

Sparking Creativity among Manufacturing Workers Using Extrinsic Rewards: A Self-Determination Theory Perspective

Abstract

The relationship between extrinsic rewards and creativity has been subject to ongoing debate within the human resource management and creativity literatures. More research on the mechanisms and boundary conditions has been called for. In this study, using 187 employee-supervisor dyads in an electronics manufacturing company, we investigated how and when creativity-contingent extrinsic rewards (CER) may foster creativity among shopfloor manufacturing employees. Drawing on self-determination theory, we hypothesized, and found that employee intrinsic motivation mediated the relationship between CER and employee creativity. This relationship was the strongest when employees rated their leader-member exchange (LMX) as high. The findings reveal the important role of CER in guiding manufacturing workers' intrinsic motivation and stimulating creativity. The identification of LMX as a moderator uncovers crucial boundary conditions of this relationship. Theoretical and practical implications are discussed.

Keywords: creativity-contingent extrinsic rewards, intrinsic motivation, creativity, self-determination theory, boundary conditions, manufacturing jobs

INTRODUCTION

The manufacturing sector contributed to 15% of the global GDP (World Bank, 2020a) and nearly 3% of the global annual growth in 2018 (World Bank, 2020c). This sector employs a large number of shopfloor employees, who are not typically portrayed as “creative”. However, it would be a mistake to think that their creativity at work – the production of ideas about products, practices, processes, or procedures that are both novel and potentially useful to the organization (Amabile, 1996; Baer & Oldham, 2006) – is not important. In fact, researchers have argued that the creative ideas of shopfloor employees are integral to the success of manufacturing companies (Axtell et al., 2000; Delbridge, 2007). Modern initiatives in manufacturing organizations, such as total quality management and continuous improvement schemes (Deming, 1982; McLoughlin & Harris, 1997), are predicated on workers’ creativity. The strategic human resource management literature (SHRM) widely references the idea of the factory as a ‘learning laboratory’ (Appelbaum et al., 2001; Leonard-Barton, 1992; Wright et al., 2001), which proposes that employees at all levels have the potential to improve internal practices and processes, even if it is in an incremental way.

Manufacturing companies have been seeking ways to increase their employees’ creativity. Stories of successfully using contingent rewards to this end have featured in media. For example, Crafts Tech, a tool manufacturing company in the US, adopted an Employee Stock Ownership Plan, which was instrumental in moving the company to a culture of innovation (e.g., Ludema & Johnson, 2019). Contingent rewards refer to financial and non-financial rewards offered by organizations to their employees in order to foster specific behaviors that advance organizational goals (Malik et al., 2015; Malik et al., 2019). They have been widely used in industry. Academic researchers, however, have insisted for a long time that contingent rewards undermine intrinsic

motivation and therefore are detrimental to creativity (e.g., Amabile, 1988; Deci et al., 1999; Deci et al., 2017). Although contingent rewards can have ‘spectacular’ effects, either in a positive or negative direction (Gerhart & Fang, 2015, p. 490), their role in enhancing or detracting from creativity remains far from settled.

Some have argued that intrinsic motivation matters less for employees performing mundane and repetitive jobs, given that their creativity is likely to be incremental rather than radical in scope (Malik et al., 2019). According to this perspective, external motivators (such as pay) are sufficient, provided that they clearly signal to employees the behaviors that the organization aspires towards (Eisenberger, 1992). Others - echoing the words of the NASA janitor in the Kennedy interview of 1962 that he was ‘helping to put a man on the moon’ - argue that even those performing routine jobs have the potential to be intrinsically motivated (Montag et al., 2012). Despite this, the field lacks informed insight as to the role of intrinsic motivation in the association between extrinsic rewards and creativity, with particular reference to people whose jobs may be construed as routine or even boring. This is surprising since, while low-cost economies exercise control through direct hierarchical relationships, it has long been recognised that competing on a global stage may rely on the tacit knowledge and discretionary efforts of shop-floor employees, including their creative ideas (Axtell et al., 2000; Delbridge, 2007; Leonard-Barton, 1992).

Building on this gap, in this paper, we examine the extent to which creativity-contingent extrinsic rewards (CER) foster the creativity of employees performing routine roles, and we further theorize the mechanisms through which these effects arise. CER entail financial and non-financial elements (pay, recognition and encouragement) focused on creative performance, rather than performance defined more generally (Eisenberger, 1992; Malik et al., 2015; Zhang et al.,

2015). Because manufacturing jobs (unlike service jobs) produce tangible outcomes, organizations are well placed to convey a strong message that creativity and innovation are recognized and valued (Gallowj & Weinstein, 1997; Prajogo, 2006).

Added to this, in acknowledgement of research demonstrating that leadership has a bearing on creative behavior (Zhang & Bartol, 2010), we spotlight leader-manager exchange (LMX), which has been suggested to play a facilitative role (Pan et al., 2012; Qu et al., 2017). Probing the role of LMX in amplifying the effect of CER on creativity through intrinsic motivation casts light on the mechanisms through which organizations might address employees' fundamental needs (Deci et al., 2017; Ryan & Deci, 2005). While CER offers the opportunity (and autonomy) for employees to devise creative ideas, we argue that those in mature (rather than underdeveloped) LMX relationships have the competence and confidence needed to respond accordingly (Graen & Scandura, 1987; Graen & Uhl-Bien, 1995). In other words, CER are more effective as a management tool when implemented in situations where LMX is high (Deci et al., 2017).

Using data collected from 187 shop-floor employees and their supervisors at an electronics manufacturing company, our contributions are two-fold. First, we show for the first time that CER deployed in a manufacturing environment - where creativity tends to be incremental rather than radical (Malik et al., 2019) - foster employee creativity through the mediating channel of intrinsic motivation. Despite offering scope to track creative and innovative outcomes, manufacturing jobs present unique challenges for the creative potential of incumbents due to routine, standardized work processes, which can induce habitual responses (Delbridge, 2007; Lillrank, 2003). Yet, research shows that employees occupying routine jobs have plenty of ideas, gained from their first-hand experience, about how things could be improved (Axtell et al., 2000;

Bernstein, 2012; Chae & Choi, 2019; Dorenbosch et al., 2005). All too often suggestions lie dormant either because shop-floor employees are unwilling to bear the cost of explaining better ways of doing things to their leaders, and/or because they fear being penalized for doing things differently (Bernstein, 2012). Because an abundance of research shows that intrinsic motivation is a potent enabler of creativity (Tierney et al., 1999; Zhang et al., 2022), tapping into this motivational state has the potential to release ideas and suggestions from the bottom up to fuel innovation and change at a higher level of analysis.

Second, this study contributes to the identification of boundary conditions in the CER–creativity relationship. An increasing number of researchers have come to agree that the relationship between contingent rewards and creativity is not uniform (Baer et al., 2003; Li et al., 2018; Li et al., 2017; Malik et al., 2015; Malik et al., 2019). However, theorization about the boundary conditions is fragmented. In this study, we use self-determination theory (SDT) as a unifying theoretical framework and identify LMX as an important boundary condition. Although researchers have demonstrated that LMX plays a positive role in employee creativity (Liden & Maslyn, 1998), it remains unclear how LMX might influence the CER-creativity association. Building on evidence about the role of high-quality LMX in fostering employee competence and career growth (Graen et al., 1987), we offer a theoretical and empirical case as to how organizations might best deploy incentive schemes such as CER. As SDT shows, contextual factors shape employees' sense of having (a degree of) control, or, alternatively, feeling powerless in the face of requirements to achieve demands and targets (Deci et al., 2017). We posit that LMX fosters an environment in which CER's behavioral cues are more likely to induce greater creativity-related intrinsic motivation. This is because the high LMX leader helps the

employee to view the messages CER convey about creativity and independent thought as achievable rather than overwhelming (Pan et al., 2012; Tierney et al., 1999).

THEORY AND HYPOTHESIS DEVELOPMENT

Creativity, HRM practices and creativity - contingent extrinsic rewards

Continuous improvement philosophy is premised on the notion that everyone's suggestions have value, regardless of whether the idea is large or small (Deming, 1982; McLoughlin & Harris, 1997). This way of thinking is integral to manufacturing operations, hence we define creativity broadly as ideas that have novelty and value within that setting (Baer & Oldham, 2006; Zhou & Shalley, 2003), rather than distinguishing between incremental and radical creativity as others have done (Malik et al., 2019). Although it is more likely that manufacturing employees in blue-collar roles would have ideas that are modest rather than far-reaching, it is far from inconceivable that from time to time a groundbreaking suggestion would arise (Ludema & Johnson, 2019). Even small ideas, when effectively implemented, can have significant effects on the bottom line (Axtell et al., 2000; Delbridge, 2007).

HRM practices can be seen as communications from organizations to employees (Bowen & Ostroff, 2004). According to this perspective, HRM practices send signals regarding what behaviors are expected of employees in line with strategic goals (Bowen & Ostroff, 2004; Guzzo & Noonan, 1994). Rewards are arguably one of four interlocking principles of high involvement work systems used to promote creativity (Song et al., 2020). Although not all contingent rewards are specific in their content, research shows that the more targeted they are on the specific behaviors managers wish to inculcate, the higher the probability that they will deliver as anticipated (Byron & Khazanchi, 2012). Accordingly, our starting point is CER, which are widely referenced by creativity scholars (Malik et al., 2015; Malik et al., 2019; Yoon & Choi,

2010). Although financial rewards for creativity feature within CER, non-financial rewards such as recognition by co-workers and acknowledgement by the organization, are part of the overall package. This means that CER come in multiple forms, including, promotion opportunities, recognition from supervisors, acknowledgement by co-workers and endorsement by the company, with creativity a central reference point.

Self-determination theory and creativity-contingent extrinsic rewards

There has been wide debate about the role of CER in fostering creativity, with scholars approaching the question from two fundamentally different standpoints. One line of work, encompassing the behavioral perspective (Skinner, 1953) and related theories, such as learned industriousness theory (Eisenberger, 1992) and expectancy theory (Vroom, 1964), argues that effort is fundamentally aversive and that rewards are required to overcome this cognitive barrier (Eisenberger, 1992). According to this way of thinking, people have the potential to enact a behavior if the context signals that they will be rewarded for doing so. This means that they are driven to act according to extrinsic factors (such as the extra pay they will receive) rather than the satisfaction they receive from performing a task.

Another school of thought holds that far from being fundamentally aversive, work has the potential to be fulfilling where contextual conditions allow. Intrinsic motivation - whereby people derive fulfilment and satisfaction from the task itself - arises when the context meets employees' deep-seated needs (Gagné & Deci, 2005). Following a similar line of reasoning, SDT suggests that given the right conditions, people have the potential to enjoy work and derive satisfaction from it, regardless of their position and status (Deci et al., 2017). The theory details multiple factors, such as managerial styles and pay contingencies, that support employees' autonomy at work (Deci & Ryan 1985; Ryan & Deci, 2017).

In turn, at heart, SDT argues that people thrive in work environments enabling *autonomous motivation*, where engagement in an activity occurs ‘with a full sense of willingness, volition, and choice’ (Deci et al., 2017, p. 20). Far from suggesting that there is a clear-cut distinction between employees’ autonomous motivation, on the one hand, and controlled, external regulation on the other hand, SDT scholars rather argue for a continuum, where work activities range from being more or less autonomous. External regulation is at the least autonomous end of the continuum, suggesting that individuals perceive their behavior as being directly controlled by others, while intrinsic motivation represents the highest level on the autonomy continuum.

Although the traditional view is that contingent rewards undermine intrinsic motivation because they distract employees’ attention away from the job towards extrinsic factors such as financial rewards, scholars more recently have posited that contingent rewards may not necessarily be damaging to intrinsic motivation. External regulation can help people experience volition and freedom at work where the required behavior is congruent with their personal goals and identities (Gagne & Deci, 2005). An important determinant of whether contingent rewards elicit intrinsic motivation concerns their informational content. Where contingent rewards signal the importance attached to the three psychological needs: autonomy, competence, and relatedness, they are likely to enhance, rather than diminish, intrinsic motivation (Gerhart & Fang, 2015). This contention is supported by creativity scholarship, which has argued that rewards can enhance intrinsic motivation and creativity when they “confirm competence, provide useful information in a supportive way, or enable people to do something that they were already motivated to do” (Hennessey & Amabile, 2010, p. 581). Although it is not a direct test of the extrinsic/intrinsic rewards relationship, insight from a meta-analysis shows that where contingent

rewards are creativity-oriented, they tend to increase creative performance. This is especially the case when employees receive task-related feedback and where they are provided with choice (Byron & Khazanchi, 2012).

The mediating role of intrinsic motivation

Based on SDT, we suggest that CER help to cultivate rather than undermine the creativity-related intrinsic motivation of shop-floor employees. CER, as opposed to other types of contingent rewards such as the proportion of at-risk pay (Zhang et al., 2022) and/ or variable rewards focused on general performance (Zhang et al., 2015), encourage the expression of ideas from those in routine jobs where creativity is not expressly required (Montag et al., 2012). Contrary to intuitive thinking, research shows that routinization does not inevitably undermine creativity; it can actually promote creativity because employees' minds are less cluttered than is the case for those performing complex jobs (Chae & Choi, 2018). Even routine work entails an element of judgement based on sub-conscious knowledge of the job and situation (Lillrank, 2003). Research shows that production employees do not lack ideas about how to improve processes (Bernstein, 2012).

Despite this, inertia often prevails (Bernstein, 2012; Leonard-Barton, 1992). This is because unlike professional employees or knowledge workers, who have the scope to be creative in a multiplicity of ways, shop-floor employees operate within highly prescribed environments. By giving permission for employees to make the necessary cognitive effort, CER communicate that employees' independent efforts to effect change are valued and appreciated. While other types of contingent rewards suggest a loss of autonomy because they require the delivery of specific targets (such as the completion of tasks or fit with quality stipulations), CER offer employees the encouragement and space to be creative. Other types of contingent rewards,

especially those focused more narrowly on performance targets, are more likely to evoke the sense of being externally controlled which is damaging for intrinsic motivation and creativity (Deci et al., 2017). Research beyond the shop-floor environment has shown that CER influence radical creativity through eliciting employee intrinsic motivation (Malik et al., 2019).

In a highly routinized environment, such as a factory shopfloor, employees are likely to view the signals CER impart about the importance and value of creativity as informational rather than controlling. SDT scholars hold that contingent rewards, when perceived by employees to offer valuable information, tend to bolster employees' sense of autonomy. This means that the recognition by peers and organizational awards associated with CER are interpreted by the employee as evidence that they have the freedom to question current practice and come up with new ideas (Gagné & Deci, 2005). Research has shown that offering informational feedback confirming that independent and autonomous thinking are welcome underpins employees' intrinsic motivation (Deci & Ryan, 1985).

Furthermore, because CER offer a degree of latitude not otherwise experienced in highly routinized factory jobs, shop-floor employees are more likely to have their innate needs for relatedness met. Encouraged by CER to devise creative ideas, employees are more likely to connect with others who can help them take their creative ideas forward (peers or supervisors). Because they are encouraged to support the creativity of others, they are likely to form stronger working relationships with co-workers similarly committed to improving work practice (Ryan & Deci, 2000; Yoon & Choi, 2010).

This means that CER offer a context conducive to creativity-related intrinsic motivation, in turn fostering employee creativity. Compared with behavior that is instrumental and shaped by extrinsic drivers, that driven by intrinsic interest in the task itself induces deeper and more

persistent involvement (Shin et al., 2017). Intrinsic motivation represents an individual's orientation towards or level of enthusiasm for the activity (Tierney et al., 1999). Intrinsically motivated individuals expend efforts based on their interest, curiosity, and desire to learn. Because it affects an employee's decision to initiate and sustain creative effort over time (Amabile, 1988), intrinsic motivation has been cited as one of the most prominent antecedents of creativity (Tierney et al., 1999). While intrinsic motivation conceptualized in general terms is an enabler of creativity (as well as other outcomes), creativity scholars have focused specifically on employees' orientation towards behaving creatively, that is, their creativity-related intrinsic motivation (Amabile, 1988; Tierney et al., 1999). Creativity-related intrinsic motivation – our focus in this paper- suggests a motivational state where employees are energized by the process of coming up with new ideas.

Research investigating the antecedents of innovation in Chinese automobile assemblers found that collective motivation was a more important predictor than collective ability (Zhao & Chadwick, 2014). By contrast, in environments (such as R&D) where creativity is expressly mandated, ability, rather than motivation, is the more important determinant (Tierney & Farmer, 2002). Baer et al. (2003) found that contingent rewards boosted the creativity of shop-floor workers by providing feedback, recognition and control over work. Other studies show that practices such as idea capture schemes and recognition for competence are positively associated with the intrinsic motivation and creativity of employees (Axtell et al., 2000; Pierterse et al., 2010).

Based on the above logic, our first hypothesis is as follows:

Hypothesis 1: Creativity-related intrinsic motivation mediates the relationship between CER and employee creativity.

The Moderating Role of LMX

Early leadership studies determined that the quality of a person's relationship with a superior varies across dyads (Graen et al., 1995). While some individuals and their managers develop mature relationships characterized by a regular and positive pattern of social exchange, others interact either as strangers or as acquaintances. Over time, the employee/ manager duo may move through the acquaintance stage towards maturity, or alternatively slip back into stranger mode. While for those in poor LMX relationships, the exchanges between supervisor and employee are primarily transactional and based on the employment contract, employees in good LMX relationships experience more developmental opportunities and tend to progress more rapidly through the career hierarchy (Graen & Scandura, 1997). Accordingly, LMX is argued to be "...pivotal in determining the member's fate within the organization" (Sparrowe & Liden, 1997, p. 522).

It has been suggested that employees who share the same macro-environment may interpret it differently depending on the quality of their relationship with their manager (Kozlowski & Doherty, 1989). While CER convey a clear message from the organization that creativity is valued, employees in high LMX relationships may perceive the message as encouraging of creativity, hence motivating, relative to low LMX counterparts (Pan et al., 2012; Tierney et al., 1999). We suggest that LMX is likely to complement the potentiality of CER to release employees' creativity-inspired intrinsic motivation, in turn their creativity, in several ways.

First, managers in high LMX relationships offer feedback to employees on their creative ideas (Tierney et al., 1999). This serves two purposes: on one hand, feedback directly bolsters employees' latent ability, which the creativity literature argues to be integral in generating higher

creativity (Amabile et al, 1996). On the other hand, the feedback offered by supervisors in high LMX relationships ameliorates the emotional risks associated with creativity. Believing themselves to be more capable because of the regular feedback they receive, employees in high LMX relationships are less likely to be downcast when an idea is not well received. This is because they are less likely to perceive the failure of a suggestion as an indication that they are inadequate but rather as a learning opportunity, meaning that persist rather than giving up (Graen & Scandura, 1995; Pan et al., 2012; Qu et al., 2017). This means that the messages conveyed through CER are viewed as achievable rather than overwhelming. Creativity scholars have long argued that being able to maintain equilibrium faced with emotional demands when a course of action does not work out is a necessary prerequisite for creativity (Amabile, 1988; Tierney et al., 1999).

Added to these points, supervisors in high LMX relationships often set up their subordinates with more challenging assignments and greater access to information relative to low LMX counterparts (Graen & Scandura, 1987). In a factory environment, this might mean having the chance to work on different production lines and/or joining quality committees intended to identify and deal with dysfunctions in the manufacturing process. Through the auspices of the supervisor, the employee is exposed to new ways of working and provided with further scope for skill development (Graen & Scandura, 1987; Pan et al., 2012). Thus, while CER open opportunities for employees to engage in creative activities, those in high rather than low LMX relationships may view these opportunities in a positive light because being exposed to learning assignments beyond their immediate roles they acquire knowledge and competence about the wider production process (Dorenbosch et al., 2005). Being engaged in more challenging and relevant tasks than their low LMX peers extends the cognitive capacities of the high LMX

employee (Liden & Graen, 1980) and makes it more likely that they will take advantage of the opportunities for creativity presented through CER.

As mentioned, autonomy support is the most important social-contextual factor in promoting integration and intrinsic motivation (Gagne & Deci, 2005; Ryan & Deci, 2019). Although CER facilitate autonomy through offering employees the opportunity to devise creative ideas, they do not directly influence another underlying psychological need, that of felt competence. Through building employee proficiency and competence, the high LMX leader helps the employee to view the messages CER convey about creativity and independent thought as within their power to deliver rather than unachievable (Pan et al., 2012; Tierney et al., 1999).

In sum, CER releases employees' creativity-oriented intrinsic motivation, in turn their creativity in circumstances where people believe themselves to be competent enough to act accordingly (Ryan & Deci, 2019). Individuals are more willing to take a chance in proposing an idea where their immediate supervisor communicates unequivocally that they have strong underlying skills. Employees who have been exposed to developmental activities beyond their day-to-day remit through the auspices of their supervisor acquire broader and deeper competence. Having the supervisor available to offer feedback on potential ideas increases the value of the suggestions and further builds their competence and confidence. LMX is therefore a critical factor in shaping the potentiality of CER to foster intrinsic motivation and creativity.

This leads to the following hypothesis:

Hypothesis 2: LMX moderates the mediated relationship between CER and creativity via creativity-related intrinsic motivation in such a way that the mediated relationship is stronger when LMX is higher.

The conceptual model of this study is presented in Figure 1.

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METHODS

Sample and data collection procedure

To test our hypotheses, we collected survey data from a large semiconductor electronics company in China. The organization produces semiconductor components such as diodes and rectifiers that are widely used in computers, mobile phones, cars, and home appliances. The company employed just over 2,000 people, most of whom worked on the production lines to produce computer chips (a small proportion of the workforce specialising in research and development were not included in the sample). The general manager permitted us to conduct a study concerning the effects of CER on employee creativity and indicated that all employees were encouraged to exhibit creativity (although not explicitly required to do so), explaining that the culture of mutual support was such that employees would be expected to recognise and support the creativity of others.

The jobs of shop-floor employees involved assembling and encapsulating electronic parts. They performed similar roles and were located at the same point on the organizational grading structure. Supervisors had a clear and consistent remit, to ensure the smooth-running of the production line for which they were responsible and to seek opportunities to improve practice. The supervisors in this study occupied positions that were analogous across the business and at the same level on the grading structure.

To ensure a representative sample of employees, we requested that in the first instance questionnaires should be distributed to 300 shop-floor employees performing more or less the same role (15% of the workforce). To help us achieve this, the general manager identified four divisions where people worked on assembly lines, and invited two of the authors of this paper, of Chinese ethnicity and speaking fluent Mandarin, to administer the questionnaires. Voluntary participation and confidentiality were guaranteed to the participants within the brief of the survey.

Over two days, the researchers approached approximately 130 employees per division during breaks or before people left work with hard copies of the questionnaire together with sealable envelopes. The surveys were administered and collected during working hours based on convenience depending on the shifts on which people were working and their availability. All employee questionnaires were distributed and collected back by the researchers, for the attention of the research team, within 24 hours. Out of the 300 questionnaires were distributed, 198 were returned. This represented a response rate of 66%.

The research team then used the company roster to identify the supervisors of those employees who had completed the questionnaire. This entailed the researchers cross-checking the names of the employees who had completed the questionnaire with the supervisor names provided by the company roster. Supervisors thus identified were then invited to complete a questionnaire rating the creativity of those employees for whom they were responsible.

The researchers followed a similar pattern to that described above, administering hard copies of the questionnaires to supervisors during work time, approaching 77 supervisors. This second stage of data collection took place two months later, during a second visit to the company

by the Chinese researchers. This helped to minimize common method variance (CMV; Podsakoff et al., 2003) and also made the process logistically more manageable.

In summary, at the first stage, the Chinese researchers on the authorship team collected data from employees. This included CER, LMX, creativity-related intrinsic motivation, and the control variables. At the second stage (i.e., two months later), following the pattern of other creativity studies (Baer et al., 2003; Malik et al., 2015; Malik et al., 2019; Zhang et al., 2022), the Chinese team invited supervisors to rate the creativity of employees, having identified the supervisors through reference to the company roster.

Although 77 supervisor questionnaires were returned, a next step was to match the supervisor responses with those of the employees. In doing so, we discovered that some data were missing (i.e., an employee questionnaire could not be matched with a supervisor questionnaire, or vice versa). Because it was important for the study's matched design to have employees' responses matched together with those of the relevant supervisor, we discounted those questionnaires that could not be matched. After aligning the two questionnaires (from employee and supervisor), we were left with questionnaires from 187 employees and 55 supervisors. The general manager confirmed that the sample characteristics approximately matched the profile of their employee population. This was the sample we deemed usable and hence included in our analysis.

The average age of the employees in the sample was 35.71 years old, with 29.95% being male. Their average organizational tenure was 5.90 years. 77.30% of employees had attained an educational level of middle school or below and 18.91% of them have finished high school or vocational training.

Measures

All measures used in this study that were originally developed in English were translated into Chinese and back-translated into English by two bilinguals who are fluent in both languages, following the advice of Brislin (1970). Minor changes in wording were made after discussions with the managers of the company to match the wording used by them internally. Unless otherwise mentioned, the measures were on a 7-point Likert scale, ranging from “1 = strongly disagree” to “7 = strongly agree”.

Creativity-contingent external rewards were measured using the eight-item scale in Malik et al. (2015) and Yoon and Choi (2010). The scale was based on the eight-item scale from Ryan and Deci (2000b), Deci et al. (1999), and Baer, Oldham, and Cummings (2003). Sample items are: “My co-workers recognize me when I perform creatively at work”; “When I perform creatively at work, my manager or the top management compliments me publicly”; “When I perform creative work, it affects my promotion”; “When I perform creatively, I receive financial rewards, such as incentives or bonuses”. Cronbach’s alpha of this scale was .89.

Creativity-related intrinsic motivation was measured using the three-item scale of Tierney et al. (1999). The three items are as follows: “I enjoy creating new procedures for work tasks”, “I enjoy finding solutions to complex problems”, and “I enjoy improving existing processes or products.” Cronbach’s alpha of this scale was .85.

LMX was measured using the 7-item LMX scale (Graen & Uhl-Bien, 1995). This scale has been validated in the Chinese context (e.g., Aryee & Chen, 2006). Sample items include “My supervisor recognizes my potential” and “I have enough confidence in my leader that I would defend and justify his/ her decision if he/she were not present to do so.” Cronbach’s alpha of this scale was .91.

Employee creativity was measured using four items from Baer and Oldham (2006).

Similar to previous research, supervisor assessment was adopted (Chae & Choi, 2019; Zhang & Bartol, 2010) where the supervisor evaluated whether his/her subordinate “often comes up with creative solutions to problems at work,” “suggests many creative ideas that might improve working conditions at the organization,” “suggests new ways of performing work tasks,” and “is a good source of creative ideas”. Cronbach’s alpha of this scale was .83.

Control variables: We controlled for important demographic variables including gender, age, organizational tenure, and education to reduce the likelihood of these variables confounding the results. Gender, age, and organizational tenure are associated with social status, which may influence employees’ motivation to engage in creative efforts (Chae & Choi, 2019). Education can positively affect creativity because it reflects an individual’s knowledge in a task domain (Zhang & Bartol, 2010), hence we controlled for it (1 = “middle school and below”, 2 = “high school or vocational training”, 3 = “3-year undergraduate degree”, 4 = “4-year undergraduate degree”, 5 = “masters”, and 6 = “doctorate”).

RESULTS

We conducted a series of confirmatory factor analyses to evaluate the discriminant validity of the scales (creativity-contingent extrinsic rewards, LMX, creativity-related intrinsic motivation, and employee creativity). The results showed that the four-factor model yielded a good fit to the data (χ^2 (203) = 334.909, CFI = .943, TLI = .935, RMSEA = .059, SRMR = .049). It is better than a) the three-factor model combining extrinsic rewards and LMX (χ^2 (206) = 640.504, CFI = .811, TLI = .788, RMSEA = .106, SRMR = .077); b) the two-factor model combining the variables reported by employees and supervisors, respectively (χ^2 (208) = 751.369, CFI = .774, TLI = .750, RMSEA = .118, SRMR = .084); and (d) the one-factor model

(χ^2 (208) = 733.664, CFI = .771, TLI = .746, RMSEA = .116, SRMR = .080). The results show that the four-factor model is the best-fitting model and there is good discriminant validity of the constructs.

Having established the reliability and validity of the constructs, we then took the mean of the items for each construct in our subsequent analysis. The descriptive statistics and zero-order correlations of the variables are shown in Table 1. As shown, there was a positive relationship between employee perceived CER and creativity-related intrinsic motivation ($r = .64, p < .01$), between CER and supervisor rated employee creativity ($r = .39, p < .01$), and between creativity-related intrinsic motivation and creativity ($r = .41, p < .01$). There was also a high correlation between LMX and creativity-related intrinsic motivation ($r = .59, p < .01$). The results suggest that the reliability and validity of the studied variables was ensured for our subsequent analysis.

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Analytical strategies

Because each supervisor rated more than one employee, the employee data is nested in supervisors. To account for this, we first checked whether there were significant between-supervisor variances in employee creativity (Zhang et al., 2022). The ANOVA results showed that the between-supervisor variance in employee creativity was significantly different ($F = 18.01, p < .01$). The results suggest that the reversed causality is not a serious issue in the study. Further to this, we used a sandwich estimator in the subsequent path analysis in Mplus (Muthén & Muthén, 1998-2017). This estimator has been used in previous research (e.g., Bednall et al., 2014) and provides a conservative estimation of the relationships between variables. To test the moderation hypotheses, the independent variables were mean centred prior to the analysis for easy interpretation of the results (Aiken & West, 1991).

Checking the effects of common method variance (CMV)

Given that the correlations between employee self-reported variables (i.e., extrinsic rewards, LMX, and intrinsic motivation) were high in the study, we conducted different post-hoc tests to check the potential concern of CMV. First, we performed the multicollinearity of these variables to check if our empirical findings were affected by the CMV. Our results indicated that when employee creativity is regressed on extrinsic rewards, LMX, intrinsic motivation and the demographic control variables, the VIF ranged between 1.01 and 1.98, ruling out significant multicollinearity issue (Hair Jr. et al., 2009). Second, we also performed Harman's Single-Factor test to examine the effect of CMV. The results indicated that the percentage of variance was 16.09 – falling far below the cut-off value of 50 percent (Booth et al., 2020). Hence, there is no significant evidence of method bias of the core variables. Third, we followed others (Booth et al., 2020; Ng & Lucianetti, 2018; Podsakoff et al., 2012; Zhang et al., 2021) to use the common latent method factor technique to examine the effects of potential CMV. The results of the unconstrained model indicated that the model yielded a good data fit ($\chi^2(186) = 362.562$, CFI = .92, TLI = .90, RMSEA = .07, SRMR = .03). Specifically, our validities still hold well for all of these factors and there is little being pulled by the common latent vector. However, to further confirm this, we continued to test the zero model to compare whether the unconstrained model is equivalent to a model in which there is no shared variance. The results of the zero model showed no big difference with the unconstrained model ($\chi^2(190) = 370.419$, CFI = .92, TLI = .90, RMSEA = .07, SRMR = .03). The results suggest that there is no substantial shared variance among all the items. Finally, we performed the average variance extracted of the core variables. The results demonstrated that the average scores ranged from .52 to .67 which falls above the cut-off value of .50 recommended by Hair et al. (1998). Taken as a whole, our results supported

that there is no significant method variance regarding the quality of the collected data in the study.

Hypothesis testing

Hypothesis 1 proposed that creativity-related intrinsic motivation would mediate the relationship between CER and employee creativity. We tested a full mediation model, while controlling for employee gender, age, organizational tenure, and education. The results in Table 2 indicated that the standardized path coefficient between CER and creativity-related intrinsic motivation was .64 ($p < .01$) and between creativity-related intrinsic motivation and creativity was .37 ($p < .01$). Using 10,000 times bootstrapping, it was revealed that the mediated, indirect effect of CER on creativity via creativity-related intrinsic motivation was .23 and its 95% confidence interval ($CI_{95\%}$) was (.12, .35), excluding zero. Hence, Hypothesis 1 received support.

----- Insert Table 2 about here-----

Hypothesis 2 proposed that the mediated relationship between CER and employee creativity via creativity-related intrinsic motivation would be moderated by LMX, such that the relationship is stronger when LMX is higher. We tested this moderated mediation model, controlling for employee gender, age, organizational tenure, and education. The results in Table 2 showed that the main effect of CER and LMX on creativity-related intrinsic motivation was .51 ($p < .01$) and .37 ($p < .01$), respectively, while the effect of the interaction term was .21 ($p < .01$). The simple slope analysis revealed that the relationship between CER and creativity-related intrinsic motivation was .72 ($p < .01$) when LMX was one standard deviation (SD) above the mean but was .51 ($p < .01$) when LMX was one SD below the mean (see Figure 2 for the illustration of the moderation effect). Correspondingly, when LMX was one SD above the mean, the indirect effect of CER on creativity via creativity-related intrinsic motivation was .20

(bootstrapped $CI_{95\%} = .06, .33$); when LMX was one SD below the mean, the indirect effect was .08 (bootstrapped $CI_{95\%} = .01, .14$). The difference between the two indirect effects was .14, with its $CI_{95\%}$ being (.04, .25), excluding zero. Hence, there was significant difference in the indirect effect when LMX was high versus when LMX was low. Therefore, Hypothesis 2 received support.

--- Insert Figure 2 about here ---

Supplemental post-hoc analysis

To check the robustness of our findings, we performed several post-hoc analyses. First, in the analysis above, we tested the relationship between CER and employee creativity through the mediation of creativity-related intrinsic motivation. Because it was not central to our theorizing, we did not examine in the main analysis the direct relationship between CER and employee creativity. There have however been claims in the literature that contingent rewards such as CER influence employee creativity through instrumental means, rather than through evoking employees' satisfaction and fulfilment (Baer & Oldham, 2006; Eisenberger et al., 1992). To test this competing hypothesis, we explored the direct relationship between CER and employee creativity. Our results show that CER were not significantly related with employee creativity ($\beta = .01, p > .10$), suggesting that CER themselves are not sufficient to elicit employee creativity. CER need to be combined with creativity-related intrinsic motivation to drive synergistic outcomes such as employee creativity. People who are intrinsically motivated are more curious about exploring alternative options and more resilient when they encounter barriers (Amabile, 1988). Creativity-related intrinsic motivation therefore presents the pathway through which CER influence employee creativity.

Second, the scale used to measure extrinsic rewards included financial (i.e., bonuses and pay increases) and non-financial (i.e., recognition and praise) rewards. To check whether these two types of extrinsic rewards have a similar relationship with employee creativity, we tested the direct effects of both types of rewards on employee creativity. Our results showed that both kinds of rewards are not significantly related to employee creativity ($\beta = .11$, $p = .14$; and $.01$, $p = .73$, respectively). Our results further reinforce the findings of prior research (e.g., Malik et al., 2015). In order to provide better insight into this direct effect, we continued to examine the indirect relationship between two kinds of rewards and employee creativity through the mediating mechanism of intrinsic motivation. Interestingly, our results suggested that intrinsic motivation significantly mediates the relationships between both kinds of rewards and employee creativity. The indirect effect of financial rewards on employee creativity is however smaller in magnitude (financial rewards: $\beta = .12$, $p < .01$ vs. non-financial rewards: $\beta = .21$, $p < .01$; respectively).

DISCUSSION

Using data collected from 187 employee-supervisor dyads at two time points, this study investigated the relationship between CER and employee creativity among manufacturing workers from a SDT perspective. The results from the analysis revealed the crucial role of creativity-related intrinsic motivation in mediating the relationship between CER and employee creativity. Because CER tap into employees' deep-seated needs for autonomy, competence and relatedness (Gagné & Deci, 2005), they present an impetus for employees to be internally driven, rather than motivated by external, extrinsic factors (such as money, promotion and recognition). This logic even applies for employees at lower levels of the hierarchy, in roles that do not explicitly require creativity (Montag et al., 2012). This study also revealed crucial boundary conditions, showing that the mediated relationship was strongest when LMX was high. This

finding suggests that the relationship between CER and creativity is not straightforward, consistent with findings from previous research (Byron & Khazanchi, 2012; Malik et al., 2015). This study specifically found that individualised support offered to employees by supervisors in high LMX relationships determined the value of CER in stimulating creativity among manufacturing workers.

Theoretical implications

Manufacturing accounts for a significant proportion of GDP around the world, and almost a third of total economic output in China. Manufacturing organizations rely on new ideas to survive in volatile conditions. Indeed, research shows that the link between innovation and business performance is stronger in manufacturing than in the service sector (Prajogo, 2006). As many manufacturing organizations compete on razor thin margins, they are eager to find creative ways to achieve a cost advantage or product differentiation. The adoption of various continuous improvement programs around the world attest to the enthusiasm of organizations to embrace new ideas from the bottom up (McLean et al., 2017). Therefore, knowledge about how to elicit creativity from employees on the shopfloor, conducting jobs that might be construed as menial and routine in nature, is urgently needed.

A wide range of literature attests to the role of intrinsic motivation as a necessary antecedent for work outcomes such as creativity (Amabile et al., 1996; Liu et al., 2016; Malik et al., 2019). Far from being at odds with intrinsic motivation, CER can support and enable it through communicating signals that speak to deep-seated human needs (Gagné & Deci, 2005; Gerhart & Fang, 2015; Zhang et al., 2021). Although studies have suggested that CER elicit outcomes through appealing to peoples' instrumental motives (Malik et al., 2019), others have argued that given the right conditions people at lower as well as higher levels of the hierarchy

have the potential to enjoy work and gain satisfaction from it (Deci & Ryan, 1985; Gagné & Deci, 2005).

This study contributes to theorising in several important respects. Our findings show that creativity-related intrinsic motivation presents the pathway through which CER elicit the creativity of manufacturing employees, with intrinsic motivation fully mediating the relationship. Although scholars have argued that those lower in the hierarchy are motivated by more instrumental motives (Baer et al., 2003; Malik et al., 2019), we demonstrate that intrinsic motivation remains important in highly routinized environments such as manufacturing. Coming up with new ideas within a highly process-driven environment entails cognitive effort, whether that be suggesting the removal of one element within the system or proposing more fine-grained approach (Lillrank, 2003). Although routinization *per se* makes limited cognitive demands, precisely because it is not all-absorbing, research shows that routinization might enable creativity in circumstances where individuals perceive that they have cognitive space (Chae & Choi, 2018). The signals conveyed through CER, welcoming and valuing new ideas, might help free up the necessary cognitive space. Indeed, the SDT lens suggests that such signals shape employee perceptions of the work environment from a position where work is closely prescribed to one where they perceive a degree of autonomy.

Although having latitude offers the potential for employees to make suggestions, autonomy alone is insufficient for the fulfilment of the fundamental human needs (Deci et al., 2017). According to SDT, employees who perceive that they are competent feel intrinsically rather than instrumentally motivated when offered opportunities for their freedom to be expressed (Ryan & Deci, 2019). Although autonomy is a key enabler for the satisfaction of human needs, it may or may not pave the way for others needs to be met.

Our study suggests that LMX complements the potentiality for CER to release employee intrinsic motivation, in turn their creativity, through fostering employee competence. Employees in high LMX relationships are more likely than low LMX counterparts to progress in their careers (Graen & Scandura, 1987). This is because supervisors whose exchange relationships with employees are mature, rather than incompletely developed, support the development of their subordinates (Graen et al., 1995). Through offering feedback, high LMX supervisors convey to employees that they are proficient and capable and help them to deal with the emotional turbulence associated with the creative process. By opening developmental avenues for followers within and beyond the immediate job, high LMX supervisors extend consolidate job-related competence. They act as a sounding board for new ideas, including those that challenge existing ways of working. Individuals are more willing to take a chance in proposing an idea where their immediate supervisor communicates unequivocally that they are highly competent and proficient. Employees who have been exposed to developmental activities beyond their day-to-day remit through the auspices of their supervisor acquire broader and deeper competence as a result, hence again are more inclined to put forward ideas. Having the supervisor available to offer feedback on potential ideas is likely to increase the value of the suggestions as employees benefit from the insight of a more experienced practitioner. LMX is therefore a critical factor in shaping the potentiality of CER to foster intrinsic motivation and creativity.

It is worth noting that a third psychological need- relatedness- is likely to be met through the unique combination of CER and LMX. Being free to pursue an idea, or build on the suggestions of others, employees are better placed to form bonds with others including co-workers and supervisors, in their quest to enhance problem-solving. Working with others,

inspired by CER, would thus help to address employees' relatedness needs. Such needs are likely to be further sustained through the LMX relationship, which offers a partnership arrangement that employees are likely to find highly motivating. LMX also speaks to relatedness needs through the wider networks to which the high LMX employees is exposed.

To further substantiate our argument that creativity-related intrinsic motivation presents the pathway through which these core effects occur, we conducted a supplementary analysis. Some have suggested that contingent rewards help to overcome employees' inherent aversion to effort, generating creativity by clearly communicating information about the rewards available (Eisenberger, 1992). People are driven by their aspirations to achieve the rewards on offer, rather than their engagement in the task. Testing for the direct effect of CER on creativity we found the results to be non-significant. This provides further evidence to support our assertion that intrinsic motivation plays a central role in eliciting creativity, even for employees engaged in routine work who are obliged to follow a strict protocol.

Practical contributions

With the insights gleaned from this study, we offer the following practical advice for manufacturing managers and HR practitioners. First, from a SDT perspective, if an organization expects its manufacturing workers to contribute to improving products or working processes through the generation of novel ideas, effective CER should be implemented to allow individuals to fulfil their fundamental psychological needs of autonomy through self-determination (Ryan & Deci, 2000). Rather than focusing solely on financial rewards for creativity (which is one of eight components), organizations need to consider the full range of external influences at their disposal. This means that creativity would be a factor in public recognition (by the organization). It would be a behavioral condition supported by co-workers as well as supervisors. Creativity

may be a factor shaping the extent to which employees are favorably reviewed at performance appraisal, and whether they are successful in promotion decisions. Only by embracing the range of practices suggested by CER are organizations likely to bring out the creativity of shop-floor employees, through intrinsic motivation. This is because CER and intrinsic motivation complement each other in order to level up the synergistic outcomes such as creativity (Amabile, 1998; Fischer et al., 2019).

In order to realise the full effects of CER, organizations need to encourage supervisors to develop mature exchange relationships with all their followers, rather than just a select few (Graen et al., 1995). This means emphasising the importance of individualised consideration on the part of the leader or supervisor and requires organizational leaders to demonstrate their commitment to such principles in a number of ways. This can be achieved: first, through role-modelling this kind of behavior to their direct reports, second through prioritising leaders' time in developing effective relationships with their subordinates and third through providing effective developmental support to supervisors as well as the senior team. Adopting this approach has implications for leadership development programmes targeted at team leaders at mid-levels in the business, not just those in senior roles.

Limitations and Future Research Directions

Despite the contributions, we acknowledge that this study has several limitations. First, as the independent variable (CER) and the mediator (creativity-related intrinsic motivation) were collected from the same respondents, the mediation effect might still be subject to CMV (Podsakoff et al., 2003). Although our dependent variable – creativity – was captured from another source (i.e., the shop-floor employee's line manager), at a later point in time, future studies could temporally separate the measurement of independent and mediator variables. We

can however be rather confident in the moderation effects, as they cannot be artefacts of CMV (Siemsen et al., 2010). Moreover, despite the advantage of using supervisor assessment of creativity to mitigate CMV, this way of assessment may only capture creativity when employees express their ideas. Employees may have internal creative ideas that are not voiced due to other mechanisms such as power distance (Li & Sun, 2015).

Second, we measured employees' perceptions of CER, rather than "objective" reward practices. Although organizational policies and practices work through employee perceptions (Kehoe & Wright, 2013) and there are individual differences in employee perceptions (Wang et al., 2020), the individual level of analysis in this study means that the results may not generalize to organizational level. Future studies could collect data from more organizations to reveal meaningful organizational differences.

Third, we did not directly measure whether the creativity exhibited by our sample was incremental or radical but rely on our knowledge of the manufacturing jobs involved and the information from the production manager of the company. Findings in previous studies using a student sample (Gilson & Madjar, 2011) and an employee sample (Malik et al., 2019) reveal that CER predict incremental creativity, whereas intrinsic motivation predict radical creativity. Future studies could directly measure incremental and radical creativity in manufacturing organizations to determine their respective frequencies. Alternatively, researchers could employ a comparative approach and recruit participants from both manufacturing and creative (e.g., R&D) sectors to examine whether different antecedents of creativity are involved. Such an approach would be meaningful to discover the role of context in creativity research.

CONCLUSION

To unravel the relationship between CER and creativity in the manufacturing sector, we adopted the SDT to examine the role of creativity-related intrinsic motivation as a mediator, and LMX as a moderator in this relationship. We found that CER promoted creativity among shop-floor employees via enhanced intrinsic motivation when their LMX was high. Our findings shed light on the important mechanisms and boundary conditions of this relationship and offer both theoretical and practical implications.

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Table 1: Descriptive statistics and zero-order correlations

	Mean	SD	1	2	3	4	5	6	7
1. Gender	.30	.46							
2. Age (years)	35.72	8.42	-.13						
3. Tenure (years)	5.90	5.22	.04	-.01					
4. Education	1.27	.54	.07	-.02	-.01				
5. Extrinsic rewards	5.75	.76	-.12	.03	-.04	-.06			
6. LMX	3.78	.63	-.13	.01	-.03	-.04	.58**		
7. Creativity-related intrinsic motivation	5.51	1.03	-.05	.06	-.05	-.06	.64**	.59**	
8. Employee creativity	4.79	.74	-.19**	-.01	-.07	-.03	.39**	.44**	.40**

Notes: ** $p < .01$, * $p < .05$, $N = 187$; LMX = Leader-member exchange.

Table 2: Results of hypothesis testing

Paths	Coefficient (standardized estimates)	SE
<i>Hypothesis 1</i>		
Extrinsic rewards → intrinsic motivation	.64	.06**
Intrinsic motivation → creativity	.37	.07**
Extrinsic rewards → intrinsic motivation → creativity	.23	.05**
<i>Hypothesis 2</i>		
Extrinsic rewards → intrinsic motivation	.51	.07**
LMX → intrinsic motivation	.37	.07**
Extrinsic rewards × LMX → intrinsic motivation	.21	.08**
Intrinsic motivation → creativity	.36	.06**
<i>Covariance</i>		
Extrinsic rewards, intrinsic motivation	.43	.07**
Extrinsic rewards, LMX	.29	.05**
Extrinsic rewards, creativity	.20	.04**
Intrinsic motivation, creativity	.29	.07**

Notes: ** $p < .01$, * $p < .05$; LMX = Leader-member exchange

Figure 1: Conceptual framework

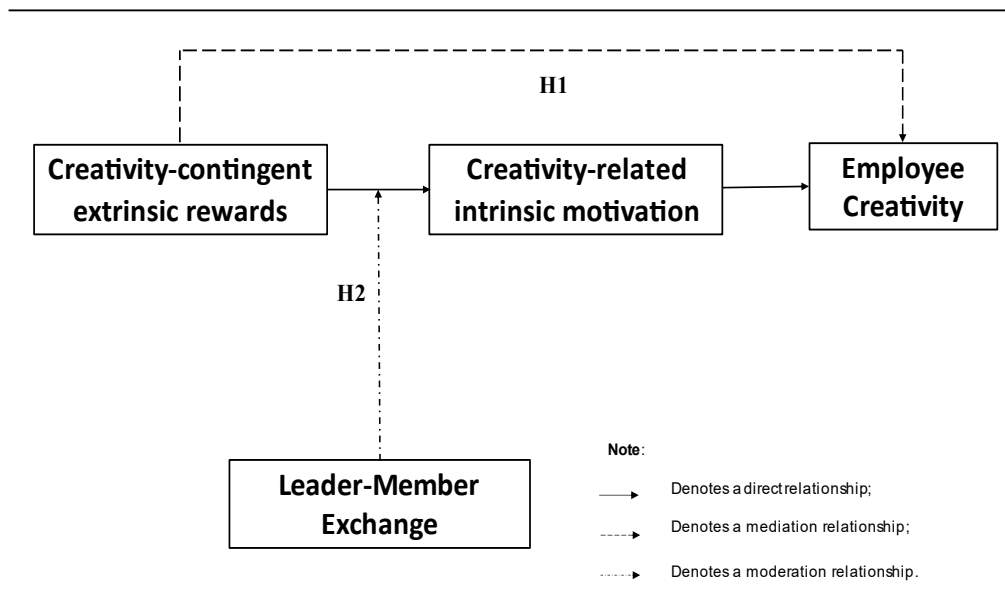


Figure 2: Moderation effect of LMX

