with knowledge sharing. This study extends this line of research by focusing on the *power* of incentives for standard task performance (i.e., the sensitivity of payoffs to the chosen

performance metrics defined in the compensation contract) and studying how incentive power may influence employee propensity to engage in knowledge sharing activities.

3. Hypothesis Development

Prior research on knowledge sharing within organizations highlights how these activities, while encouraged and often times rewarded, are rarely formally assigned to employees by their superiors (Davenport 1995; Jarvenpaa and Staples 2008). Most rank-and-file employees are hired to perform a set of defined operational tasks. Organizations rely on the dependability of employee performance on these tasks and reward them based on some measure of output reflecting quantity and quality (Katz 1964). If employees were only hired as "agents" to perform a standard task, organizational performance could be maximized by improving task design and optimally allocating different dimensions of the task to different agents, each compensated based on performance on their assigned responsibilities (Holmstrom and Milgrom 1991). However, most executives concur that employee engagement that goes beyond what they are specifically hired for is essential to organizational success. Rather than considering employees to be "agents" that only work on prescribed tasks, organizations increasingly demand that their employees behave as "stewards" and act more broadly in the best interest of the organization (Davis et al. 1997; Segal and Lehrer 2012). Consistent with this view, employees are often encouraged to perform desired activities that do not pertain to the employees' contractual responsibilities prescribed by explicit incentive contracts and but are vital to the survival and profitability of the organization.[2] Knowledge sharing is an example of these behaviors.

[2] The literature has adopted a broader definition of these activities, grouping them under the definition of "extra-role behaviors" (Katz 1964; Wright et al. 1993; Cheng and Coyte 2014). Extra-role behaviors encompass a broader set of behaviors than the focus of this paper and include organizational citizenship behavior (Organ 1988) and prosocial organizational behavior (Brief and Motowidlo 1986). Specific examples include activities that improve cooperation and collaboration, protect the organization, its assets, and its members from disaster, and constructive ideas for operational improvements (Katz 1964).

In many ways, knowledge sharing is akin to prosocial organizational behavior in that it refers to a discretionary act that contributes positively to the success of others and of the organization but is not directly or explicitly recognized in the contract that governs the relationship between the worker and the organization with respect to the employee's main responsibilities (Benabou and Tirole 2006; Lee and Ahn 2007; Cheng and Coyte 2014). The social and organizational context in which the worker operates influences the extent to which his or her behavior is driven more by task-related determinants versus social and organizational determinants (Jarvenpaa and Staples 2000). How the worker experiences his or her organizational context is reflected in her psychological contract.

Psychological contracts pertain to the employee's interpretation of the employment relationship and related beliefs about his or her own and the firm's commitments (Argyris 1960; Millward and Hopkins 1998). Employees infer their psychological contract from implicit and explicit signals they receive in their interactions with coworkers and managers within their organization (Rousseau 1995; Millward and Hopkins 1998). Implicit signals include observed patterns of exchange, consistency between promises made and promises kept, and general demonstrations of reciprocal trust and fairness. Explicit signals include elements of the formal employment contract (i.e., job descriptions, part-time versus full-time employment, contracted versus employed labor, etc.) and compensation agreements governing the relation between tasks defined as the worker's main responsibilities and payoffs. The more explicit the signal, the stronger its weight in the formation of a psychological contract (Millward and Hopkins 1998).

Psychological contracts range along a continuum between transactional and relational. Transactional psychological contracts reflect the employee's belief that the relationship with the organization entails a series of independent economic exchanges of time and defined tasks (i.e.,

standard tasks) for compensation (Millward and Hopkins 1998). A relational contract, instead, corresponds to an ongoing social exchange involving a broader set of responsibilities that are not limited to the task defined in the formal employment contract (Rousseau 1995). We build on this work and posit that employees rewarded with high-powered incentives (i.e., compensation contracts with high elasticity of payoffs with respect to standard task output) form a transactional psychological contract with the organization that predominantly motivates performance as specified in the compensation contract. Similarly, we posit that employees rewarded with low-powered incentives (i.e., low elasticity of payoffs with respect to standard task output) form a relational psychological contract with the organization that motivates them to engage in other desirable activities not specified in the contract.

Therefore, even when managers explicitly encourage knowledge sharing by introducing dedicated formal control systems and reward knowledge sharing behaviors, if high-powered incentives are interpreted as transactional psychological contracts, we expect that employees' motivation to share knowledge that may benefit organizational performance will be lower, as employees will fixate on their standard task performance at the expense of non-prescribed behaviors that are not explicitly recognized by their formal compensation contract. In contrast, we expect that employees who infer relational psychological contracts from low-powered incentives will likely define their commitment toward the success of the organization as a broader set of behaviors not limited to standard tasks (i.e., relational psychological contracts) and exhibit greater willingness to share knowledge to improve organizational performance (Argote et al. 2003). Thus, we formulate our main hypothesis as follows:

> HYPOTHESIS**:** *Compared to low-powered incentives, high-powered incentives are associated with lower propensity to share knowledge*.

4. Research Setting

4.1 Research Site

Our field data is obtained from a Chinese manufacturing firm that produces packaging materials and supplies. The firm maintains a stable client base such that its revenue stream is largely predictable. However, production volumes exhibit seasonal fluctuations – the firm's busiest months of operations are in the summer and fall, driven by orders from two major clients, whereas production is suspended in the winter months.[3, 4] Due to the small margins typical of this industry, firm profits largely depend on its ability to maximize capacity utilization (through avoidance of quality defects and rework, reduction of machine downtime due to technical issues, etc.) and to improve cost efficiency.

The firm's operations are organized into 11 departments. Examples include the box-gluing department, the laminating department, the printing department, the storage and transportation department, etc. Employees within each department are assigned operational responsibilities (i.e., standard tasks). The tasks assigned to employees are similar within each department and differ across departments. However, tasks across departments are fairly comparable in terms of complexity and can be measured using readily available objective performance metrics related to productivity, efficiency, and quality. Each department is managed by a supervisor (herein: manager). Other employees in the department hold no supervisory responsibilities.

4.2 Incentive Contracts for Rank-and-File Employees

Employees' standard tasks are rewarded based on explicit incentive contracts, whereby total compensation is determined by combinations of fixed and variable components. Contracts

[3] The practice to suspend production in the winter months is common in this industry and region. Note that, while production lines may be idle, the company continues to operate even during those months.
[4] A typical fiscal year, therefore, could be subdivided in three periods. Idle time (i.e., winter months), busy months (i.e., summer and fall months), and regular production months (i.e., the remaining months).

can assume one of three forms: (1) include only a fixed component (*Fixed*), (2) include only a variable component (*Variable*), or (3) include both a fixed and a variable component (*Mixed*). The variable component is determined based on objective output measures.

The type of contract offered to the prospective employee depends predominantly on the time of the year in which an employee is recruited. During the busiest months of the year, the company tends to offer volume-based variable contracts to attract workers with the prospect of high wages. During idle times, when production volumes are low, management is inclined to offer fixed contracts, which provide prospective workers with an expectation of a minimum guaranteed level of income.[5] Therefore, within a department, employees performing similar tasks may be compensated with different types of contract. [6] While the time of the year might influence the type of contract offered to the employee, it does not impact the likelihood of retention of the new hire, as the company does not employ temporary workers. This is important for our study, as the expected duration of the relationship with the organization is one of the factors influencing the formation of psychological contracts, whereby longer (shorter) relations are associated with relational (transactional) psychological contracts (Millward and Hopkins 1998). Additionally, the bulk of the bargaining power in the hiring process rests with the firm, consistent with industry and regional norms. Accordingly, incentive contract negotiations at the time of hire are almost non-existent, and hired employees accept the contracts they are offered. Further, interviews with management confirmed that prospective employees are screened predominantly on the basis of their skills and qualification, and that knowledge sharing propensity is not assessed during the

[5] We do not have any information about the relation between different periods in the operating cycle and the offering of Mixed contracts.

[6] During our interviews, management highlighted how workers operating in the same department earn, on average, similar amounts. The company shared with us actual compensation data related to only one month of operations. During that month, there were no statistically different levels of pay across contracts within departments for workers that did not have supervisory responsibilities. It is possible that individual pay may vary across contracts on a month-to-month basis, with *Fixed* contract workers earning more (less) than *Variable* contract ones in idle (busy) months.

selection process. These institutional characteristics reduce the selection bias concerns, whereby employees that are more inclined to share knowledge may negotiate a contractual form that they prefer, or the firm might offer certain types of contracts based on the applicant's propensity to share knowledge.[7] Employees hired as managers are more likely to be offered a fixed contract. In our sample period, we do not observe any within-worker change in contract type, nor do we observe any front-line employee being promoted to manager positions.

4.3 Promotion of Knowledge Sharing

Due to the small margins and the labor-intensive nature of its main operations, the firm empowers its employees in all departments and at all levels of the organization to propose ideas that might improve efficiency, productivity, and profitability. At the beginning of 2014, immediately after a merger[8] that led to a change in the top management composition, the new management introduced a suggestion system to foster a culture of knowledge sharing and collaboration. In line with research supporting the use of direct incentives for knowledge sharing (Lee and Ahn 2007; Lyu and Zhang 2017), management introduced monetary rewards for submissions of feasible and beneficial employee ideas. However, not all submitted suggestions are rewarded. Management subjectively evaluates each submission, and employees receive a monetary award only if management approves the idea as being valuable for the firm.

The reward is incremental to the compensation for standard tasks as defined in the compensation contract. The amount awarded is not pre-determined but decided ex-post on a case-by-case basis, based on the expected benefit generated by the suggestion, and ranges between 1%

[7] In addition to the incentive role of contracts, a number of studies also propose that contracts are also associated with a sorting role in that employees with particular characteristics may self-select into a specific contract type (Kachelmeier and Williamson 2010). This is not the case in our setting.

[8] The event was a friendly merger, and there were no drastic changes in the company's operations.

and 3% of the proponent's monthly pay.[9,10] The awarding of the reward and its amount are in no way related to the form of standard task compensation or to the specific organizational role, status, standard task performed, or seniority of the worker. Therefore, every employee in the organization is exposed to the same incentive to submit improvement suggestions. This is important for our study, as similar prospects to receive monetary rewards for idea submissions across contracts would bias against our hypothesized relation between standard task incentive power and knowledge sharing behavior. Furthermore, engagement in knowledge sharing behavior is unlikely to be interpreted as a means to obtain greater levels of pay in the future (e.g., career advancements, salary increases, etc.). Interviews with management confirmed that knowledge sharing is not a factor considered in the promotion process and we do not observe any promotion in our sample period spanning across three years. Additionally, since average pay levels in this company are relatively low, employees are likely to heavily discount the possibility of future compensation in favor of current payoffs. Therefore, it is unlikely that employees view knowledge sharing as a way to increase their future promotion opportunities.

Management classifies each suggestion into a pre-determined type. Suggestion types, corresponding descriptions, and examples of submitted suggestions are provided in Appendix 1. In consultation with company management, we grouped the suggestion types into two broad categories based on their scope of applicability—narrow scope and broad scope. Narrow scope submissions pertain to the standard task of the proponent, including ideas to improve efficiency (e.g. speed, throughput, etc.), quality (e.g. incidence of rework, defects, etc.), or standardization and streamlining of the production process (e.g. 5S initiatives). In contrast, broad scope

[9] We do not have information about the actual rewards paid out to individual employees in our sample period.
[10] Because, on average, workers that hold no supervisory responsibilities earn similar amounts to colleagues performing similar tasks independently from their contract, we have no reason to believe that the direct incentive for ideas submission might be more attractive for workers whose contract is of a certain form.

suggestions aim to improve organizational aspects other than the proponent's standard execution tasks. Examples include initiatives that promote collaboration across teams or departments, improve the morale or culture of the workforce, increase automation, reduce overhead costs, or improve the long-term sustainability of the organization. The classification in narrow and broad scope ideas is relevant for our study because it relates to behaviors associated with relational and transactional psychological contracts documented in the literature. Narrow scope suggestions likely benefit the proponent and those that perform similar tasks in the organization. In contrast, broad scope suggestions aim at benefiting other individuals that perform different tasks, or the whole organization and its long-term goals. To the extent that, compared to transactional ones, relational psychological contracts are associated with greater cooperation and willingness to contribute to the overall success of the organization (Millward and Hopkins 1998; Rousseau 1995; Schein 1980), standard task incentive power might influence not only the propensity to engage in knowledge sharing activities, but also the scope of applicability of shared knowledge.

5. Data

Our sample includes monthly employee-level data from March 2014 to December 2016. There are 513 unique employees, for a total of 6,016 employee-month observations. For each month in the sample period, we collect information on the number, type, and quality of all suggestions submitted through the system. In addition, for each employee, we obtain data on their incentive contract type and demographic characteristics. A detailed description of the variables of interest for our analyses is provided below and summarized in Appendix 2.

5.1. Dependent Variables: Knowledge Sharing and Knowledge Type

The suggestions submitted through the system in our sample period constitute our operationalization of employee-level knowledge sharing behaviors, which we measure using an

indicator variable ($Submission_{i,t}$) that assumes value one if employee *i* submits a suggestion in month *t*, and zero otherwise. To analyze suggestions based on their scope of applicability, we construct indicator variables representing idea submissions for each type used by the company, assuming value one if employee *i* submitted an idea of the particular type in month *t*, and zero otherwise. There are three narrow scope categories: suggestions related to standardization and streamlining of operating tasks ($Sub\_5S_{i,t}$), suggestions to improve the quality of the production process, lower defects, and rework ($Sub\_quality_{i,t}$), and suggestions about ways to increase efficiency and throughput ($Sub\_efficiency_{i,t}$). The six broad scope categories include initiatives with long term benefits ($Sub\_lt_{i,t}$), suggestions benefiting a group or a team ($Sub\_group_{i,t}$), suggestions benefiting a different department than the proponent's ($Sub\_diffdep_{i,t}$), suggestions aiming to reduce overhead costs ($Sub\_cost_{i,t}$), to improve the technology, automation, and computerized systems of the firm ($Sub\_tech_{i,t}$), and to improve team or group morale ($Sub\_morale_{i,t}$). We also construct indicator variables capturing the two broad categories of suggestion types, namely $Sub\_Broad_{i,t}$ and $Sub\_Narrow_{i,t}$.

Table 1, panel A, provides descriptive statistics on the knowledge sharing variables. Submissions occurred only in about 6% of our employee-month observations and were concentrated in about 15% of the employees (Table 1, panel B). This is in line with the large body of research claiming that knowledge sharing within organizations is difficult to obtain even in the presence of specific incentives (Gupta and Govindarajan 2000; Balakrishnan and Letmathe 2000, Vera-Munoz et al. 2006; Lee and Ahn 2007; Fey and Furu 2008; Hwang et al. 2009). With respect to individual types, ideas aiming at reducing costs, improving efficiency, and promoting long term organizational outcomes were the most common.

To capture submissions that are considered useful by management and rewarded, we construct the variable $Approved_{i,t}$, which assumes value one if management considers the suggestion submitted by employee *i* in month *t* to be valuable, and zero if not. Descriptive statistics (Table 1, panel A) show that, in our sample period about 95% of the submitted ideas were approved. We also observe that the ratio between submission and approval is largely consistent across types of suggestions. It is difficult for us to interpret the high percentage of approved ideas. On the one hand, it is possible that, given the relatively small number of suggestions, employees pre-evaluate the content of their suggestion and decide to submit it through the system only if it is likely to be evaluated positively. On the other hand, management could be rewarding almost all submitted suggestions to incentivize a greater volume of submissions, among which there could be good ideas, and avoid demotivating effects associated with submitting ideas that are then not approved (Baumann and Stieglitz 2014).[11] Nevertheless, the low frequency by which employees submit ideas is consistent with the idea that the small amount of the reward may have limited effect in motivating employees to share knowledge (Wolfe and Loraas 2008).[12]

5.2. Independent Variables: Contract Types

We proxy for the different types of compensation contracts with indicator variables $Fixed_i$, $Variable_i$, and $Mixed_i$, each assuming value 1 if the employee is rewarded with the corresponding type of contract, and zero otherwise. In our setting, the type of contract constitutes an employee-level time-invariant characteristic. As shown in Table 1, panel C, about 58 percent (13 percent) [30 percent] of all employees are compensated with a *Fixed* (*Variable*) [*Mixed*] contract. The type

[11] We do not have access to information about what ideas were actually implemented at the site or when.

[12] A concern may arise with respect to the small amount of the reward driving knowledge sharing behavior more than standard task incentive power. Two factors assuage this concern. First, the likelihood of approval and the amount of the reward is not dependent on the structure of the incentive contract, thus exposing all employees to the same incentive to share knowledge. Second, Baumann and Stieglitz (2014) show that larger monetary rewards for the provision of improvement ideas might generate a larger stream of suggestions than smaller monetary incentives would, but not a materially different number of good ideas.

of psychological contract experienced by each employee is a latent construct in our design. Our data is archival, and we did not have the possibility to inquire about indicators of psychological contract types using other data collection methods (i.e., surveys). We rely on the literature stating that the more explicit the signal about the mutual obligations and expectations between the worker and the organization, the stronger the weight of the signal in the formation of the employee's psychological contract. Recall that our assumption is that *Fixed* contracts are more likely to signal a relational psychological contract, whereas *Variable* contracts are more likely to signal a transactional psychological. We do not have information about the internal composition of the fixed and variable components in the *Mixed* contracts, but we expect that the propensity to infer a transactional (relational) psychological contract increases with the relative weight of the variable (fixed) component.

5.3. Control Variables: Employee Characteristics

We control for employee individual characteristics that may be associated with the employee's psychological contract type and/or with the propensity to engage in knowledge sharing activities (see Table 1, panel C). We include $DormEmp_i$, an indicator variable assuming value one if the employee lives in company-provided housing (dormitory), and zero otherwise. Living in the company dormitory may lead to greater identification with the company and contribute to the formation of a relational psychological contract, thus increasing employee propensity to share knowledge independently from the structure of the standard task compensation contract. Additionally, sharing common areas, such as cafeterias, exercise facilities, or leisure spaces within the dormitory facilities might increase employees' opportunities to develop ideas collectively, thus increasing the likelihood to submit them through the system, or, alternatively, to exchange

knowledge informally, thus reducing the likelihood of submitting ideas through the suggestion tracking system. About 7 percent of all employees in our sample live in dormitory facilities.

Next, we control for gender using the indicator variable $Female_i$, which assumes value one if the employee is female, and zero otherwise. About 38 percent of all employees in our sample are female. Research has found gender to be a predictor of psychological contract type, with female employees scoring more toward the transactional end of the spectrum than male coworkers (Millward and Hopkins 1998). Therefore, gender might influence the propensity to share knowledge independently from the standard task contract type.

Further, we control for employee age (Age_i) measured in number of years. Age may correlate with an employee's experience level and knowledge base. According to Argote et al. (2003) individual ability to share is an important determinant of knowledge sharing. Pre-requisites for the ability to share knowledge include the acquisition or development of content that is not known to others and the skills to formulate the information in a transferable way. On the one hand, greater accumulated experience and maturity might endow the worker with greater knowledge content and sharing skills. On the other hand, younger employees may be exposed to newer notions and practices that they may want to import in their organization. The average employee in our sample is about 33 years old. A related, but distinct employee-level individual characteristic is *Tenure*, which measures the length of the contractual relation between the organization and the employee in years.[13] Differently from age, tenure may be more relevant to the accumulation and sharing of *organization-specific* knowledge. On the one hand, employees that have been with the company for a longer time might have accumulated greater firm-specific institutional and technical knowledge which they may be able to share with others. On the other hand, relatively new hires

[13] *Age* and *Tenure* are measured at the beginning of our sample period and maintained constant over the months included in our sample.

might bring information about organizational solutions that they might have experienced in other firms, or simply hold an unbiased view of the needs and processes of the operations, which might lead them to share ideas to innovate them. The average tenure in our sample is 1.8 years, and spans between a minimum value of 1 year to a maximum of 17.[14] We also control for the role of each employee within the company. $Mgmt_i$ is an indicator variable assuming value one if the employee holds supervisory responsibilities (i.e., the employee is a manager), and zero otherwise. A supervisory role within the company may be associated with better ability and/or experience, which may impact the supervisor's knowledge sharing activities. About 8 percent of all employees in our sample hold supervisory responsibilities. Managers are compensated for their standard task with *Fixed* compensation contracts.

Finally, recall that the site underwent a merger event at the beginning of 2014 (i.e., before the beginning of our sample period). The change in ownership shifted the organizational culture toward a stronger focus on employee well-being, including the notion that a more stable income stream would allow for higher employee satisfaction, resulting in greater organizational commitment. Consequently, newly hired employees were more likely to be offered a fixed contract than incumbent ones. Pre-existing contracts of employees hired prior to the merger event were not modified. While interviews with the current management team indicated no explicit intent to select new hires based on their propensity to share knowledge, it is possible that changes in the employee selection criteria might confound our results. Therefore, we include $JoinAfterMerger_i$ as an

[14] The low value of the average tenure is not reflective of high turnover. In fact, very few people left the company during our sample period. The low average tenure is more reflective of the fact that a large percentage of the employees that had been hired before the merger had left the company before the beginning of our sample period and had been replaced with new hires. In our sample. About 72% of the workers had joined the company after the merger (see Table 1, panel C). This is one additional reason to include *Tenure* as a control variable.

additional control variable in all our models. This indicator variable assumes value one if the employee was hired after the merger event and zero otherwise.

--- Insert Table 1 here ---

Table 2 reports the pairwise Pearson correlations between all variables of interest in this study. Consistent with our prediction, variable contracts and mixed contracts appear to be negatively correlated with submission of suggestions, while fixed contracts are positively correlated with ideas submission. Additionally, female employees and younger ones are less likely to submit ideas, while employees with longer tenure and performing management roles are more likely to do so. Interestingly, we note that employees that joined the company after the beginning of 2014 tend to share knowledge *less* than those that were already in the ranks at the time of the merger, consistent with post-merger management not explicitly selecting new hires based on their propensity to share knowledge. We acknowledge that post-merger hires also correlate with lower tenure, thereby inhibiting us from disentangling the effect of these two factors impacting employee knowledge sharing behaviors.

--- Insert Table 2 here ---

6. Empirical Analyses and Results

6.1. Standard Task Incentives and Propensity to Share Knowledge

Table 3 summarizes the test results for our main hypothesis, which predicts that employees rewarded with high-powered incentives are less likely to engage in knowledge sharing activities compared to low-powered incentives. We model the relation between standard task incentive power and the likelihood of a worker submitting a suggestion through the system as follows:

$$Submission_{ijt} = \alpha + \beta_1 Variable_i + \beta_2 Mixed_i + \beta_3 JoinAfterMerger_i + \beta_4 DormEmp_i + \beta_5 Female_i + \beta_6 Age_i + \beta_7 Mgmt_i + \beta_8 Tenure_i + \sum_{t=1}^{k} \gamma_t Month_t + \sum_{j=1}^{n} \delta_j Department_t + \varepsilon \quad (1)$$

We estimate equation (1) using logistic regression.[15] The base case with respect to contract types is $Fixed_i$. We include month fixed effects to account for seasonality in production volumes.[16] The coefficients reported in column (1) of Table 3 correspond to the estimation without department fixed effects, while in column (2) we also include department fixed effects, to further control for unobservable department-level characteristics.[17] Controlling for month and department fixed effects, the negative coefficient estimated for *Variable* (β_1= -0.903, p<0.10 in column (2)) suggests that employees under a variable pay contract are 71.1 percent less likely to submit improvement suggestions compared to employees rewarded with *Fixed* contracts.[18] The propensity to share knowledge by employees paid with *Mixed* contracts is not statistically different from that of employees with *Fixed* contracts when we control for department fixed effects. However, Wald test results indicate employees paid with *Variable* contracts share knowledge less than their coworkers paid with *Mixed* contracts. While we do not have information about the composition of the fixed and variable components in the *Mixed* contracts, we expect the propensity to share knowledge to be somewhat in between the two extremes (i.e., fully fixed and fully variable contracts). Taken together, our results are consistent with our predictions of a negative relation between standard task incentive power and employees' knowledge sharing.[19]

[15] Our main tests involve estimations using panel data. While the contract type is defined at the employee level and it does not change over time (i.e., time-invariant employee characteristic), institutional characteristics of the operations in our field setting (seasonality, idle months, high productivity months) are likely to influence the likelihood of knowledge sharing activity differently in different months of operation. Nonetheless, we also estimate all of our statistical models at the employee cross-sectional level and obtain generally consistent results (untabulated), with the exception of rare cases where the statistical power is too low to find significant effects.

[16] In later tests we explore the influence of variation in production volumes on knowledge sharing behaviors (see Section 6.1)

[17] Because we are interested in studying the propensity to share knowledge, we use $Submission_{i,t}$ as our dependent variable, which captured the intent of the worker to share knowledge. We repeat our estimations using $Approved_{i,t}$ as our dependent variable, which captures the propensity to share high-quality ideas. We find consistent results (untabulated).

[18] The coefficients are log of the odd ratio. To interpret the coefficients, we transform the log of the odds back to a probability: p = exp(0.903)/(1+exp(0.903)) = .711.

[19] Our results are robust to the elimination of outliers with respect to knowledge sharing behaviors. In particular, in untabulated tests, we repeat our estimation of equation (1) excluding a particular department, where the average

The significance of the coefficients estimated for our control variables is consistent across the two estimations. In line with the idea that employees who reside in company dormitory facilities are more likely to develop a relational psychological contract with the organization and, therefore, be more inclined to contribute to its overall performance, these workers exhibit a greater propensity to share knowledge. We also find that knowledge sharing is higher for employees with supervisory responsibilities. Recall that these employees tend to be rewarded with fixed pay contracts for their standard tasks. Therefore, the associated coefficient refers to the incremental propensity to share knowledge associated with supervisory responsibilities within the subgroup of employees rewarded with low-powered incentive contracts.[20] Age, gender, and tenure are do not seem to predict the likelihood to share knowledge.

--- Insert Table 3 here ---

6.2 Scope of Shared Knowledge

We estimate equation (1) by specifying different dependent variables corresponding to each category that management uses to classify proposed ideas. Estimation results are reported in Table 4. We find no significant differences between *Fixed* and *Variable* contracts or between *Mixed* and *Fixed* contracts with respect to employees' propensity to submit narrow-scope suggestions (Table 4, panel A, column (1)), whereas employees compensated with variable contracts are less likely to submit broad-scope suggestions (column (2)), consistent with our expectations. Furthermore, as documented in Table 4, panel B, within the subset of broad-scope

propensity to submit suggestions was four times as high as the next highest department. Our results are consistent with those reported in Table 3.

[20] In untabulated estimations, we dropped all workers with supervisory responsibilities from our sample and found results consistent with those reported in Table 3. In further tests (also untabulated) we restrict the sample to employees that joined the organization after the merger. While there are no suggestions submitted by employees with *Variable* contracts within this subsample, we continue to find that *Mixed* contracts are less likely to submit suggestions compared to *Fixed* contracts. These results are still consistent with our main hypothesis, as *Mixed* contracts exhibit higher incentive power than *Fixed* contracts.

ideas, the coefficient associated with $Variable_i$ is significantly negative with respect to suggestions captured by variables $Sub\_diffdep_{i,t}$, $Sub\_cost_{i,t}$, and $Sub\_tech_{i,t}$. Additionally, when we predict suggestions benefiting different departments ($Sub\_diffdep_{i,t}$), the coefficient estimated for *Mixed* is also significantly negative and not statistically different (Wald test: $p>0.10$) than the coefficient associated with *Variable*. We note that, in our sample, there are no submissions of ideas classified as "group" ($Sub\_group_{i,t}$) or "long-term" ($Sub\_lt_{i,t}$) performed by employees with *Variable* contracts. Similarly, suggestions pertaining to technology ($Sub\_tech_{i,t}$) are never submitted by workers associated with *Mixed* contracts. We find no statistical difference between *Mixed* and *Fixed* contracts with respect to $Sub\_group_{i,t}$, whereas employees paid with *Mixed* contracts appear to submit more long-term suggestions ($Sub\_lt_{i,t}$) than *Fixed* pay coworkers. While we acknowledge that this particular result is inconsistent with our predictions, we do not have sufficient information about the composition of the mixed contracts that could guide our interpretation. We also note that we are unable to estimate equation (1) with respect to ideas classified as improving the company climate and morale (*Sub_morale*), as all suggestions of this type were submitted by employees with *Fixed* contracts, providing further evidence of a negative relation between incentive power and sharing knowledge with broad scope of applicability.

Taken together, our results suggest that our main findings about the relation between incentive power and the propensity to share knowledge are concentrated predominantly in cases where shared knowledge aims to benefit workers performing other tasks or the organization as a whole. That is, while the structure of the standard task compensation contract is not associated with different behaviors with respect to ideas pertaining the proponent's task, workers whose compensation contract is based on high-powered incentives are less likely to propose ideas that benefit others. These findings are consistent with the notion that higher incentive power, by

fixating employees' attention on their standard task, is associated with employee behavior corresponding to transactional psychological contracts. Suggestions, when shared, are therefore limited to improvements benefiting the standard task that they exchange for money. Employees subject to low-powered incentives, on the contrary, tend to share suggestions that impact their standard task, but also that benefit a broader set of constituents, including workers in different departments and the organization as a whole.

--- Insert Table 4 here ---

7. Additional Tests

7.1. Endogeneity in Contract Assignment

A potential concern that may limit the validity of our inferences arises from the possibility that, in our setting, the type of incentive contract may be endogenously determined based on the employee's propensity to share knowledge. We address this concern in the following ways. First, interviews with top management confirmed that contract assignment decisions are not deliberately based on employees' potential for knowledge sharing. Specifically, top management emphasized that our research setting is a manufacturing site employing workers with relatively low levels of education, and that their interview and selection process is based predominantly on the applicant's skills. Knowledge sharing is not a topic discussed in the interview process. Second, we leverage the institutional practice to offer contracts of different nature depending on the timing of the hire during the year cycle (see Section 4) to re-estimate equation (1) using an instrumental variable (IV) approach, by which we predict knowledge sharing behavior using a two-stage least square (2SLS) estimation adopting the time of hire as an instrument.

We construct two instruments using indicator variables to capture the time of hire within the annual operating cycle. *JoinBusy* assumes value 1 if employee *i* was hired during the busy

months of the year, and 0 otherwise. *JoinIdle* assumes value 1 if employee *i* joined the firm during the months where the operating lines are not running, and 0 otherwise.[21] Consistent with top management's description of their hiring practices, we posit that the month of hire should be correlated with offering a *Variable* or *Fixed* contract to the prospective employee but not with the employee's propensity to share knowledge. In other words, to qualify as a proper instrument, each of the two indicator variables needs to satisfy a validity requirement by being correlated with the endogenous regressors—the contract types—and an exclusion restriction requirement, by being uncorrelated with the error terms in the regressions predicting knowledge sharing behaviors.

Table 5 reports our estimation results for each of the selected instruments – panel A corresponds to *JoinBusy* and panel B to *JoinIdle*. In both cases we follow the same protocol. In the first stage (column (1)), we estimate the following contract determinant model including the respective instrument as a predictor:

$$ContractType_{ij} = \alpha + \beta_1 JoinAfterMerger_i + \beta_2 DormEmp_i + \beta_3 Female_i + \beta_4 Age_i + \beta_5 Mgmt_i + \beta_6 Tenure_i + \beta_7 Instrument_i + \sum_{j=1}^{n} \delta_j Department_t + \varepsilon \quad (2)$$

where the dependent variable is an indicator (*Variable* in panel A and *Fixed* in panel B) assuming value one if the contract exhibits a *Variable (Fixed*) structure, and zero otherwise. All other variables are defined as previously described. We estimate equation (2) using logit regression.

In panel A, *JoinBusy* satisfies the validity requirement, as the associated coefficient is positive and significant (β_7 = 1.008, p<0.01), confirming that employees who join the firm during busy months are more likely to be offered a *Variable* contract. Similarly, in panel B, *JoinIdle* also satisfies the validity requirement as the associated coefficient is positive and significant (β_7 =

[21] Recall that the firm experiences three types of production volumes: the winter months correspond to idle periods, the summer months correspond to the busy season, and the remaining months correspond to regular production volumes.

1.012, p<0.10) confirming that employees hired during times when production is idle are more likely to be offered a *Fixed* contract. Columns (2) and (3) report the estimation of the second stage (equation (1)), which predicts the likelihood of suggestions submission. In this specification, the contract variable (*Variable* in panel A and *Fixed* in panel B) assumes the instrumented value from the first stage regression. Because, as mentioned earlier, we do not have any information about the relation between time of hire and the assignment of a *Mixed* contract to an applicant, we control for *Mixed* to maintain consistency with our main analyses. We continue to find that employees rewarded with *Variable* (*Fixed*) contracts are less (more) likely to submit improvement suggestions compared to *Fixed* (*Variable*) contract employees (column (2)). However, our results are not robust to the inclusion of department fixed effects (column (3)), likely due to the fact that different departments may hire in different periods of the annual cycle and that variation would therefore be already absorbed by the fixed effects.

We also conduct a weak instrument test,[22] and report the first-stage F-statistics on excluded instruments in columns 2 and 3. Sufficiently large *F*-statistics (i.e., *F* greater than 23 – see Olea and Pflueger (2013)) allow us to reject the null hypothesis that the instruments are weak. In columns (4) and (5) we provide evidence of a satisfactory exclusion restriction, by showing that *JoinBusy* (*JoinIdle*) is not correlated with the error term of the estimation of equation (1).[23] Additionally, having two orthogonal instruments while having only one endogenous regressor (i.e., contract type) allows us to conduct an overidentification test to further determine if the instruments satisfy the exclusion restriction. The Hansen-Sargan *J*-statistic for the over-identification test has

[22] The concern is that the standard errors on the IV estimates are likely to be much larger if the excluded instrumental variables are only weakly correlated with the endogenous regressors.

[23] We re-estimate the 2SLS estimation using a different specification of our instrumental variable. Specifically, we construct an ordinal variable (*JoinPeriod*) assuming value -1 if the employee is hired during busy months, value 0 if the employee joins the firm in regular production months, and value +1 if the employee is hired during idle months. Untabulated estimations provide equivalent results to those reported in Table 5.

a *p*-value of 0.809, by which we reject the null hypothesis that both instruments are uncorrelated with the error term of the main regressions. Collectively, our results reduce the endogeneity concern with respect to the relation between contract type and knowledge sharing.

--- Insert Table 5 here ---

7.2. Incentive Contracts and Multitasking

Our main analyses show that low-powered incentives are associated with greater employee engagement in knowledge sharing activities. We have argued that high-powered incentives are likely associated with transactional psychological contracts. These, in turn, are associated with lower propensity to contribute to the success of the organization beyond the employee's standard task, therefore discouraging knowledge sharing. A possible alternative explanation is that employees may experience the tradeoff between standard tasks and knowledge sharing as a multi-tasking problem (Holmstrom 1989; Holmstrom and Milgrom 1991). Through this lens, devoting effort to activities that are not explicitly prescribed and are subject to greater payoff uncertainty (due to the subjective evaluation of submitted suggestions and, contingent on a suggestion being classified as valuable, the ex-post determination of the reward) may depend on the opportunity cost associated with those behaviors. Therefore, our results could be explained simply by multitasking effects already documented in the literature and not by the psychological contract inferred by employees and ensuing propensity to engage in organizational pro-social behaviors.

To address this concern, we examine the relation between incentive contract type and two key performance outcomes related to the employee's standard execution task, namely the likelihood of meeting operational targets and the incidence of production quality issues. In our setting, each month, management flags individual employees as having met (or not) their assigned

targets.[24] We use this information to create an indicator variable $Met_{i,t}$ which assumes value one if employee *i* meets or exceeds their budgeted output in month *t*, and zero otherwise. Additionally, management monitors employee contribution to quality performance by tracing quality defects and complaints to all employees that participated in the production process associated with the quality issue. Relevant employees are flagged in the company's information system every time a complaint is filed. We construct an indicator variable ($BadQuality_{i,t}$), which assumes value 1 if employee *i* is flagged for quality issues in month *t* and zero otherwise. Table 6 reports the logit estimations of the following model:

$$Outcome_{ijt} = \alpha + \beta_1 Submission_{it} + \beta_2 Variable_i + \beta_3 Mixed_i + \beta_4 JoinAfterMerger_i + \beta_5 DormEmp_i + \beta_6 Female_i + \beta_7 Age_i + \beta_8 Mgmt_i + \beta_9 Tenure_i + \sum_{t=1}^{k} \gamma_t Month_t + \sum_{j=1}^{n} \delta_j Department_t + \varepsilon \quad (3)$$

The dependent variable (*Outcome*) is substituted by each of our proxies measuring productivity and quality, respectively. The results, reported in Table 6, show that engagement in knowledge sharing activities, proxied by the variable *Submission*, does not exhibit any significant relation with the likelihood of meeting expectations with respect to productivity (columns (1) – (3)) or quality (columns (4) to (6)). Taken together, our results suggest that individual choices to share knowledge are not likely to be driven by the opportunity cost to devote effort away from the standard task. In other words, knowledge sharing does not appear to be the outcome of a multitasking problem.

--- Insert Table 6 here ---

[24] We do not have information about the magnitude of the targets, or the actual levels of performance exhibited by individual employees or departments.

7.3. Managerial Engagement in Knowledge Sharing

In this section we explore the role of department managers' knowledge sharing behaviors on that of their subordinates. Prior research suggests that contextual norms and culture may significantly influence employees' propensity to engage in knowledge sharing (Balakrishnan and Letmathe 2013; Elbashir et al. 2011). We explore the knowledge sharing behavior of department managers as a proxy for the tone set to influence the culture of the department. *A priori*, it is unclear how subordinates' knowledge sharing activity is associated with that of their manager. On the one hand, department managers can contribute to shaping a department culture where subordinates are empowered and encouraged to share their knowledge. Their leadership role may serve as a conduit to transmit the organizational culture set by top management as daily interactions of rank and file employees are primarily with their department supervisors. Under this assumption, employees' knowledge sharing behavior would be positively correlated with that of their department manager. On the other hand, even when subordinates might identify opportunities for knowledge sharing, department managers might exploit their position of power to attribute subordinates' ideas to themselves and, consequently, extract benefits both in terms of monetary rewards associated with approved ideas, but also in terms of reputation and signaling to top management. This behavior might demotivate subordinates and suppress any incentives for knowledge sharing. Under this assumption, we would expect a negative correlation between department managers' propensity to share knowledge and that of their employees.

To study whether and how department managers knowledge sharing behaviors influence the relation between incentive power and employees' propensity to share knowledge, we relax our main model specification excluding department-fixed effects. Instead, we include the variable $ManagerHighSub_j$, an indicator variable coded as 1 if the manager of department j submits more

suggestions in our sample period than the median number of submissions by managers, and zero otherwise. We estimate the following model:

$$\begin{aligned} Submission_{ijt} = {} & \alpha + \beta_1 Variable_i + \beta_2 Mixed_i + \beta_3 ManagerHighSub_j \\ & + \beta_4 Variable_i * ManagerHighSub_j + \beta_5 Mixed_i * ManagerHighSub_j \\ & + \beta_6 JoinAfterMerger_i + \beta_7 DormEmp_i + \beta_8 Female_i \\ & + \beta_9 Age_i + \beta_{10} Tenure_i + \sum_{t=1}^{k} \gamma_t Month_t + \varepsilon \end{aligned} \quad (4)$$

In order to isolate the effect of the manager's activity on their subordinates' knowledge sharing, we exclude all managers from our sample. That is, we only include observations related to subordinates, and classify subordinates as reporting to a manager with high (low) knowledge sharing activity depending on the department to which they belong.

Table 7 summarizes our results. We estimate equation (4) using logit regression. The main effect associated with the variable *ManagerHighSub* indicates that subordinates working under a manager that submits a high number of suggestions exhibit greater engagement in knowledge sharing compared to colleagues that operate under managers with lower submission activity. This is consistent with the importance of the managers' leadership role in establishing a knowledge sharing culture (Elbashir et al. 2011; Balakrishnan and Letmathe 2013; Lyu and Zhang 2017). However, we find that this effect is mitigated, on average, when subordinates are rewarded with variable contracts (see Table 7, column (1)), suggesting that, even when managers foster a culture of knowledge sharing, high-powered incentives continue to reduce the employees' propensity to share their ideas with others. Examining the influence of managers' knowledge sharing behavior on the submission of suggestions by scope (columns (2) and (3)), we continue to find a higher likelihood of submissions across both narrow- and broad-scope types. Additionally, employees rewarded with *Mixed* contracts exhibit an incremental positive effect with respect to broad-scope submissions when operating under a manager supportive of knowledge sharing.

--- Insert Table 7 here ---

7.4. Influence of Operational Pressure on Knowledge Sharing

In this section, in exploratory fashion, we examine whether and how the standard task business cycle might influence the relation between incentive contract structure and propensity to share knowledge. As mentioned, in our field setting, production is subject to seasonal variations, whereby certain months are systematically busier than others. The main effect of busy production months on the propensity to share knowledge is uncertain *a priori*. On the one hand, busy months may focus employees to fulfilling demand at the expense of other activities. During months with lower production requirements, employees might have more time to think about and develop their suggestions, compared to busy times when most of their energy is dedicated to fulfilling demand. On the other hand, however, the increased pressure associated with busy production months might highlight inefficiencies and opportunities for improvement, thus leading to a higher incidence of submissions of improvement ideas. These opportunities might be obfuscated by the availability of slack resources during quieter months. In particular, we are interested in the joint influence of operational pressure and incentive contracts on employees' knowledge sharing behaviors.

To examine how knowledge sharing behavior varies with the standard task business cycle, and whether the incentive contract structure affects this relation, we relax our main model specification and exclude time-fixed effects. Instead, we include the variable $BusyMonth_t$, defined as an indicator coded as 1 if month t falls in a period of high production volumes and zero otherwise, and estimate the following model:

$$\begin{aligned} Submission_{ijt} = {} & \alpha + \beta_1 Variable_i + \beta_2 Mixed_i + \beta_3 BusyMonth_t + \beta_4 Variable_i * BusyMonth_t + \\ & \beta_5 Mixed_i * BusyMonth_t + \beta_6 JoinAfterMerger_i + \beta_7 DormEmp_i + \beta_8 Female_i + \\ & \beta_9 Age_i + \beta_{10} Mgmt_i + \beta_{11} Tenure_i + \sum_{j=1}^{n} \delta_j Department_j + \varepsilon \end{aligned} \quad (5)$$

We estimate equation (5) using logit regression. Results reported in Table 8 indicate that, on average, employees are more likely to submit their suggestions during busy production months,

consistent with the view that greater performance pressure on the standard task might highlight process inefficiencies and other frictions, thus increasing employee awareness of opportunities for improvement and motivation for sharing knowledge.[25] This result further strengthens our earlier conclusion that the relation between incentive power and knowledge sharing is not explained by the multitasking framework. Additionally, our estimation of equation (5) yields a positive coefficient associated with the interaction between *BusyMonth* and *Mixed*, indicating that employees rewarded with *Mixed* contracts exhibit an incremental tendency to submit improvement suggestions during busy months. The analyses of suggestions by scope of applicability indicate that this incremental effect is driven by submissions of narrow scope, whereas there are no interaction effects for broad-scope suggestions.[26]

--- Insert Table 8 here ---

8. Conclusions

In this study, we empirically examine the relation between the incentive power of compensation contracts for employees' standard execution tasks, and their propensity to share knowledge with their coworkers. We obtained field data from a company that tracks improvement idea submissions using a dedicated information system. We find theory-consistent evidence suggesting that employees rewarded for standard execution tasks with high-powered incentives exhibit lower propensity to share knowledge compared to employees with low-powered incentives. We posit that high-powered incentives for well-defined standard tasks explicitly linked to monetary rewards are associated with employees inferring a transactional psychological contract

[25] The finding that operational pressures influence the likelihood of submitting improvement suggestions further supports our choice to estimate our models using the panel data and not simply at the employee level of analysis.
[26] We interpret this result as the joint effect of the two components of a *Mixed* contract. It is plausible that the fixed component might lead to incrementally higher frequencies of knowledge sharing behaviors, while the variable component, exacerbated by the busy production period, might direct the incremental knowledge sharing behavior toward improvements of tasks constituting the main responsibilities of the proponent.

governing their relationship with the firm, whereby tasks and time are exchanged for pay. Employees rewarded with low-powered incentives, in contrast, are more likely to infer relational contracts with their organization and consequently more willing to contribute to its success in ways that go beyond their assigned tasks. Our results are consistent with this interpretation.

We further distinguish between different types of suggestions—narrow-scope ideas, reflecting suggestions directly related to the proponent's standard execution task, and broad-scope ideas, related to improvement opportunities for organizational aspects unrelated to the execution task assigned to the proposing employee. We show that, compared to low-powered ones, high-powered incentives are associated with lower propensity to exchange knowledge that extends beyond the employee's standard task. We interpret this result as further evidence of employees experiencing high-powered incentive contracts as signals of a transactional relationship and low powered incentive contracts as signals of a relationship based on social exchanges. We perform a battery of robustness tests to reduce concerns for potential alternative explanations, such as the endogeneity of the relation between contract type and knowledge sharing, as well as the possibility that our results may be explained by a multitasking framework.

Our findings extend the literature on the design of control systems to drive knowledge sharing in organizations. Extensive research has explored ways to incentivize knowledge sharing, including contrasting input-based incentives directly rewarding the act of sharing knowledge with indirect incentives rewarding standard task performance that would benefit from knowledge sharing, as well as comparing the effects of linking individual payoffs to individual versus collective standard task performance. However, the influence on knowledge sharing of standard task performance elasticity of payoffs to standard task performance (i.e., incentive power) had not been addressed. Additionally, our work contributes to the line of inquiry examining potential

unfavorable effects of high-powered incentives. Our results suggest that compensation contracts that hinge on high responsiveness of payoffs to standard task performance inhibit knowledge sharing activities, thereby impacting an important source of competitive advantage.

Finally, in exploratory tests, we also document how knowledge sharing is more likely to be observed when department managers implement a culture fostering knowledge sharing as well as during times of added pressure to perform on the standard task, in which opportunities for improvement become more salient. We continue to find an attenuating effect of high-powered incentives, even when coupled with managers setting a culture of empowerment and encouragement of knowledge sharing. Additionally, incentive power interacts with operational pressures in a way that leads to combined effects of fixed and variable components of pay.

This research is subject to limitations that are common to many archival field studies. First, external validity concerns arise from the fact that we use information pertaining to a single organization, and our results might therefore be influenced by idiosyncratic characteristics of the field setting. Second, we are restricted by the contract types in use at the research site. While the observed contracts allow us to compare low-powered versus high-powered monetary incentives, alternative contract types, performance measures, reward types or amounts (not observed in our setting) may be better suited to encourage knowledge sharing. Third, we only have limited information about the internal mix of fixed and variable components of the mixed contracts, which prevents us from making strong inferences with respect to the consequences of adopting such a hybrid contract design. Despite these limitations, our study sheds new light on how the strength of incentives associated with standard tasks can influence the propensity to engage in knowledge sharing. Research on control systems that can improve employee engagement in activities beneficial to firm performance but not prescribed as part of the employee main responsibilities is

relatively scant. Our finding that low-powered incentives are more likely to induce employees to share suggestions, and especially those that benefit a broader set of constituents, provides novel insights into the effectiveness of management control systems to foster pro-organizational employee behaviors. We encourage future research to further explore additional management control practices and systems that can stimulate knowledge sharing in a broader spectrum of organizations and cultural settings.

Appendix 1: Types of Suggestions

Category	Type	Description	Examples	Variable
Broad Scope Suggestions (*Sub_Broad*)	Long-term	Ideas that enhance the long-term success of the company	"At this stage, our company does not have a complete proofing management standard. As a result, illegal operations often occur. We shall draft a formal proofing management standard that workers should follow."	*Sub_lt*
	Group	Ideas that promote collaboration	"Due to the building setup, the offset printing plant is now separated by the detention area of the outgoing products, resulting in poor communication and inconvenience. I hope that the outer wall can be removed so that the collaboration among the workers in the offset printing plant can be largely improved."	*Sub_group*
	Different Department	Ideas that benefit other departments	One employee from storage department suggests that "defective products in stock cannot be sold and may be used to print internal documents and labels."	*Sub_diffdep*
	Cost	Ideas that decrease overhead expenses	"There are two machines that are damaged for different reasons. We can assemble the good parts of one machine to the other. As a result, we only need to buy one new machine rather than two machines."	*Sub_cost*
	Technology	Ideas that enhance to company's computerized processes and automation	"The booster pump of the company's fire protection system is pressurized every 3-5 minutes due to the sensitivity of the pressure switch and the leakage of the pipeline, resulting in the pump being often damaged and the water pressure being insufficient. I suggest to add a timing device to the pump control circuit, which not only provides a higher water pressure in the pipeline, but also increases the pressurization interval to around 20 minutes."	*Sub_tech*
	Morale	Ideas that improve team/group morale	"We can celebrate office birthdays on a monthly basis. This is a way to gain employees' sense of belongings and increase employee satisfaction."	*Sub_morale*
Narrow Scope Suggestions (*Sub_Narrow*)	5S	Ideas that enhance the standardization process of the standard task	"I suggest to draw a paper diagram depicting the model, configuration and operation of the laminating machine."	*Sub_5s*
	Quality	Ideas that decrease the number of bad-quality (standard task) outputs	"There is no waste disposal area between the two templates in the middle of die cutting area, which increases the probability of defective projects. I suggest to add a 3mm waste disposal area in the middle of die cutting area, so that workers can verify each product during the process."	*Sub_quality*
	Efficiency	Ideas that enhance the speed of executing the standard task	"“400 per roll” of material is currently used, resulting in too frequent machine shutdowns as materials need to be replaced. This results in wasting a lot of printing time. I suggest to order the “800 per roll” material instead."	*Sub_efficiency*

Appendix 2: Variables Definition

Knowledge Sharing Variables	
Submission	Indicator variable assuming value 1 if the employee submits a suggestion in month t, and zero otherwise
Approved	Indicator variable assuming value 1 if the employee submits a suggestion that is approved and rewarded by management in month t, and zero otherwise
Sub_Narrow	Indicator variable assuming value 1 if the employee submits a suggestion that is classified as one of the Narrow Scope suggestion categories described in Appendix 1, and zero otherwise
Sub_Broad	Indicator variable assuming value 1 if the employee submits a suggestion that is classified as one of the Broad Scope suggestion categories described in Appendix 1, and zero otherwise
Sub_lt	Indicator variable assuming value 1 if the employee submits a suggestion classified as "long-term" in month t, and zero otherwise
Sub_group	Indicator variable assuming value 1 if the employee submits a suggestion classified as "group" in month t, and zero otherwise
Sub_diffdep	Indicator variable assuming value 1 if the employee submits a suggestion classified as "different department" in month t, and zero otherwise
Sub_cost	Indicator variable assuming value 1 if the employee submits a suggestion classified as "cost" in month t, and zero otherwise
Sub_tech	Indicator variable assuming value 1 if the employee submits a suggestion classified as "technology" in month t, and zero otherwise
Sub_morale	Indicator variable assuming value 1 if the employee submits a suggestion classified as "morale" in month t, and zero otherwise
Sub_5s	Indicator variable assuming value 1 if the employee submits a suggestion classified as "5s" in month t, and zero otherwise
Sub_quality	Indicator variable assuming value 1 if the employee submits a suggestion classified as "quality" in month t, and zero otherwise
Sub_efficiency	Indicator variable assuming value 1 if the employee submits a suggestion classified as "efficiency" in month t, and zero otherwise
Contract-related Variables	
Variable	Indicator variable assuming value 1 if employee *i* is paid with a variable contract for their standard task, and zero otherwise
Mixed	Indicator variable assuming value 1 if employee *i* is paid with a mixed contract for their standard task, and zero otherwise
Fixed	Indicator variable assuming value 1 if employee *i* is paid with a fixed contract for their standard task, and zero otherwise
Employee Characteristics	
JoinAfterMerger	Indicator variable assuming value 1 if employee *i* joined the firm after the merger event, and zero otherwise
DormEmp	Indicator variable assuming value 1 if employee *i* lives in the company-sponsored accommodations, and zero otherwise
Female	Indicator variable assuming value 1 if employee *i* is a female, and zero otherwise
Age	Continuous variable capturing the age of employee *i* in years, calculated at the beginning of the sample period
Mgmt	Indicator variable assuming value 1 if employee *i* holds supervisory responsibilities in the company, and zero otherwise
Tenure	Continuous variable capturing the tenure of employee *i* in years
Department	Categorical variable assuming values corresponding to each of the 11 departments in the site

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TABLE 1
Descriptive statistics

Panel A: Panel data

	N	Mean	p50	Std. Dev.	Min	p25	p75	Max
Knowledge Sharing Variables								
Submission	6016	0.060	0.000	0.238	0.000	0.000	0.000	1.000
Approved	6016	0.057	0.000	0.233	0.000	0.000	0.000	1.000
Sub_Narrow	6016	0.026	0.000	0.158	0.000	0.000	0.000	1.000
Sub_Broad	6016	0.050	0.000	0.218	0.000	0.000	0.000	1.000
Sub_lt	6016	0.014	0.000	0.119	0.000	0.000	0.000	1.000
Sub_group	6016	0.009	0.000	0.094	0.000	0.000	0.000	1.000
Sub_diffdep	6016	0.003	0.000	0.055	0.000	0.000	0.000	1.000
Sub_cost	6016	0.046	0.000	0.210	0.000	0.000	0.000	1.000
Sub_tech	6016	0.005	0.000	0.068	0.000	0.000	0.000	1.000
Sub_morale	6016	0.002	0.000	0.041	0.000	0.000	0.000	1.000
Sub_5s	6016	0.007	0.000	0.083	0.000	0.000	0.000	1.000
Sub_quality	6016	0.007	0.000	0.085	0.000	0.000	0.000	1.000
Sub_efficiency	6016	0.017	0.000	0.129	0.000	0.000	0.000	1.000

Panel B: Cross-sectional data

	N	Mean	p50	Std. Dev.	Min	p25	p75	Max
Knowledge Sharing Variables								
SubmissionE	513	0.154	0.000	0.361	0.000	0.000	0.000	1.000
ApprovedE	513	0.152	0.000	0.359	0.000	0.000	0.000	1.000
Sub_NarrowE	513	0.109	0.000	0.312	0.000	0.000	0.000	1.000
Sub_BroadE	513	0.125	0.000	0.331	0.000	0.000	0.000	1.000
Sub_ltE	513	0.014	0.000	0.116	0.000	0.000	0.000	1.000
Sub_groupE	513	0.031	0.000	0.174	0.000	0.000	0.000	1.000
Sub_diffdepE	513	0.023	0.000	0.151	0.000	0.000	0.000	1.000
Sub_costE	513	0.109	0.000	0.312	0.000	0.000	0.000	1.000
Sub_techE	513	0.031	0.000	0.174	0.000	0.000	0.000	1.000
Sub_moraleE	513	0.012	0.000	0.108	0.000	0.000	0.000	1.000
Sub_5sE	513	0.047	0.000	0.211	0.000	0.000	0.000	1.000
Sub_qualityE	513	0.049	0.000	0.216	0.000	0.000	0.000	1.000
Sub_efficiencyE	513	0.078	0.000	0.268	0.000	0.000	0.000	1.000

Panel C: Employee-level data

	N	Mean	p50	Std. Dev.	Min	p25	p75	Max
Contract-related Variables								
Variable	513	0.127	0.000	0.333	0.000	0.000	0.000	1.000
Mixed	513	0.296	0.000	0.457	0.000	0.000	1.000	1.000
Fixed	513	0.577	1.000	0.495	0.000	0.000	1.000	1.000
Employee Characteristics								
JoinAfterMerger	513	0.719	1.000	0.450	0.000	0.000	1.000	1.000
DormEmp	513	0.068	0.000	0.252	0.000	0.000	0.000	1.000
Female	513	0.382	0.000	0.486	0.000	0.000	1.000	1.000
Age	510	33.081	31.354	10.620	16.000	24.375	41.059	66.720
Mgmt	513	0.076	0.000	0.265	0.000	0.000	0.000	1.000
Tenure	513	1.816	1.000	1.319	1.000	1.000	2.091	17.000

Notes: Table 1 reports the summary statistics for all variables used in the empirical tests. All variables are defined in Appendix 2. Panel A reports the descriptive statistics corresponding to our complete panel data sample. In panel A, knowledge sharing variables are defined as indicator variables assuming value 1 if the employee has submitted at least one suggestion of the indicated kinds during the month and zero otherwise, and the indicator variable *Approved* assumes value 1 if any idea submitted by the employee has been approved during the month and zero otherwise. Panel B reports the descriptive statistics relative to our data collapsed to the cross-sectional employee-level. In panel B, knowledge sharing variables are defined as indicator variables assuming value 1 if the employee has submitted at least one suggestion of the indicated kinds during our sample period and zero otherwise (the suffix "*E*" in the variable label indicates the term "*ever*"), and the indicator variable *ApprovedE* assumes value 1 if any idea submitted by the employee has ever been approved during our sample period and zero otherwise. Panel C reports the descriptive statistics related to employee characteristics, including their contract type and demographic information.

TABLE 2
Correlations

	1	*2*	*3*	*4*	*5*	*6*	*7*
1. Submission	1.0000						
2. Sub_Narrow	0.6396***	1.0000					
3. Sub_Broad	0.9041***	0.4561***	1.0000				
4. Sub_lt	0.4780***	-0.0020	0.5288***	1.0000			
5. Sub_group	0.3756***	0.1073***	0.4154***	0.4609***	1.0000		
6. Sub_diffdep	0.2162***	0.0682***	0.2391***	0.1718***	0.2207***	1.0000	
7. Sub_cost	0.8703***	0.3997***	0.9626***	0.5427***	0.4064***	0.2050***	1.0000
8. Sub_tech	0.2699***	0.2673***	0.2985***	-0.0083	0.0453***	-0.0037	0.1591***
9. Sub_5s	0.3309***	0.5173***	0.1184***	-0.0102	0.0555***	-0.0046	0.0669***
10. Sub_quality	0.3387***	0.5296***	0.2223***	-0.0104	0.0952***	0.0667***	0.1944***
11. Sub_efficiency	0.5183***	0.8103***	0.4372***	0.0057	0.0558***	0.0400***	0.4180***
12. Sub_morale	0.1610***	0.0451***	0.1781***	-0.0049	0.0826***	-0.0022	0.1656***
13. Variable	-0.1068***	-0.0420***	-0.1051***	-0.0696***	-0.0547***	-0.0244*	-0.1011***
14. Mix	-0.0449***	-0.0516***	-0.0453***	0.0482***	0.0080	-0.0129	-0.0404***
15. Fixed	0.1292***	0.0783***	0.1280***	0.0212	0.0409***	0.0317**	0.1205***
16. JoinAfterMerger	-0.0951***	-0.0635***	-0.0864***	-0.0746***	-0.0540***	-0.0148	-0.0834***
17. DormEmp	0.0007	-0.0164	0.0064	0.0721***	0.0182	0.0020	0.0115
18. Female	-0.0244*	-0.0657***	-0.0015	0.0433***	0.0267**	0.0050	0.0120
19. Age	-0.0474***	-0.0196	-0.0550***	-0.0246*	-0.0248*	-0.0348***	-0.0562***
20. Mgmt	0.2293***	0.1523***	0.2057***	0.1255***	0.0848***	0.0577***	0.1897***
21. Tenure	0.0617***	0.0258**	0.0668***	0.0772***	0.0328**	0.0071	0.0689***

	8	*9*	*10*	*11*	*12*	*13*	*14*
8. Sub_tech	1.0000						
9. Sub_5s	0.1996***	1.0000					
10. Sub_quality	0.1948***	0.1100***	1.0000				
11. Sub_efficiency	0.1802***	0.0972***	0.3363***	1.0000			
12. Sub_morale	0.0572***	-0.0034	-0.0035	0.0579***	1.0000		
13. Variable	-0.0167	-0.0251*	-0.0132	-0.0337***	-0.0234*	1.0000	
14. Mix	-0.0349***	-0.0083	-0.0149	-0.0543***	-0.0208	-0.2933***	1.0000
15. Fixed	0.0429***	0.0285**	0.0236*	0.0734***	0.0373***	-0.6289***	-0.5588***
16. JoinAfterMerger	-0.0348***	-0.0467***	-0.0336***	-0.0484***	-0.0301**	-0.4520***	0.1929***
17. DormEmp	-0.0020	-0.0135	0.0068	-0.0166	-0.0174	0.4595***	0.0608***
18. Female	-0.0458***	-0.0562***	-0.0223*	-0.0336***	-0.0250*	0.2091***	-0.0849***
19. Age	0.0235*	0.0637***	-0.0202	-0.0550***	0.0038	0.3157***	-0.0132
20. Mgmt	0.0507***	0.0941***	0.0450***	0.1233***	-0.0044	-0.1914***	-0.1633***
21. Tenure	0.0033	0.0150	0.0035	0.0223*	0.0071	0.3751***	-0.1638***

(Table 2 continues on the next page)

(Table 2 – Cont'd)

	15	*16*	*17*	*18*	*19*	*20*
15. Fixed	1.0000					
16. JoinAfterMerger	0.2352***	1.0000				
17. DormEmp	-0.4481***	-0.3817***	1.0000			
18. Female	-0.1123***	-0.0565***	-0.0957***	1.0000		
19. Age	-0.2632***	-0.2289***	0.1409***	0.1606***	1.0000	
20. Mgmt	0.2988***	-0.1850***	-0.1243***	-0.1839***	0.0287**	1.0000
21. Tenure	-0.1921***	-0.7691***	0.3827***	0.0079	0.2816***	0.1971***

Notes: Table 2 reports the Pearson correlation coefficients among all of our variables of interest for the estimation of our statistical models. *, **, and *** represent significance levels of 0.10 [or 10 percent], 0.05 [or 5 percent], and 0.01 [or 1 percent], respectively.

TABLE 3
Incentive power and knowledge sharing

	(1) *Submission*	(2) *Submission*
Variable	-2.585***	-0.903*
	(-3.97)	(-1.95)
Mixed	-1.047**	-0.060
	(-2.08)	(-0.13)
JoinAfterMerger	-0.879*	-0.546
	(-1.78)	(-1.17)
DormEmp	1.596**	1.120**
	(1.98)	(2.51)
Female	0.356	-0.195
	(0.78)	(-0.73)
Age	-0.020	-0.011
	(-1.12)	(-0.54)
Mgmt	1.487***	0.899**
	(3.36)	(2.15)
Tenure	-0.016	-0.120
	(-0.27)	(-1.26)
Intercept	-2.717***	-4.685***
	(-4.90)	(-9.42)
Wald Test:		
H_0: *Variable = Mixed*	p>0.10	p<0.10 *
N	5833	5833
pseudo R^2	0.180	0.321
Month FE	Yes	Yes
Department FE	No	Yes

Notes: Table 3 reports the coefficients estimated for equation (1) using logit regression. *Fixed* serves as the base case included in the intercept. Estimations in column (2) include department fixed effects. All estimations include month fixed effects and cluster standard errors by department. We report the significance of the Wald test of the null hypothesis that the coefficient estimated for *Variable* is not statistically different than the coefficient estimated for *Mixed*. *, **, and *** represent significance levels of 0.10 [or 10 percent], 0.05 [or 5 percent], and 0.01 [or 1 percent], respectively.

TABLE 4
Contract type and suggestion scope

Panel A: Aggregate categories: narrow scope versus broad scope

	(1)	(2)
	Sub_Narrow	*Sub_Broad*
Variable	-0.104	-1.601*
	(-0.30)	(-1.79)
Mixed	-0.031	-0.468
	(-0.07)	(-0.61)
JoinAfterMerger	-0.954***	-0.345
	(-2.91)	(-0.75)
DormEmp	0.398	1.899**
	(1.61)	(2.27)
Female	-0.528*	-0.070
	(-1.66)	(-0.22)
Age	-0.004	-0.014
	(-0.15)	(-0.75)
Mgmt	1.167**	0.693**
	(2.55)	(1.97)
Tenure	-0.182	-0.079
	(-1.55)	(-1.11)
Intercept	-4.162***	-6.459***
	(-7.55)	(-14.16)
Wald Test:		
H_0: *Variable = Mixed*	p>0.10	p<0.10 *
N	4899	5833
pseudo R^2	0.196	0.389
Month FE	Yes	Yes
Department FE	No	Yes

Panel B: Individual suggestion categories

	Narrow Scope Suggestions			Broad Scope suggestions				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sub_5s	*Sub_quality*	*Sub_efficiency*	*Sub_lt*	*Sub_group*	*Sub_diffdep*	*Sub_cost*	*Sub_tech*
Variable	-0.827	-0.612	0.466	0.000	0.000	-12.366***	-1.575*	-1.647**
	(-1.09)	(-0.71)	(1.04)	(.)	(.)	(-10.66)	(-1.70)	(-2.46)
Mixed	0.588	-0.343	-0.216	2.696***	1.634	-12.269***	-0.362	0.000
	(0.97)	(-0.38)	(-0.39)	(2.64)	(1.15)	(-7.54)	(-0.54)	(.)
JoinAfterMerger	-1.585	-1.360*	-0.761**	2.832*	-1.359*	1.091*	-0.271	-1.015
	(-1.04)	(-1.65)	(-2.55)	(1.90)	(-1.86)	(1.69)	(-0.48)	(-1.08)
DormEmp	-0.542	0.637	0.022	0.000	-1.934	14.918***	1.911**	0.767
	(-1.47)	(1.06)	(0.06)	(.)	(-1.23)	(11.05)	(2.29)	(0.69)
Female	-2.359**	-0.155	-0.118	-0.124	0.555	-0.745	0.054	-1.237
	(-1.97)	(-0.26)	(-0.46)	(-0.07)	(0.67)	(-0.66)	(0.17)	(-1.25)
Age	0.076**	-0.003	-0.040	-0.161**	-0.031	-0.091*	-0.013	0.052**
	(2.12)	(-0.08)	(-1.61)	(-2.03)	(-1.29)	(-1.70)	(-0.62)	(2.12)
Mgmt	1.804**	0.463	1.219**	0.207	-0.227	1.615	0.579	0.411
	(2.57)	(0.53)	(2.48)	(0.10)	(-0.63)	(1.09)	(1.54)	(0.47)
Tenure	-0.224	-0.229	-0.118	0.494*	-0.216	0.086	-0.058	-0.105
	(-0.45)	(-1.28)	(-1.24)	(1.87)	(-0.98)	(1.03)	(-0.73)	(-0.22)
Intercept	-6.493***	-4.261***	-4.231***	-7.749***	-6.711***	-2.249	-7.488***	-3.891***
	(-8.76)	(-4.50)	(-8.10)	(-3.54)	(-5.99)	(-1.11)	(-9.62)	(-4.91)
Wald Test: H_0: *Variable = Mixed*	p<0.01 ***	p>0.10	p>0.10	N/A	N/A	p>0.10	p=0.105	N/A
N	2849	3146	4571	996	1336	546	5656	1185
pseudo R^2	0.294	0.129	0.276	0.762	0.402	0.129	0.410	0.131
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 4 reports the coefficients estimated for equation (1) using the propensity to share knowledge for each individual category of suggestions. All estimations include month and department fixed effects, and cluster standard errors by department. **Panel A** relates to aggregate measures of scope of applicability (see Appendix 1). **Panel B** reports the estimation results for each suggestion category. In columns (4) and (5), the coefficient associated with *Variable* cannot be calculated, as no suggestion relative to long term initiatives or group-level initiatives is submitted by workers whose standard task contract is *Variable*. Also, no long-term suggestion (col. (4)) is offered by employees that live in the company dormitories. In column (6), the coefficient associated with Mixed cannot be calculated, as no suggestion relative to technology is submitted by workers whose

standard task contract is *Mixed*. The estimation of equation (1) using *Sub_morale* as dependent variables is not possible, as *Fixed* perfectly predicts the outcome of interest in that suggestions in that category are submitted exclusively by employees rewarded with Fixed contracts during our sample period. We report the significance of the Wald test of the null hypothesis that the coefficient estimated for *Variable* is not statistically different than the coefficient estimated for *Mixed*. The Wald test cannot be performed in those cases where the coefficient cannot be calculated. *, **, and *** represent significance levels of 0.10 [or 10 percent], 0.05 [or 5 percent], and 0.01 [or 1 percent], respectively.

TABLE 5
Endogeneity test: instrumental variable

Panel A: Instrument *JoinBusy*

	First Stage	**Second Stage**		**Exclusion Restriction**	
	(1)	(2)	(3)	(4)	(5)
DV	*Variable*	*Submission*	*Submission*	*Submission*	*Submission*
Variable		-11.549**	-4.658	-2.599***	-0.918**
		(-2.39)	(-1.31)	(-3.97)	(-1.98)
Mixed		-3.748**	-1.883	-1.047**	-0.047
		(-2.44)	(-1.21)	(-2.04)	(-0.10)
JoinAfterMerger	-2.488***	-3.360**	-1.612	-1.107**	-0.628
	(-2.97)	(-2.48)	(-1.50)	(-2.04)	(-1.47)
DormEmp	1.714	5.037**	1.778	1.752**	1.180**
	(1.50)	(2.53)	(1.63)	(1.98)	(2.46)
Female	0.481	1.374**	0.293	0.377	-0.174
	(0.38)	(2.39)	(0.85)	(0.81)	(-0.66)
Age	0.042	0.072*	0.009	-0.019	-0.010
	(1.30)	(1.84)	(0.79)	(-1.01)	(-0.53)
Mgmt	-1.595	-2.111	-0.125	1.489***	0.899**
	(-1.35)	(-1.55)	(-0.24)	(3.47)	(2.15)
Tenure	0.063	-0.245**	-0.125*	0.001	-0.109
	(0.40)	(-1.98)	(-1.90)	(0.01)	(-1.15)
JoinBusy	1.008***			-0.517	-0.187
	(2.70)			(-1.11)	(-0.51)
Intercept	-2.002*	-0.603	-0.331	-2.541***	-4.625***
	(-1.94)	(-1.08)	(-0.19)	(-4.21)	(-7.92)
Wald Test: *H_0: Variable = Mixed*		p<0.05 **	p>0.10	p>0.10	p<0.10 *
Weak Instrument Test (F-statistic)		139.98	229.25		
N	419	5866	5833	5833	5833
pseudo R^2	0.508			0.185	0.321
Month FE		Yes	Yes	Yes	Yes
Department FE	Yes	No	Yes	No	Yes

Panel B: Instrument *JoinIdle*

	First Stage	Second Stage		Exclusion Restriction	
	(1)	(2)	(3)	(4)	(5)
DV	*Fixed*	*Submission*	*Submission*	*Submission*	*Submission*
Fixed		4.808***	0.299	2.523***	0.903*
		(4.81)	(0.12)	(4.06)	(1.94)
Mixed		3.199***	0.323	1.507	0.849*
		(4.63)	(0.23)	(1.46)	(1.79)
JoinAfterMerger	1.259**	-1.458***	-0.298	-0.859	-0.546
	(2.48)	(-4.87)	(-0.39)	(-1.62)	(-1.17)
DormEmp	-2.967*	2.272***	0.449	1.716*	1.130**
	(-1.65)	(5.27)	(0.58)	(1.91)	(2.30)
Female	0.596	0.582***	-0.117	0.389	-0.192
	(1.33)	(4.30)	(-0.47)	(0.83)	(-0.72)
Age	-0.014	0.018**	-0.004	-0.017	-0.010
	(-0.64)	(2.06)	(-0.47)	(-0.90)	(-0.55)
Mgmt	3.439***	-0.235	0.502	1.544***	0.902**
	(3.19)	(-0.81)	(1.36)	(3.48)	(2.24)
Tenure	0.075	-0.096**	-0.068	-0.045	-0.121
	(0.37)	(-2.08)	(-1.24)	(-0.92)	(-1.30)
JoinIdle	1.012*			0.824	0.044
	(1.77)			(1.39)	(0.08)
Intercept	-1.434**	-5.991***	-2.731**	-5.481***	-5.601***
	(-2.48)	(-6.21)	(-2.04)	(-5.45)	(-8.01)
Wald Test: H_0: *Variable = Mixed*		p<0.01 ***	p>0.10	P<0.10 *	p>0.10
Weak Instrument Test (F-Statistic)		235.90	340.91		
N	422	5866	5833	5833	5833
pseudo R^2	0.386			0.188	0.321
Month FE		Yes	Yes	Yes	Yes
Department FE	Yes	No	Yes	No	Yes

Notes: Table 5 reports the 2SLS estimation results for equation (1). In panel A we adopt as instrument *JoinBusy*, an indicator variable assuming value 1 if the month in which employee *i* is hired is a busy month, and 0 otherwise. In panel B we adopt as instrument *JoinIdle*, an indicator variable assuming value 1 if the month in which employee *i* is hired is an idle month, and 0 otherwise. In both panels, column (1) reports the estimation results of the first stage (equation (2)), while columns (2) and (3) report the results of the second stage estimation, where variable *Variable (Fixed*) in panel A (panel B) assumes instrumented values from the first stage, and we control for *Mixed* to maintain consistency with our main tests. Column (2) does not include department fixed effects, while column (3) does. Columns (4) and (5) provide evidence of satisfactory exclusion restrictions for each instrument and differ by the inclusion of department fixed effects (present in column (5) but not in column (4)). All estimations include month fixed effects and are cluster standard errors by department. The Sargan J statistic for the over-identification test has a *p*-value of 0.809, based on which we are unable to reject the null hypothesis that both instruments are not correlated with the error term of the main regressions, further satisfying the exclusion restriction. We report the significance of the Wald test of the null hypothesis that the coefficient estimated for Variable is not statistically different than the coefficient estimated for *Mixed*. *, **, and *** represent significance levels of 0.10 [or 10 percent], 0.05 [or 5 percent], and 0.01 [or 1 percent], respectively.

TABLE 6
Contracts type and standard execution tasks outcomes

	(1) *Met*	(2) *Met*	(3) *Met*	(4) *BadQuality*	(5) *BadQuality*	(6) *BadQuality*
Submission		0.207	0.211		0.134	0.117
		(0.83)	(0.84)		(0.78)	(0.76)
Variable	-0.045		-0.042	-0.554		-0.553
	(-0.19)		(-0.18)	(-1.42)		(-1.42)
Mixed	-0.340***		-0.340***	0.065		0.065
	(-2.67)		(-2.71)	(0.60)		(0.59)
JoinAfterMerger	0.173	0.236	0.171	-0.007	0.175	-0.005
	(0.46)	(0.67)	(0.46)	(-0.02)	(0.38)	(-0.01)
DormEmp	0.354	0.285	0.353	0.206	0.105	0.205
	(0.88)	(0.71)	(0.87)	(0.98)	(0.36)	(0.98)
Female	0.181*	0.175*	0.182*	-0.576	-0.592	-0.573
	(1.76)	(1.77)	(1.78)	(-1.12)	(-1.30)	(-1.11)
Age	-0.006	-0.006	-0.006	0.008	0.006	0.008
	(-0.43)	(-0.41)	(-0.42)	(0.90)	(0.64)	(0.90)
Mgmt	0.282	0.266	0.268	-0.061	0.053	-0.068
	(1.40)	(1.32)	(1.28)	(-0.10)	(0.11)	(-0.12)
Tenure	-0.165	-0.131	-0.167	0.057	0.046	0.058
	(-1.04)	(-0.91)	(-1.04)	(0.39)	(0.28)	(0.39)
Intercept	-3.957***	-4.176***	-3.937***	-2.562***	-2.709***	-2.563***
	(-4.16)	(-4.20)	(-4.11)	(-5.66)	(-5.06)	(-5.66)
N	5799	5799	5799	5672	5672	5672
pseudo R^2	0.072	0.071	0.072	0.139	0.134	0.139
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 6 reports the coefficients of equation (3) estimated using logit regression and adopting different dependent variables representing important organizational outcomes. Respectively, columns (1-3) report the estimation of equation (3) using the dependent variable $Met_{i,t}$, an indicator variable assuming value 1 if employee *i* met or exceeded the assigned target in month *t* and zero if the employee *i* missed the target; Columns (4-6) report the estimation of equation (3) using the dependent variable $BadQuality_{i,t}$, an indicator variable assuming value 1 if the activity for which employee *i* is responsible was associated with a quality complaint in month *t* and zero otherwise. All estimations include month fixed effects and department fixed effects and cluster standard errors by department. *, **, and *** represent significance levels of 0.10 [or 10 percent], 0.05 [or 5 percent], and 0.01 [or 1 percent], respectively.

TABLE 7
Influence of manager's knowledge sharing

	(1) *Submission*	(2) *Sub_Narrow*	(3) *Sub_Broad*
Variable	-2.237***	-0.386	-3.189***
	(-2.76)	(-0.73)	(-3.74)
Mixed	-1.359	-0.134	-2.501***
	(-1.42)	(-0.25)	(-2.74)
ManagerHighSub	1.236*	1.430**	1.325*
	(1.85)	(2.23)	(1.74)
Variable ManagerHighSub*	-1.583*	-1.466	-1.183
	(-1.68)	(-1.14)	(-1.34)
Mixed ManagerHighSub*	1.174	-0.890	1.977*
	(1.05)	(-1.02)	(1.69)
JoinAfterMerger	-0.997**	-1.211***	-0.831*
	(-2.46)	(-2.94)	(-1.85)
DormEmp	2.000**	0.512	2.786***
	(2.33)	(1.11)	(3.19)
Female	0.325	-0.952**	0.563
	(0.71)	(-2.30)	(1.00)
Age	-0.058*	-0.037	-0.079**
	(-1.90)	(-0.78)	(-2.28)
Tenure	0.103	0.019	0.175
	(0.65)	(0.07)	(1.16)
Intercept	-2.916***	-3.173***	-2.886***
	(-4.15)	(-4.13)	(-3.35)
Wald Tests:			
H_0: *Variable = Mixed*	p<0.10 *	p<0.05 **	p<0.10 *
H_0: *Variable + Variable*ManagerHighSub* = 0	p<0.01 ***	p>0.10	p<0.01 ***
H_0: *Mixed + Mixed*ManagerHighSub* = 0	p>0.10	p>0.10	p>0.10
N	5061	3994	5061
pseudo R^2	0.209	0.136	0.254
Month FE	Yes	Yes	Yes

Notes: Table 7 reports the coefficients estimated for equation (4) using logit regression. *Fixed* is the base (dropped) case. The variable *ManagerHighSub* is an indicator variable coded as 1 if the manager of Department *j* submits more suggestions in our sample period than the median number of submissions by managers, and 0 otherwise. For the purpose of this analysis we restricted the sample to non-manager employees. Column (1) relates to the estimation of Eq. (4) when the DV is any type of submission. Column (2) relates to the estimation of Eq. (4) when the dependent variable is the submission of narrow-scope suggestions. Column (3) relates to broad-scope suggestions. Wald test results for the indicated null hypotheses are reported in the bottom section of the table. The estimation includes month fixed effects and clusters standard errors by department. *, **, and *** represent significance levels of 0.10 [or 10 percent], 0.05 [or 5 percent], and 0.01 [or 1 percent], respectively.

TABLE 8
Busy months and knowledge sharing

	(1) *Submission*	(2) *Sub_Narrow*	(3) *Sub_Broad*
Variable	-0.931*	-0.193	-1.273
	(-1.88)	(-0.51)	(-1.46)
Mixed	-0.725	-1.402	-0.988
	(-0.95)	(-1.09)	(-1.03)
BusyMonth	0.373***	0.109	0.417**
	(2.68)	(0.73)	(2.24)
*Variable*BusyMonth*	-0.126	0.171	-0.911
	(-0.28)	(0.42)	(-0.86)
*Mixed*BusyMonth*	1.083**	2.073**	0.892
	(2.13)	(1.97)	(1.43)
JoinAfterMerger	-0.670*	-1.329***	-0.326
	(-1.92)	(-3.43)	(-1.04)
DormEmp	1.238***	0.518**	1.868**
	(2.62)	(2.24)	(2.18)
Female	-0.181	-0.521*	-0.053
	(-0.68)	(-1.68)	(-0.17)
Age	-0.012	-0.006	-0.014
	(-0.62)	(-0.22)	(-0.82)
Mgmt	0.897**	1.194***	0.674**
	(2.35)	(2.75)	(2.25)
Tenure	-0.216**	-0.377*	-0.118**
	(-2.18)	(-1.96)	(-2.26)
Intercept	-3.397***	-2.967***	-5.639***
	(-4.72)	(-3.49)	(-8.65)
Wald Tests:			
H_0: *Variable = Mixed*	p>0.10	p>0.10	p>0.10
H_0: *Variable + Variable*BusyMonth* = 0	p<0.10 *	p>0.10	p<0.10 *
H_0: *Mixed + Mixed* BusyMonth* = 0	p>0.10	p<0.05 **	p>0.10
N	5978	5893	5978
pseudo R^2	0.288	0.178	0.355
Department FE	Yes	Yes	Yes

Notes: Table 8 reports the coefficients estimated for equation (5) using logit regression. *Fixed* is the base (dropped) case. The variable *BusyMonth* is an indicator coded as 1 if month *t* is a month of high production volumes and 0 otherwise. Column (1) relates to the estimation of Eq. (5) when the DV is any type of submission. Column (2) relates to the estimation of Eq. (5) when the dependent variable is the submission of narrow-scope suggestions. Column (3) relates to broad-scope suggestions. Wald test results for the indicated null hypotheses are reported in the bottom section of the table. The estimation includes department fixed effects and clusters standard errors by department. *, **, and *** represent significance levels of 0.10 [or 10 percent], 0.05 [or 5 percent], and 0.01 [or 1 percent], respectively.