

RESEARCH ARTICLE

Overtime work as the antecedent of employee satisfaction, firm productivity, and innovation

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Summary

Overtime work has been blamed for the deterioration of employee satisfaction and productivity. However, the organization-level implications of overtime work as a normative expectation remain unclear. In this study, such effects were analyzed through human capital theory and a causal attribution approach. Various organizational outcomes and boundary conditions were explored in explaining these implications. The analysis of time lagged data from 273 firms affirmed that a firm's overtime level was related negatively to employee satisfaction. However, it was positively related to the firm's productivity and curvilinearly (inverted U-shaped) related to innovation. The effects of the firm's overtime level on firm productivity and innovation were also moderated by organizational trust. This study highlights the costs and benefits of overtime work as tools for utilizing human capital and reveals the critical contingency of organizational trust that enables firms to attenuate the costs of the overtime level and accentuate its potential benefits.

KEYWORDS

employee satisfaction, firm productivity, innovation, overtime work

1 | INTRODUCTION

Long work hours are increasingly becoming prevalent among contemporary organizations. Approximately 40% of American and Japanese employees work for over 50 hr per week (Barnes, Jiang, & Lepak, 2016; Iwasaki, Takahashi, & Nakata, 2006). The European Quality of Life Survey 2016 (Eurofound, 2017) verified that the increased work hours in 28 countries substantially decreased work-life balance over the last 10 years. Moreover, the advancement in information technology has further blurred the boundaries between work and life, thereby forcing employees to devote additional time at work (Ng & Feldman, 2008). Existing studies highlight the adverse effects of overtime work (referred to as "overtime" hereafter) on an employee's health and performance (Dembe, Erickson, Delbos, & Banks, 2005; Proctor, White, Robins, Echeverria, & Rocskay, 1996).

However, the general organizational literature, except for a few (Ng & Feldman, 2008; Shepard & Clifton, 2000), has not paid sufficient attention to overtime and its organizational implications. Scholars have viewed overtime as an individual stressor and speculated that

the organization-level pattern of overtime might negatively affect firms' productivity and performance based on individual-level findings and theories (Golden, 2012; Shepard & Clifton, 2000). However, the conceptual and empirical patterns identified at one level may not automatically apply to another level (cf. multilevel homology versus heterogeneity; Chen, Bliese, & Mathieu, 2005). In the present study, overtime has been theorized and empirically examined as a firm-level phenomenon that has organizational consequences.

Organizations generally use overtime to fully utilize their internal human capital despite its potential downsides. Such work intensification is an irreversible trend among contemporary organizations that control their employees' work hours to increase firm performance. For example, extended work shifts are widely used by firms to alleviate staffing shortages and ensure cost efficiency during high workload (Barnes et al., 2016). Widespread managerial interventions, such as workforce restructuring, smart workplace tools, and flexible work arrangements, commonly signify additional work under a limited workforce. The prevalent emphasis on work dedication and "going the extra mile" through citizenship regard employees who work

and innovation (Wright & McMahan, 2011). However, the exploitation of overtime deteriorates employees' health (Dembe et al., 2005; Peccei, 2004), thereby negatively affecting their satisfaction and future performance potential (Beckers et al., 2008). Accordingly, the firm overtime level as an HRM policy may have ambivalent implications on outcomes.

We also draw on a causal attribution approach to theorize the differentiated effects of the firm overtime level on employee satisfaction and firm performance (e.g., firm productivity and innovation). Moore (2000) proposed that work exhaustion can trigger attribution-independent and attribution-dependent reactions. In attribution-independent reaction, work exhaustion can directly influence employee satisfaction. Employees will experience reduced satisfaction immediately without searching for the cause of overtime. Thus, the firm overtime level can automatically reduce employee satisfaction even without causal explanation. By contrast, firm performance is related to the attribution-dependent reactions to overtime that may change depending on the causal search and attribution among employees, who shift their task motivation and behavior based on their causal explanation of overtime. Thus, the extent to which the firm overtime level influences firm performance varies depending on employees' sensemaking of the organizational context and the cause of the firm overtime level. On the basis of the causal attribution perspective of work exhaustion (Moore, 2000), we propose that employees' contextual perception (e.g., organizational trust) modifies the relationship between the firm overtime level and firm performance. However, it does not affect the relationship between the firm overtime level and employee satisfaction, which is direct and attribution independent.

2.3 | Firm overtime level and employee satisfaction

Employee satisfaction refers to the extent to which employees are satisfied with their job, compensation, and employer. It represents the overall satisfaction level of employees within the organization (Böckerman & Ilmakunnas, 2012; Dineen, Noe, Shaw, Duffy, & Wiethoff, 2007). Meta-analytical evidence reveals that long and extended work hours deprive employees of the time needed for rest and recovery, thereby significantly deteriorating individual physiological symptoms, such as eye strain, sleep disturbance, appetite, and fatigue (Nixon, Mazzola, Bauer, Krueger, & Spector, 2011; Sparks, Cooper, Fried, & Shirom, 1997). Increased work hours are detrimental not only to physiological but also to psychological health (Ng & Feldman, 2008; Sparks et al., 1997). These negative consequences that are affected directly by overtime are unconstrained by cognitive interpretation or attribution (cf. attribution-independent reactions; Moore, 2000).

We propose that a firm's high overtime level forces employees to work long hours, thereby resulting in work exhaustion and further reduction of satisfaction (Dembe et al., 2005). The potential negative relationship between overtime and individual psychological strain (Beckers et al., 2008) can be accentuated at the organization level because people tend to share and ruminate their negative experiences. Negative moods are contagious, and they can spread among employees (Cowan, Sanditov, & Weehuizen, 2011). Bliese and

Halverson (1996) verified that the relationship between work hours and employee well-being is stronger at the group level than at the individual level. Thus, we propose the following hypothesis:

Hypothesis 1. *The firm overtime level is negatively related to employee satisfaction.*

2.4 | Firm overtime level and firm productivity

The firm overtime level can be related positively to firm performance. Previous literature on stress identified two dimensions of stressor with distinct performance implications (Boswell, Olson-Buchanan, & LePine, 2004; Cavanaugh, Boswell, Roehling, & Boudreau, 2000). Hindrance stressors, such as politics and role ambiguity, are negatively associated with performance. Meanwhile, challenge stressors, such as high workload and time pressure, promote performance. The work demands can be viewed by employees as obstacles to be overcome to achieve challenging goals (LePine, Podsakoff, & LePine, 2005). As challenge stressors, additional work hours and performance pressures may increase employee productivity (Janssen, 2001; Ng & Feldman, 2008).

In the present study, firm productivity is defined as the extent to which a firm efficiently performs its core functions (Wall et al., 2004). We propose a positive relationship between the firm overtime level and firm productivity for the following reasons. First, firms can use their overtime level as an HRM policy to encourage and legitimize additional efforts in completing organizational tasks. The cost of paying existing employees for their extra hours will be cheaper than the overall costs of hiring new employees. New recruitment involves additional costs, such as training, reallocation allowance, insurance, and other benefits. By contrast, existing employees can perform a similar task more skillfully and with relatively less time and effort. Perhaps for these reasons, the literature on human capital utilization highlights the firm-level benefit of organizational norms for increased work hours (e.g., Ployhart et al., 2014).

Second, sufficient work hours provided by a high overtime level may improve the task competency of employees. Task pressures brought by high overtime level enable employees to focus on carrying out their core functions and efficiently complete them using existing methods (Baer & Oldham, 2006; Gilbert, 2005). The firm overtime level as a challenge stressor may also increase the expertise and intensive engagements of employees (Cavanaugh et al., 2000), thereby making them work efficiently and promoting firm productivity.

Third, the negative effects of the individual-level drawbacks, such as overtime-induced stress, on productivity can be mitigated at the firm level. The normatively enforced work pattern of long work hours can be maintained at the firm level by recruiting new employees who are willing to take overtime. These new employees can be socialized and replace exhausted members. Thus, the firm overtime level can contain the organization from the potential individual-level detriments of overtime.

In sum, an organization can maximize its human capital utilization even at the expense of decreased satisfaction of its employees (Peccei, 2004). As LePine et al. (2005, p. 766) put it, "The positive

indirect effect of challenge stressors through motivation to be stronger than the negative indirect effect of challenge stressors through strains." As a challenge stressor, the firm overtime level motivates employees to improve and utilize their skills and expertise that can contribute to productivity. Thus, we propose the following hypothesis:

Hypothesis 2. *The firm overtime level is positively related to firm productivity.*

2.5 | Firm overtime level and firm innovation

Firm innovation refers to the organizational introduction of new products and services (Klingebiel & Rammer, 2014), which involves the successful implementation of new ideas by the members of a firm (Zhou & George, 2001). Firm innovation requires adequate organizational resources and collective efforts to transform resources into innovative outputs (Chen, Zhao, Liu, & Wu, 2012). Such organizational resources include human capital with task-relevant knowledge and sufficient time to explore and produce novel approaches to work (Amabile, 1997). Additional work hours increase the time used for innovation and the time shared among employees for knowledge exchange. Staying together in the workplace may form emotional ties among employees, which may allow them to exchange their specialized knowledge and explore domain-relevant knowledge. The firm overtime level help to promote the knowledge exchange, thereby enhancing firm innovation brought by combining knowledge.

The firm overtime level has a positive effect on firm innovation as firm productivity does. However, the positive effect can be maintained only up to a certain point due to the different nature of innovation from firm productivity. We propose a curvilinear (i.e., inverted U shape) relationship between the firm overtime level and firm innovation for the following reasons. First, with the increasing levels of firm overtime, employees are likely to lose resources, such as time and energy, which they can expend to complete tasks. Employees, therefore, are urged to focus only on the core in-role functions. Increasing overtime diminishes slack resources needed for extra-role efforts and prevents proactive behaviors, such as the spontaneous search for new opportunities and solutions (Gilbert, 2005). This process may underlie the inverted U shaped curvilinear effect of challenge stressors, such as time pressure, on creativity and innovation (e.g., Cavanaugh et al., 2000; Ohly, Sonnentag, & Pluntke, 2006).

Second, the positive effect of the firm overtime level on firm innovation relies on increased knowledge sharing. However, such an effect can diminish when employees work overtime excessively. Employees are likely to address challenge stressors, such as time pressure and high workload, by adopting an active reaction mode, such as persistent effort toward work and learning (LePine et al., 2005). However, excessive overtime leads to exhaustion or burnout, thereby narrowing employees' attention to core tasks while diminishing their interpersonal engagement required for knowledge exchange.

Finally, we assume that the firm overtime level would have a positive linear effect on productivity with the continuous

replacement of exhausted employees to offset the negative effect of overtime-related strains. However, this process may not work for firm innovation. Compared with executing existing procedures and functions, identifying deficiencies and opportunities in the task and generating innovative solutions require a considerable amount of expertise, motivation, and tacit skills (Amabile, 1997), which recruits or replacement workers may not possess. In sum, the firm overtime level increases employees' motivation to learn, share knowledge, and collaborate with others. However, this motivation is beneficial for firm innovation only up to a certain extent, and then it turns into a negative force.

Hypothesis 3. *The firm overtime level is curvilinearly related to firm innovation.*

2.6 | Organizational trust: Boundary condition

Individual-level studies on overtime revealed that work environment characteristics are necessary to fully understand the impact of overtime on employees (Sparks et al., 1997). Physical environment, such as noise level, heat, and poor ventilation, moderates the relationship between work hours and employee health (Beckers et al., 2008). Meanwhile, psychological work environment, such as task-related autonomy, voluntary decision for overtime, and social support, also buffers the negative effects of overtime including work dissatisfaction (Tucker & Rutherford, 2005).

Drawing on these studies, we isolate organizational trust as a moderating contingency to clarify further the conflicting implications of the firm overtime level on organizational outcomes. Trust is defined as the willingness of a party to accept vulnerability to the actions of another party based on positive expectations of the behaviors of another (De Jong & Dirks, 2012; Mayer & Davis, 1999). Organizational trust refers to the aggregate levels of trust that employees have in their organization, which includes coworkers, other departments, and the management (Fulmer & Gelfand, 2012; Mayer, Davis, & Schoorman, 1995; McEvily & Tortoriello, 2011). In this study, we focus on organization-level trust because the firm overtime level imposes a normative expectation of working extended hours. Organizational trust might consequently change employees' interpretations of and reactions to such irregular demands (e.g., Leslie et al., 2012; Wright & Nishii, 2007).

Given that firms are inherently multilevel systems, the theoretical construct and the empirical operationalization of organizational trust must consider various referents at multiple levels of analysis, including individual (e.g., coworkers), department (e.g., inter-departmental communication), and the entire organization (e.g., management and performance appraisal practice; Fulmer & Gelfand, 2012; Shockley-Zalabak, Ellis, & Winograd, 2000). The conceptualizations of trust across levels and referents share similarities and thus are interdependent. For instance, the trust among coworkers at the individual level may be influenced by the trust in the top management at the organization level. Numerous constructs in the organizational literature (e.g., creativity, efficacy, and empowerment) have been argued to be quasi-isomorphic across levels (Chen et al., 2005; Fulmer & Gelfand, 2012). Likewise, in this study, the different referents (e.g., coworkers, other

departments, and management) that contribute to employees' interpretation of the firm overtime level are included in conceptualizing and operationalizing organizational trust.

Organizational trust can mitigate the potential detriments of the firm overtime level by facilitating positive sensemaking or attribution of irregular expectations. Employees can attribute the cause of the firm overtime level to either firms' exploitative intention or genuine interest in improving performance and achievement (cf. self-serving versus organization-serving attributions, Leslie et al., 2012). Employees are likely to search and attribute the cause of the normative overtime level to constructive intentions if they trust their organization. Moreover, employees might feel less frustrated by and resistant to the firm overtime level if they trust the fairness of performance appraisal and compensation for their additional efforts (Collins & Smith, 2006; Janssen, 2001). In addition, employees might believe that their coworkers will not take advantage of their task dedication and extra contribution if the organization is characterized by trust (cf. sucker effect, Ambrose & Kulik, 1999). Therefore, a high organizational trust may attenuate the potential negative attributions of employees toward the firm overtime level while accentuating the positive implications toward firm performance.

We also propose that, when organizational trust is high, the curvilinear effect of the firm overtime level on firm innovation will intensify. With high organizational trust, positive implications of the firm overtime level on knowledge sharing, learning motivation, and experimentation may become strong, thereby intensifying the benefits of overtime toward firm innovation. However, with an increase of overtime, employees eventually feel exhausted. They are then less likely to share knowledge and explore new possibilities, thereby introducing the adverse effect of overtime on firm innovation. This negative turn may be strong and steep when organizational trust is high because employees may believe that the knowledge of coworkers is still available in the future. High organizational trust may induce withdrawal from exchanging knowledge due to possible fatigue. They may also believe that knowledge can be shared easily later on when they are not distressed with a high workload. Thus, we expect that the curvilinear relationship between overtime and innovation is pronounced when organizational trust is high.

By contrast, organizational trust may not modify the negative relationship between the firm overtime level and employee satisfaction because employee satisfaction is attribution-independent (Moore, 2000). Employees will not search for the cause of work exhaustion resulting from overtime. Unlike firm performance that involves attribution-dependent processes, employee satisfaction will be impacted directly by the firm overtime level regardless of the organizational trust level. Thus, we propose the moderating role of organizational trust only for firm performance.

Hypothesis 4. *Organizational trust positively moderates the relationship between the firm overtime level and performance, such that (a) the positive relationship involving firm productivity and (b) the curvilinear relationship involving firm innovation is more pronounced when organizational trust is high than when it is low.*

3 | METHOD

3.1 | Data and sample characteristics

The hypotheses were tested using the Human Capital Corporate Panel data collected by the Korea Research Institute for Vocational Education and Training, a government-funded labor policy group. A stratified, random sample was drawn from firms listed in the database of the Korea Investors Service. The initial sample of 1,851 firms was classified on the basis of industry (i.e., manufacturing, service, and finance) and firm size (i.e., below 299, 300–999, and above 1,000). Approximately 25% of the firms were randomly selected from each classification and included in the corporate survey sample.

The current study drew on two waves of corporate survey data collected in 2011 (T1) and 2013 (T2). This strategy reduced the causal ambiguity in testing the predictive relationships often encountered when cross-sectional or postdictive data are used (Sung & Choi, 2014). Individual respondents were randomly sampled from each participating organization with different numbers of managers and employees proportional to the size of the organization. The T1 sample included 10,064 employees who were randomly sampled from the 456 firms that reported their average overtime hours and organizational trust. Approximately 22 employees ($SD = 17.46$) from each firm participated in the corporate survey conducted in T1. The T2 sample included 8,681 employees and 8,203 managers who were randomly sampled from 371 firms that reported their satisfaction and firm productivity, respectively. Thus, approximately 24 employees ($SD = 17.34$) and 23 managers ($SD = 17.47$) from each firm participated in the survey conducted in T2. In addition, the number of patents used to assess firm innovation was obtained from the patent database archived by the Korean Intellectual Property Office for 2 years (i.e., 2012 and 2013) after the T1 corporate survey.

The final analysis sample included data from 273 firms with usable matching data from the T1 and T2 corporate surveys. This analysis sample included responses from 7,828 employees or an average of 27 employees per firm in T1 and 6,874 employees and 6,537 managers or an average of 28 employees and 27 managers per firm in T2. The firms in the final sample represented three industry domains with 16 specific industries: manufacturing ($N = 215$, eight industries; e.g., electronics, computer, chemical, machinery, and plastic); service ($N = 37$, five industries; e.g., telecommunication, software/system, and entertainment); and finance ($N = 21$, three industries; i.e., banking, insurance, and financial service). Potential inclusion biases were verified, and no meaningful difference was identified between the organizational characteristics (e.g., firm size, firm age, and industry) of included and excluded firms.

3.2 | Measures

3.2.1 | Firm overtime level (T1, employees)

Employees reported their average work hours per week for the last year over the regulated work time of their firm (Nixon et al., 2011). The question was adopted from the objective measure used by Allen and Bunn (2007): "What was your weekly average hours worked over the regulated work time?" Employees of the T1 sample reported that

they place an average of 8.92 additional hours per week beyond the regulated 40 work hours (under 48 hr in 118 firms, between 48 and 52 hr in 103 firms, between 52 and 56 hr in 43 firms, and between 56 and 60 hr in nine firms). The Korean government legislates the standard work hours of 40 hr per week and the additional payments for overtime hours. The average individual overtime hour, which was reported by multiple employees randomly sampled within each firm (average of 27 employees from each firm with a maximum of 74 employees depending on the firm size), was used to obtain the overall firm-level overtime hours. The analysis of variance test using the organization as a grouping factor indicated the significant difference in overtime hours across firms ($p < 0.0001$). Further analysis of the aggregation statistics also indicated the substantial firm-level variance and reliability of firm-level scores of overtime ($ICC(1) = 0.22$, $ICC(2) = 0.87$). Each firm's overtime level was consistent as demonstrated by the highly significant correlation of the firm-level overtime scores reported in T1 and T2 ($r = 0.56$, $p < 0.0001$). The acceptable reliability and agreement within firms and the significant correlation between two periods support our conceptualization of overtime as a social norm shared at the organization level.

3.2.2 | Organizational trust (T1, employees)

The employees evaluated the extent to which they trust their coworkers, managers, and employer (Fulmer & Gelfand, 2012) using four items ($\alpha = 0.86$) rated on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*): (a) "In our company, employees trust each other"; (b) "In our company, departments engage in collaborative communication"; (c) "Our managers are trustworthy enough to follow in every aspect"; and (d) "In our company, the performance appraisal and reward allocation are conducted fairly." The level of trust reported by employees was aggregated using the mean (Chan, 1998) to indicate firm-level organizational trust (De Jong & Dirks, 2012; McEvily & Tortoriello, 2011). To justify the aggregation to the firm level, intraclass correlations and interrater agreements were calculated, and these aggregation statistics exceeded generally accepted cut-off points (mean $r_{wg(i)} = 0.89$, median $r_{wg(i)} = 0.90$, $ICC(1) = 0.14$, $ICC(2) = 0.80$).

3.2.3 | Employee satisfaction (T2, employees)

Using the items adopted from previous studies (Böckerman & Ilmakunnas, 2012; Dineen et al., 2007), firm-level employee satisfaction was measured by aggregating individual employee satisfaction within each firm. Employees reported their satisfaction by rating three items ($\alpha = 0.80$) on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*): "In this company, I am satisfied with (a) what I am doing, (b) the salary level, and (c) the general characteristics of work." The employee ratings were averaged to obtain firm-level employee satisfaction scores (mean $r_{wg(i)} = 0.88$, median $r_{wg(i)} = 0.89$, $ICC(1) = 0.17$, $ICC(2) = 0.82$).

3.2.4 | Firm productivity (T2, managers)

Firm productivity was measured using three items on a 5-point scale (1 = *much worse*, 5 = *much better*; Wall et al., 2004). The department managers evaluated the organization-level productivity of their firms

by rating the following items ($\alpha = 0.76$): "What is your firm's productivity status in comparison to your main competitors in term of (a) overall employee productivity, (b) efficiency of working process, and (c) process competitiveness through cost reduction." Firm productivity was computed by averaging the ratings offered by approximately 27 managers representing each organization (mean $r_{wg(i)} = 0.91$, median $r_{wg(i)} = 0.93$, $ICC(1) = 0.28$, $ICC(2) = 0.67$). This firm productivity measure was positively and significantly correlated with firm revenue per employee at T2 ($r = 0.14$, $p < 0.05$), which demonstrates the validity of the current measure as an indicator of firm productivity.

3.2.5 | Firm innovation (T2, Korean Intellectual Property Office)

On the basis of previous firm-level studies (Yang, Phelps, & Steensma, 2010), the number of patents was employed as an objective measure of innovative performance across firms. The firm overtime level at T1 would be predictive of the innovation process after T1. Given the time lag between organizational processes and outcomes, two subsequent years following T1 would be viable for assessing subsequent firm innovation. Thus, the number of patents registered in 2012 and 2013 for each organization was added to generate the firm innovation measure. The alternative measure using the number of patent applications did not change the current hypothesis testing results.

3.2.6 | Control variables (T1, HR managers and Korea Investors Service)

We identified a number of factors that may be significant for organizational outcomes, such as satisfaction, productivity, and innovation, and included them as control variables in our analyses. First, we included basic firm characteristics, such as firm age and size (Sorensen & Stuart, 2000). Firm size was computed by the natural logarithmic transformation of the total number of full-time equivalent employees (Yang et al., 2010). Second, we created two dummies for the manufacturing, service, and finance industries to control for the effects of industry types that shape different outcome expectations (Sung & Choi, 2014). Third, we controlled for the firm welfare level indicated by the total welfare expenses per employee because favorable working conditions can mitigate the negative effects of the firm overtime level, which is particularly related to employee satisfaction. Fourth, the present analysis controlled for the proportion of employees with master's and doctoral degrees within each firm because the quality of human capital may affect organizational outcomes, such as productivity and innovation (Baer & Oldham, 2006). Fifth, we controlled for firm-level R&D intensity that can be determined by dividing the annual R&D investment by annual revenue, which is often regarded as a firm's innovative capacity (Yang et al., 2010). Sixth, we included job security as measured by the proportion of employees who have worked for over 10 years to control for the possibility that long-tenured employees have high organizational trust and employee satisfaction. Seventh, we created a dummy variable of unionization to control for the possible influence of the labor union on organizational trust and other organizational outcomes. Approximately 37% of the firms in the analysis sample reported the status of unionization. Finally, we controlled for overtime dispersion across employees, which can be regarded as the strength of the normative social pressure of overtime. Overtime dispersion was

measured using the standard deviation of overtime hours reported by employees of the same organization (Chan, 1998).

4 | RESULTS

A series of hierarchical regression analyses were conducted to test the main and moderated effects of the firm overtime level on employee satisfaction and firm productivity. In addition, we employed negative binomial regression to test the effects on firm innovation because the number of patents is a count variable that is overdispersed, which violates an underlying assumption of the linear and Poisson regres-

sions (Yang et al., 2010). Unstandardized coefficients were reported for the negative binomial regression results because no consensus has been reached on the appropriate construction of standardized coefficients (Menard, 2011). Table 1 shows the descriptive statistics and correlations.

4.1 | Firm overtime level and organizational outcomes

Hypothesis 1 proposes that the firm overtime level negatively affects employee satisfaction. Model 2 in Table 2 reports that the firm overtime level exhibits a significantly negative relationship with employee

TABLE 1 Descriptive statistics and correlations

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Firm size (T1)	6.14	1.05												
2. Firm age (T1)	32.75	16.72	0.14*											
3. Welfare level (T1)	6.26	7.79	0.16*	-0.03										
4. Education level (T1)	0.05	0.06	0.17*	-0.08	0.09									
5. R&D intensity (T1)	0.01	0.03	0.08	-0.08	-0.09	0.35*								
6. Job security (T1)	0.11	0.10	0.32*	0.09	0.24*	0.23*	-0.09							
7. Unionization (T1)	0.17	0.38	0.20*	0.20*	0.11	-0.04	-0.05	0.15*						
8. Overtime dispersion (T1)	5.78	2.19	-0.01	0.05	-0.08	-0.04	0.03	-0.03	0.21*					
9. Firm overtime level (T1)	8.82	3.65	-0.03	-0.06	-0.08	-0.15*	0.06	-0.07	0.12	0.54*				
10. Organizational trust (T1)	3.39	.32	0.23*	0.01	0.18*	0.15*	0.00	0.12	-0.01	-0.22*	-0.20*			
11. Employee satisfaction (T2)	3.51	.32	0.32*	0.02	0.21*	0.30*	0.21*	0.09	0.11	-0.18*	-0.22*	0.42*		
12. Firm productivity (T2)	3.44	.41	0.32*	-0.01	0.08	0.17*	0.11	0.01	-0.02	-0.11	0.03	0.35*	0.43*	
13. Firm innovation (T2)	36.79	166.05	0.40*	0.06	0.00	0.07	0.08	0.00	0.01	0.01	-0.03	0.10	0.17*	0.16*

Note. $N = 229-273$.

* $p < 0.05$.

TABLE 2 Hierarchical regression predicting employee satisfaction and firm productivity

Variables	Employee satisfaction			Firm productivity		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Firm size	0.25***	0.25***	0.19**	0.38***	0.38***	0.32***
Firm age	-0.02	-0.04	-0.03	-0.08	-0.06	-0.07
Manufacturing industry	-0.12	-0.11	-0.09	0.19	0.18	0.18
Service industry	-0.23*	-0.24*	-0.20	0.02	0.03	0.03
Welfare level	0.16**	0.16**	0.12*	0.08	0.08	0.04
Education level	0.24***	0.21**	0.19**	0.14	0.16*	0.16*
R&D intensity	0.13*	0.15*	0.16**	-0.01	-0.02	0.01
Job security	-0.11	-0.11	-0.11	-0.08	-0.08	-0.09
Unionization	0.10	0.11	0.11	-0.04	-0.05	-0.04
Overtime dispersion	-0.19**	-0.11	-0.06	-0.11	-0.19**	-0.16*
Firm overtime level		-0.15*	-0.12		0.16*	0.21**
Organizational trust			0.30***			0.27***
Organizational trust × Firm overtime level			0.02			0.15*
R^2	0.27	0.29	0.37	0.19	0.20	0.29
ΔR^2		0.02*	0.09*		0.02*	0.11*

Note: $N = 229$.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

satisfaction ($\beta = -0.19, p < 0.01$) after various firm-specific factors were controlled for. Thus, Hypothesis 1 was supported.

Hypothesis 2 posits that the firm overtime level is positively related to firm productivity. Model 5 in Table 2 reports that the relationship between the firm overtime level and firm productivity is positive and significant ($\beta = 0.16, p < 0.05$). This result supported Hypothesis 2.

Hypothesis 3 advances that a curvilinear relationship exists between the firm overtime level and firm innovation. A quadratic term of the firm overtime level was added in Model 3 in Table 3 to determine the possibility of a curvilinear effect (Sorensen & Stuart, 2000). The quadratic term showed a significantly negative effect ($b = -0.01, p < 0.05$) with the increment of the linear effect ($b = 0.33, p < 0.01$). Moreover, the fit of the quadratic effect model is significantly better than that of the linear effect model ($\Delta\log\text{-likelihood} = 1.87, \chi^2(1) = 3.74, p < 0.05$). Figure 2 graphically depicts the curvilinear relationship between the firm overtime level and firm innovation. In sum, these patterns support Hypothesis 3 by showing that the firm overtime level is curvilinearly related to firm innovation.

4.2 | Moderating effects of organizational trust

We predict that organizational trust moderates the relationship between the firm overtime level and firm performance (i.e., firm productivity and firm innovation). Specifically, Hypothesis 4a posits that organizational trust moderates the positive relationship between the firm overtime level and firm productivity. The interaction term of the firm overtime level and organizational trust was included after being mean-centered (Aiken & West, 1991). Model 6 in Table 2 reports that organizational trust exerted positive main and moderating effects on firm productivity ($\beta = 0.27, p < 0.001$ and $\beta = 0.15, p < 0.05$, respectively). The form of this significant moderation was further analyzed through simple slope analysis (Aiken & West, 1991). Figure 3 shows

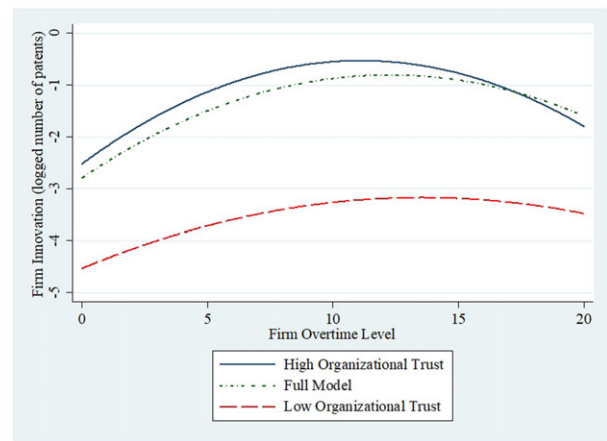


FIGURE 2 Firm overtime level and firm innovation under high and low organizational trust [Colour figure can be viewed at wileyonlinelibrary.com]

that the effect of the firm overtime level on firm productivity was positive and significant when organizational trust is high (i.e., one SD above the mean of organizational trust; $\beta = 0.36, p < 0.001$). However, the firm overtime level does not predict firm productivity when organizational trust is low ($\beta = 0.05, ns$).

Hypothesis 4b proposes that the curvilinear relation between the firm overtime level and firm innovation is more pronounced when organizational trust is high than low. The distribution of the number of patents tends to be nonlinear, positively skewed, kurtotic, and overdispersed with many low-count and zero observations (Coxe, West, & Aiken, 2009). We conducted a split-sample analysis to avoid biases in estimating the effects of interaction terms in nonlinear models, such as Tobit and negative binomial (for detailed explanations, see Hoetker, 2007, p. 332–336; Shang, Nesson, & Fan, 2017, p. 2), and assessed the varying effects of the firm overtime level under the different degrees of organizational trust. Following the recommended

TABLE 3 Negative binomial regression predicting firm innovation

Variables	Full model			High trust	Low trust
	Model 1	Model 2	Model 3	Model 4	Model 5
Firm size	1.23*** (0.12)	1.21*** (0.11)	1.21*** (0.12)	1.16*** (0.13)	1.48*** (0.23)
Firm age	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.00 (0.01)
Manufacturing industry	3.83*** (0.52)	3.82*** (0.51)	3.85*** (0.51)	3.64*** (0.62)	5.96*** (1.15)
Service industry	3.12*** (0.57)	3.23*** (0.57)	3.18*** (0.57)	3.48*** (0.73)	4.89*** (1.24)
Welfare level	-0.01 (0.01)	-0.00 (0.02)	-0.00 (0.02)	-0.02 (0.02)	0.01 (0.04)
Education level	5.43+ (3.02)	5.81+ (3.04)	5.68+ (2.99)	-1.25 (4.39)	13.30** (4.24)
R&D intensity	5.18 (5.19)	4.51 (5.17)	4.96 (5.09)	-0.23 (8.68)	10.08 (6.36)
Job security	0.40 (1.61)	0.01 (1.56)	0.07 (1.54)	-1.37 (2.18)	0.83 (2.20)
Unionization	-0.16 (0.29)	-0.20 (0.28)	-0.17 (0.28)	-0.17 (0.40)	-0.22 (0.41)
Overtime dispersion	0.01 (0.05)	-0.06 (0.06)	-0.07 (0.06)	-0.09 (0.09)	0.04 (0.08)
Firm overtime level		0.09* (0.04)	0.33** (0.12)	0.36* (0.17)	0.20 (0.19)
Firm overtime level ²			-0.01* (0.01)	-0.02+ (0.01)	-0.01 (0.01)
Log-likelihood	-877.16	-874.48	-872.60	-464.23	-394.73
Chi-sq.(df)		5.36*(1)	9.11**(2)		

Note: $N = 273, N(\text{High Trust}) = 134, \text{ and } N(\text{Low Trust}) = 139$. Standard errors reported in parentheses.

* $p < 0.10$;

** $p < 0.05$; *** $p < 0.001$.

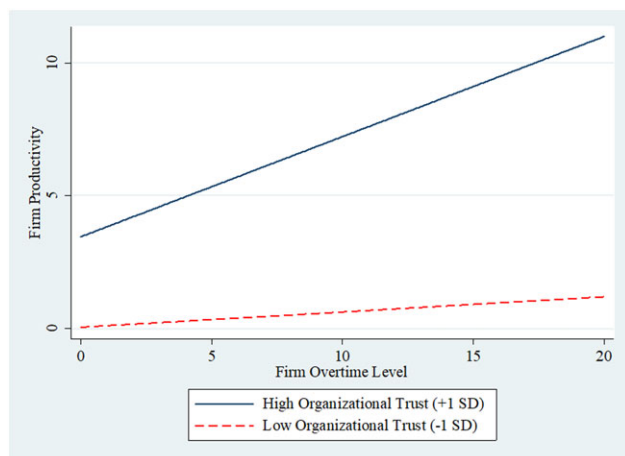


FIGURE 3 Interactive effect of firm overtime level and organizational trust on firm productivity [Colour figure can be viewed at wileyonlinelibrary.com]

procedure to test the moderation in nonlinear models (e.g., Cassiman & Veugelers, 2006; Klingebiel & Rammer, 2014), we divided the entire sample into firms with an organizational trust score above the mean ($N = 134$) and those below the mean ($N = 139$) to perform a split-sample analysis. Even splitting the sample by the median does not change the results.

Models 4 and 5 in Table 3 report the results of the negative binomial regression analysis for the two subsamples. Results affirm the positive linear effect of the firm overtime level and its negative quadratic effects on firm innovation in firms characterized by high organizational trust ($b = 0.36, p < 0.05$; $b = -0.02, p < 0.10$), whereas both effects were statistically insignificant in firms with low organizational trust ($b = 0.20$ and -0.01 , both *ns.*). Figure 2 compares the impact of the firm overtime level between firms with a high versus low organizational trust and shows that the relationship between firm-level overtime and firm innovation is accentuated by organizational trust. These findings support Hypothesis 4b and corroborate that high organizational trust intensifies the curvilinear effect of the firm overtime level on firm innovation.

We did not hypothesize the moderating effect of organizational trust on the relationship between the firm overtime level and employee satisfaction because satisfaction is independent of employees' causal attribution, thereby unlikely being affected by organizational trust. Supporting this logic, the interaction between the firm overtime level and organizational trust was insignificant in predicting employee satisfaction (Model 3 of Table 2: $\beta = 0.02, ns.$).

4.3 | Post hoc analyses

Several post hoc analyses were performed to provide additional insights into the ambivalent implications of the firm overtime level (all result tables available upon request). First, we tested the possibility that the firm overtime level has curvilinear effects on employee satisfaction and firm productivity because a few individual-level studies report that stress or time pressure exhibits a curvilinear relationship with the satisfaction and performance of employees (Baer & Oldham, 2006; LePine et al., 2005; Ohly et al., 2006). When we added the

quadratic terms of the overtime level on models that predict employee satisfaction and firm productivity, all the linear and quadratic effects of the overtime level became insignificant ($\beta = 0.08$ and -0.24 , both *ns.*, for employee satisfaction; $\beta = 0.30$ and -0.15 , both *ns.*, for firm productivity).

Second, the current measure of organizational trust included employees' trust toward various constituents, including coworkers, work units, the management, and the organizational system. We checked if the different aspects of organizational trust exert distinct moderating effects on organizational outcomes. When we used the first two items that represent interpersonal trust among employees toward coworkers and other work units (items a and b), this trust measure significantly moderated the effects of the firm overtime level on firm productivity (significant interaction between interpersonal trust and the firm overtime level: $\beta = 0.16, p < 0.01$) and firm innovation (significant linear and quadratic effects in the high interpersonal trust condition: $b = 0.35$ and -0.02 , respectively, both $p < 0.05$) versus insignificant linear and quadratic effects in the low interpersonal trust condition ($b = .16$ and $-.01$, respectively, both *ns.*). We also tested the same moderating effect of organizational trust using two items targeted at the management and performance appraisal system, which may reflect employee trust toward the organization in general (items c and d). For this measure, trust exerted a significant moderating role only for the relationship between the firm overtime level and firm productivity ($\beta = 0.13, p < 0.05$).

Third, although we treated the three organizational outcomes as separate consequences of the firm overtime level, employee satisfaction as the sum of negative individual experiences can influence on macro-level outcomes, such as firm performance (Hitt, Beamish, Jackson, & Mathieu, 2007). Thus, employee satisfaction possibly mediates the effect of the firm overtime level on firm productivity and firm innovation (Böckerman & Ilmakunnas, 2012). The result confirmed a significant, negative indirect effect of the firm overtime level on firm productivity via employee satisfaction (indirect effect = -0.007 , 95% CI [$-0.014, -0.001$]). However, mediation by employee satisfaction was not observed in the case of firm innovation.

Finally, we examined the possibility that the dispersion of the firm overtime level modifies its effects on organizational outcomes. The negative effect of the firm overtime level on employee satisfaction was greater and more significant in organizations with high overtime dispersion ($\beta = -0.19, p < 0.05$) than in those with low overtime dispersion ($\beta = -0.13, p < 0.10$). By contrast, the positive effect of the firm overtime level on firm productivity was greater in firms with low overtime dispersion ($\beta = 0.16, p < 0.10$) than in those with high overtime dispersion ($\beta = 0.05, ns.$). Moreover, the positive effect of the firm overtime level on firm innovation was observed only in firms with low overtime dispersion ($b = 0.11, p < 0.05$) but not in those with high overtime dispersion ($b = 0.03, ns.$).

5 | DISCUSSION

The systematic investigation of the firm-level implications of overtime remains lacking despite the increasing use of overtime in contemporary organizations. This study analyzed this generally

unexplored but critical phenomenon. The results of the current analysis confirmed the conflicting outcome perspective regarding the firm overtime level. First, the firm overtime level diminished employee satisfaction, which replicates the individual-level relationship between overtime work and work satisfaction (Beckers et al., 2008; Nixon et al., 2011). Second, the firm overtime level enhanced firm productivity, perhaps due to the increased utilization of human capital toward exploitative efficiency. Third, firm overtime level was curvilinearly related to firm innovation, which reveals the diminishing and ultimately negative return from excessively exploiting human capital toward exploration and experimentation. Finally, organizational trust was determined to be a boundary condition that positively moderates the effects of the firm overtime level on firm productivity and innovation. This study has critical implications for theory and practice and limitations that should be considered in further research.

5.1 | Theoretical implications

This study extends the research on individual overtime to the organization level by conceptualizing it as the injunctive social norm (i.e., firm overtime level). Previous individual-level studies contended that overtime is undesirable and leads to dysfunctional psychological and behavioral reactions (e.g., Dembe et al., 2005; Proctor et al., 1996). The current analysis confirms that the firm overtime level also exerts detrimental effects on employee satisfaction. The negative effect on employee satisfaction is not attenuated even when the organization is characterized by high organizational trust, thereby confirming that the effect of overtime on employee satisfaction is rather direct and does surpass the attribution or sense-making process (Moore, 2000). Moreover, post hoc analysis indicates that employee satisfaction operates as an intervening process that engenders a negative indirect effect of the firm overtime level on firm productivity, which is otherwise positive. The present analysis supports a robust conclusion that overtime elicits adverse affective and attitudinal reactions across the individual and organization levels of analysis (cf. multilevel homology, Chen et al., 2005).

The current study contributes to the human capital utilization literature by demonstrating a positive effect of the firm overtime level on firm productivity. The implications of stressor at the individual level are complicated with typically negative consequences (Dembe et al., 2005; Sparks et al., 1997), although a few studies affirm a curvilinear effect on performance (Baer & Oldham, 2006; Ohly et al., 2006). However, the increased work hours of the entire workforce seem to generate an additional resource toward organizational functions, thereby promoting firm productivity and enhancing the organizational return on human capital. The present findings reveal that potentially negative effects of firms' HRM policy on individuals can be mitigated at the organization level and thus realize the intended effects of the HRM policy.

However, a few caveats should be considered. First, the positive link between the firm overtime level and firm productivity is not observed in firms with low organizational trust. Employees tend to interpret the firm overtime level as an exploitative and unfair HRM policy; hence, they may not spend additional work hours to perform

organizational tasks when they distrust one another and the employer. Second, the firm overtime level exerts a significant and negative indirect effect on firm productivity through diminished employee satisfaction. Increased overtime results in strains among employees, such as exhaustion and dissatisfaction, which ultimately reduce their performance potential. The negative indirect effect through employee satisfaction can be intensified in organizations with low organizational trust.

This study aspires to contribute to the stress literature that has mainly focused on individual-level analysis and a single aspect of the stressor. The current firm-level analysis confirms the curvilinear relationship between the firm overtime level and firm innovation. Although overtime and time pressure may not be identical constructs, the current pattern is consistent with the individual-level finding that time pressure is curvilinearly related to creativity. Similar to individuals, organizations must be "optimally" stimulated or pressured to produce an innovative output. Researchers must consider the type and level of stressors considering such challenge stressors as overtime can change their character from being good to bad depending on the level or intensity of overtime.

The current study also extends the research on trust at the organization level by exploring the dark side of trust as a potentially exploitive HRM strategy. We confirmed that the positive link between the firm overtime level and firm performance intensifies when organizational trust is high. Accordingly, organizational trust can trickle employees to work longer voluntarily by enhancing organizational commitment and, to engage in cooperative behavior by making them believe that others do not act opportunistically. These findings prove that high organizational trust ironically enables the employer to pursue organizational goals at the cost of employees' sacrifices such as overcommitment to their work. Thus, employees' trust or trustworthiness of the employer can intensify the exploitive aspect of HRM policy (cf. pessimistic perspective of HRM, Peccei, 2004). In this sense, a good working environment might be considered a soft strategy for utilizing human capital (e.g., Google's free food for breakfast, lunch, and dinner). Organizational trust and favorable work environments may increase the acceptable range of challenge stressors and delay the speed of transition from a good to a bad stressor. This theoretical speculation must be further investigated in future studies.

Post hoc analysis demonstrated that the issue of trust might also be related to the fairness of the firm overtime level. Hence, dispersion across employees in overtime modifies the effects of the firm overtime level. Employees' sensemaking and reaction to work contexts are shaped through constant social comparison (Lamertz, 2002). Employees may perceive their work hours to be longer than the actual overtime hours when others leave work earlier, thereby generating a strong negative reaction. However, employees are more likely to take overtime for granted as a social norm applied fairly to everyone when most employees work overtime together (i.e., low overtime dispersion). The high congruence in overtime across employees may generate the sense of fairness, which should elicit favorable reactions from employees and contribute to firm performance. This pattern also offers important practical implications for managers.

5.2 | Practical implications

The present study clarifies the potential benefits and limitations of prevailing exploitive HRM practices such as overtime policy and offers practical insights. Similar to various human capital-utilizing practices (e.g., extended shifts, norms for prioritizing work over sleep, and constant connectivity through company-paid smartphones), the firm overtime level can facilitate the effective and timely utilization of human capital. However, the current analysis indicates that overtime, even at the firm level, still generates negative affective outcome such as employee dissatisfaction. In addition, the firm overtime level can result in the intended return only up to a certain point. The optimal point of the firm overtime level in the current data is approximately 12 hr per week or approximately 2 hr per day. Results corroborate that the net effect of overtime is positive when the overtime level is low, such that employees can cope with mild stress from overtime and accept it as a challenge stressor. However, the cost after the optimal level may become larger than the benefit from overtime, thereby diminishing the return from additional work hours. At a high firm overtime level, only marginal performance benefits can be achieved at the expense of severely deteriorated employee satisfaction and morale. Therefore, firms must put careful, ethical, and long-term considerations about this trade-off of using the firm overtime level as a strategic tool for firm performance.

This study also highlights several practical considerations before using the firm overtime level as an HRM policy for utilizing human capital to enhance firm performance. First, organizational trust is a critical boundary condition that buffers employees from the psychological toll of the firm overtime level and accentuates its positive impact on the value function between extended work hours and firm performance. Overtime without trust may fail to produce or even hinder the expected performance gain. Thus, organizations must carefully manage the firm overtime level by increasing its challenge aspect but reducing its hindrance aspect. For instance, proper work environment, such as organizational trust, job control, and flextime, may reduce strains of the stressor and promote its motivation (Boswell et al., 2004; LePine et al., 2005). Second, fairness across employees regarding the distribution of additional work hours mitigates the negative affective reactions, such as work exhaustion, and strengthens the positive implications of overtime. Thus, managers should equalize overtime hours across employees or acknowledge and offer equitable rewards for differential additional work hours. Finally, the curvilinear effect of the firm overtime level on firm innovation shows a trade-off between quantity and quality of work outcomes; exploitive pursuit can drive out exploratory firm performance (March, 1991). In sum, managers should be cautious regarding the sustainability, contingencies, and trade-off of exploitive performance gains from the firm overtime level.

5.3 | Study limitations and future directions

Despite the considerable theoretical and practical contributions of the present analysis, several limitations should be considered. First, a few of the current constructs can be assessed using additional alternative measures although the current research design offers several

strengths (e.g., a large firm-level sample with multisource and multiwave data, including objective indicators). For instance, employee satisfaction can be assessed using a reference-shift consensus composition model instead of the current additive consensus model (Chan, 1998). Moreover, alternative approaches to operationalize innovation at the firm level are available other than the number of patents, including new product development, product or service differentiation, and sales from recently developed products (Klingebiel & Rammer, 2014). Additional empirical efforts are necessary to further validate the effects of the firm overtime level on organizational outcomes with varying operationalization.

Second, the present study did not investigate several plausible intermediate mechanisms that may account for the reason as to why the firm overtime level affects various organizational outcomes. For instance, the work intensification dimension of the firm overtime level can increase sleep deprivation, job stress, and negative workplace affect shared among employees (Barnes et al., 2016; Nixon et al., 2011), which are detrimental to organizational functions (Van de Voorde et al., 2012). Further studies should explore alternative processes that follow the firm overtime level to overcome the potential misspecification of the given organizational phenomenon.

Third, the current measure of overtime solely focused on the absolute quantity of additional work hours, regardless of the quality and intensity of work or perceived strength of overtime. Overtime hours can refer to many things, such as laziness, reduced work efforts to lengthen work hours, labor intensity, or merely political or impression management among employees. The feeling and experience of each employee who works the same extra hours will vary depending on personal status, such as physical health and mental energy. The current measure cannot capture these differences. It, thus, generates the issue of homogenizing potentially heterogeneous additional work hours. Future studies must consider qualitative differences to further elaborate the function and significance of the firm overtime level for employees and organizations.

Finally, the current research context that involved South Korean firms should be considered in generalizing the findings. South Korea is one of the overworked societies, and its culture is characterized by collectivistic unities and hierarchical order (OECD, 2013), thereby possibly offering a favorable social context for exploiting the homogeneity of employees' overtime. In addition, according to the OECD Social Indicator, the percentage of people reporting trust in others in South Korea is approximately 27 percent, which is lower than the OECD average of 36% (OECD, 2016), which accentuates the role of organizational trust as a boundary condition. Further research is required to verify whether the present findings are generalizable to other social and national contexts, particularly to western countries where heterogeneity in overtime across employees has higher probability, individual discretion and independence are generally appreciated, and people express higher interpersonal trust.

6 | CONCLUSION

What is the organization-level implication of overtime work? The current analysis of a firm's overtime level as a firm-level social norm

regarding work hours demonstrates its ambivalent implications toward various organizational outcomes. The firm overtime level is negatively related to employee satisfaction but positively related to firm productivity and curvilinearly related to firm innovation. Moreover, the effects of the firm overtime level on firm productivity and innovation are positively moderated by the organizational trust. In conclusion, our findings reveal considerable perils and promises that result in firm-level overtime as a prevailing tool for utilizing human capital and highlight the critical contingency of organizational trust. Given the increasing competition that forces organizations to utilize their resources further and achieve more with less workforce, further conceptual and empirical endeavors to ascertain costs and benefits associated with firm overtime from the short- and long-term perspectives are of benefit to organizational scholars and practicing managers.

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