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Differential effects of autonomy on employee satisfaction and organizational performance depending on the type of financial incentives: evidence from a four-wave panel of Korean companies

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ABSTRACT

This study examines the effects of an autonomy-supportive climate on employee satisfaction and organizational performance at the organizational level. It also extends self-determination theory by applying this theory to the differential interaction effects of individual and group incentives with an autonomy-supportive climate on employee satisfaction and organizational performance. Employees may differently utilize autonomy granted to them depending on whether or not they are granted financial incentives and depending on the type of financial incentives granted to them, if any. The hypotheses were tested by moderated mediation models using nationally representative panel data that were collected from 2009 to 2015. The moderation analyses provide evidence that while individual incentives strengthened the effect of an autonomy-supportive climate on employee satisfaction, group incentives weakened that effect. Furthermore, individual incentives resulted in little change to the effect of an autonomy-supportive climate on organizational performance, but group incentives strengthened that effect. Since the results do not identify specific best practices for the combination of an autonomy-supportive climate and financial incentives, this study implies that top management should make strategic choices with regard to which combination of practices they adopt among less or more autonomy-supportive practices and individual or group incentives.

KEYWORDS

Autonomy-supportive climate; employee satisfaction; group incentive; individual incentive; organizational performance; self-determination theory

Introduction

Self-determination theory asserts that satisfying employees' need for autonomy enhances their intrinsic motivation, job satisfaction and

performance. The evidence supporting this theory has accumulated over a few decades (e.g. Deci et al., 1989; Deci et al., 1999; Gagne & Deci, 2005; Jo et al., 2020; Liu et al., 2011; Ryan & Deci, 2000a), but extensive areas still require more detailed inquiry. First, since most previous research on autonomy has been conducted at the individual level (Giebe & Rigotti, 2022; Liu et al., 2022; Zeijen et al., 2020), we possess relatively little knowledge about the effects of autonomy at the organizational level (Park, 2018), and thus additional investigation is warranted. Deci and colleagues assert that self-determination theory is not limited to individual autonomy (Deci et al., 1989; Deci et al., 2001). Nonetheless, most studies that use self-determination theory as a theoretical framework have still been limited to individual autonomy (e.g. Martela & Ryan, 2020; Nie et al., 2015). Thus, it is necessary to investigate how autonomy affects employees' and firms' outcomes at the organizational level. In response to this need, the current study examines the effects of an autonomy-supportive climate on employee satisfaction and organizational performance. In this study, *autonomy-supportive climate* refers to an organizational climate that is created by granting considerable autonomy to employees. Organizational climate is 'the shared perceptions of and the meaning attached to the policies, practices and procedures employees experience' (Schneider et al., 2013, p. 362). Thus, an autonomy-supportive climate consists of employees' shared perceptions of and the meaning attached to the autonomy-supportive practices provided by managers (Baard et al., 2004; Deci et al., 1989). This concept has been extensively adopted in the organizational behavior field (e.g. Liu & Fu, 2011; Slemp et al., 2018; Vansteenkiste et al., 2004) as well as in the educational psychology field (e.g. Brisimis et al., 2021; Dincer et al., 2012). An autonomy-supportive climate reflects the collective phenomena that the interactions between organizational members (i.e. managers and employees) give rise to and continue (Morgeson & Hofmann, 1999). Support for the notion of an autonomy-supportive climate at the organizational level may come from Deci et al. (2001), who indicated that autonomy comprises three types: autonomy enabled by one's immediate supervisor, by top management and by the overall work climate. While a supervisor can facilitate an autonomy-supportive climate within a team by granting considerable autonomy to subordinates, an autonomy-supportive climate at the organizational level can be developed by top management or by the overall work climate.

A second area that requires further research in self-determination theory is the role of group incentives. Most studies on this theory have focused on individual incentives (see a meta-analysis by Deci et al., 1999). However, group incentives may have a different influence on employees' perceptions, attitudes and behavior than individual incentives

may have. For example, while employees who receive individual incentives have a primary interest in achieving their own goals and improving their own performance, employees who receive group incentives have more interest in their team and organizational performance (Kruse, 1993; Pendleton & Robinson, 2017). Therefore, it is important to distinguish group incentives and individual incentives when the roles of financial incentives in self-determination theory are investigated.

The third area that requires further research in self-determination theory concerns the undermining hypothesis. Cognitive evaluation theory, a subtheory of self-determination theory (Ryan & Deci, 2000b), posits that tangible rewards, including financial incentives, undermine employees' feelings of autonomy and thus decrease their intrinsic motivation and satisfaction. However, self-determination theory admits that financial incentives may enhance motivation if the incentives are granted in an autonomy-supportive context (Deci & Ryan, 1987). This proviso suggests the interaction effects between financial incentives and an autonomy-supportive climate because it implies that the effects of financial incentives on motivation may depend on whether the climates or contexts in which financial incentives are granted to employees are autonomous or controlling (Landry et al., 2020; O'Donoghue & van der Werff, 2022). Nonetheless, research on self-determination theory has been limited to the undermining hypothesis, neglecting the prospect of these interaction effects. Thus, further study needs to investigate the interaction effects between autonomy support and financial incentives. Furthermore, in combination with the above discussion about the differential roles of individual incentives and group incentives, this study explores the differential interaction effects of individual and group incentives with an autonomy-supportive climate on employee satisfaction and organizational performance. Employees may differently utilize the autonomy given to them according to whether they are granted individual incentives or group incentives, and different combinations of an autonomy-supportive climate with individual incentives and group incentives may have different influences on employee satisfaction and organizational performance.

This study contributes to the literature on self-determination theory in various ways. First, drawing on self-determination theory and using national panel data, we examine how an autonomy-supportive climate affects employee satisfaction and organizational performance at the organizational level. Because most previous studies on the associations of autonomy with satisfaction and performance were conducted at the individual level (see Van den Broeck et al., 2016, for a meta-analysis), we know little about whether and how an organization-wide autonomy-supportive climate is linked to employee satisfaction and

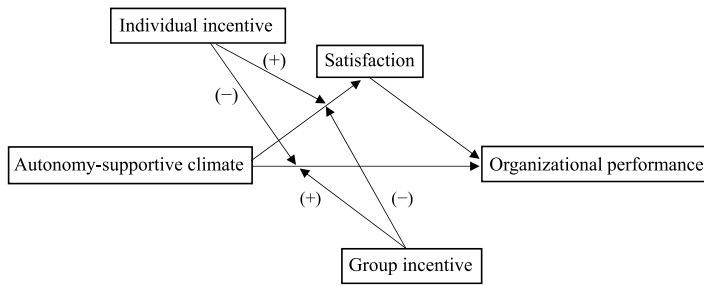


Figure 1. A hypothesized moderated mediation model.

organizational performance. Second, while self-determination theory has argued for the undermining hypothesis with respect to financial incentives regardless of their types, this study explores the differential effects of individual incentives and group incentives. Since employees with group incentives will have different perceptions, attitudes and behavior than those with individual incentives, it is important to distinguish group incentives and individual incentives. Third, this study proposes interaction effects between an autonomy-supportive climate and financial incentives instead of the undermining hypothesis of self-determination theory. Some combinations of an autonomy-supportive climate and financial incentives may reduce motivation and satisfaction of employees, but other combinations may improve them. We further explore whether the interactions of an autonomy-supportive climate with financial incentives have different effects on employee satisfaction and organizational performance. Finally, because the results of this study demonstrate that there are no best practices regarding the combination of autonomy-supportive practices and financial incentives, this study suggests that top managers should make strategic choices with regard to which combination of practices they adopt among less or more autonomy-supportive practices and individual incentives or group incentives. Figure 1 illustrates the research model of this study.

Theory and hypotheses

Autonomy-supportive climate

Self-determination theory asserts that human beings possess an innate need for autonomy, as well as needs for competence and relatedness and that when these needs are fulfilled, employees are motivated to perform according to their will and feel satisfied at their job (Deci et al., 1989; Ryan & Deci, 2000a). Previous studies have supported the positive effect of autonomy on employee satisfaction or related outcomes (e.g. Heyns & Rothmann, 2018; Muller & Niessen, 2019; van Hooff & De Pater, 2019). According to a meta-analytic review by Slemp et al.

(2018), autonomy support had a corrected correlation of .56 with job satisfaction. However, these studies were performed at the individual level, examining outcome variables such as job satisfaction, engagement and job performance.

On the other hand, Deci and colleagues (Deci et al., 1989; Ryan & Deci, 2000a) asserted that autonomy is closely associated with a participative management practice and thus self-determination theory can be applied not only to an individual approach but also to a group or organizational approach. Olafsen et al. (2018) found that as an individual approach, managerial autonomy support enhances work motivation through psychological need satisfaction. An organization-wide autonomy-supportive climate can be created with HR practices by top management. Rigby and Ryan (2018) asserted that employee satisfaction can come from a supportive managerial climate. Autonomy-supportive managers grant employees considerable discretion and encourage personal initiative, in contrast with controlling managers (Deci & Ryan, 1987; Deci et al., 1989; Huyghebaert-Zouaghi et al., in press; Slemph, 2017). From this perspective, most employees in autonomy-supportive contexts or in companies with autonomy-supportive HR practices become satisfied with their organization because they can use autonomy to achieve their goals and perform their tasks according to their volition, thanks to their organization or top management.

We use the concept of *employee satisfaction* to refer to employees' collective satisfaction, which has been used to denote collective satisfaction in some previous studies (e.g. Harter et al., 2002; Koys, 2001), instead of *job satisfaction*, which is used to represent individual employees' satisfaction. Since employees in an organization share similar work environments, such as HR practices and leadership, collective levels of satisfaction can be expected to emerge (Kozlowski & Klein, 2000; Whitman et al., 2010). Employee satisfaction includes employees' satisfaction with the organization's practices and policies and the organization itself in general. Since autonomy-supportive contexts or HR practices tend to influence the entire establishment or organization in the same direction, an autonomy-supportive climate is likely to enhance employees' overall satisfaction levels. According to an analytic review by Van Mierlo et al. (2005), self-managing teams, in which autonomy is granted at the group level differently from individual autonomy, were consistently associated with team members' higher satisfaction.

Employee satisfaction is likely to improve organizational performance because satisfied employees work harder and are more cooperative with co-workers and managers than unsatisfied employees. The relationship between satisfaction and performance has been a long-standing research topic, but a consensus on the causality of this relationship has not yet

been reached. The traditional view is that satisfaction enhances performance. However, recent scholars have more varied views: performance increases satisfaction through a sense of achievement and high income; satisfaction and performance influence each other; or a third variable intervenes in their relationship (Judge et al., 2001).

Ryan et al. (1996) identified the concept of shared attitudes as a factor that can affect organizational performance. In the attraction-selection-attrition model, Schneider et al., (1995) asserted that employees in an organization become homogeneous in disposition and develop shared attitudes over time. If most employees in an organization are satisfied with their organization, they will share positive attitudes and cooperate with each other to accomplish the organization's goals, leading to higher organizational performance (Koys, 2001; Ryan et al., 1996). According to Schneider and Bowen (1985), collective employee satisfaction should be correlated with organizational effectiveness because incumbent employees are in a position to be aware of and responsive to organizational goals. In contrast, low levels of employee satisfaction create norms of conflict, negative evaluations of each other, and decreased motivation to achieve collective goals, which bring down organizational performance (Whitman et al., 2010). In fact, a meta-analysis by Harter et al. (2002) shows that business-unit-level employee satisfaction is positively associated with business outcomes, such as customer satisfaction, profit and productivity. According to the meta-analysis by Whitman et al. (2010), unit-level satisfaction was significantly associated with unit-level performance. Furthermore, Koys (2001) found in a longitudinal unit-level study of restaurants that employee satisfaction at Time 1 had a positive influence on customer satisfaction at Time 2, but the reverse influence was not significant. Thus, although we do not deny the possibility of reverse effects, in the current study we assume that employee satisfaction will positively affect organizational performance. An autonomy-supportive climate is more likely to lead directly to higher satisfaction, which in turn increases organizational performance, than to lead indirectly through a series of processes involving higher motivation, increased effort, improved performance and then higher satisfaction.

An autonomy-supportive climate may also enhance organizational performance through cognitive processes, such as by making employees aware of the necessity of cooperation, as well as through affective processes, such as by improving employee satisfaction. Employees in an autonomy-supportive climate feel responsible for accomplishing certain goals and are stimulated to cooperate with others to accomplish them (Janz, 1999). Furthermore, an autonomy-supportive context can foster efficiency by encouraging employees to make appropriate

decisions and accomplish them at low costs. Banker et al. (1996) indicated in a longitudinal study of an electromechanical assembly plant that labor productivity was improved and defect rates were reduced after self-managing teams were formed. Employees can also increase efficiency by sharing more tacit knowledge when they are granted substantial autonomy and responsibility than when they are controlled by managers (Jiang & Chen, 2018). These results indicate the direct effect of an autonomy-supportive climate on organizational performance in our research model.

Applying self-determination theory to organizational-level contexts and based on the previous findings, we propose the following hypothesis:

Hypothesis 1: Autonomy-supportive climate has a positive effect on employee satisfaction, which in turn increases organizational performance.

Interactions of an autonomy-supportive climate with financial incentives

Financial incentives are an HR practice in which employees' wages are entirely or partially connected to performance. They can generally be divided into individual incentives and group or collective incentives (Kruse, 1993; Park & Kruse, 2014; Peterson & Luthans, 2006; Rynes et al., 2005). Individual incentives are a pay system in which individual employees are granted bonuses based on their own performance. Merit-based pay, sales commissions and piece-rate pay are examples of individual incentive plans. On the other hand, group or collective incentives are a pay system that grants employees bonuses based on team, unit or organizational performance. Gain-sharing and profit-sharing plans are the most common examples of group incentives (Peterson & Luthans, 2006).

Employees may consider individual incentives to be a fair practice because they are given bonuses according to their abilities, efforts or performance. Employees under these plans pay most of their attention to their own goals and performance and do not have inducement to cooperate with each other. However, employees under group incentive plans may feel pressure to exert effort to enhance team or organizational performance because they and their co-workers are given bonuses according to their team or organizational performance (Gomez-Mejia et al., 2000; Kandel & Lazear, 1992; Kruse, 1993). They should pay most of their attention to team or organizational performance and cooperate with each other to enhance it. Thus, depending on whether or not they are granted financial incentives and depending on the type of financial incentives granted to them, employees may differently perceive their work environments, including autonomy-supportive contexts, and use differently the autonomy granted to them.

Separately from the debates around the effects of financial incentives on autonomy feelings or motivation (i.e. the undermining hypothesis), a few studies (e.g. Jones et al., 2017; Park, 2015; Pendleton & Robinson, 2017) have investigated the interaction effects between autonomy (or decision-making participation) and financial incentives (or financial participation). The current study explores the interaction effect between two independent practices, i.e. autonomy support and financial incentives, rather than the relationship between financial incentives and autonomy feelings. In the next section, we develop arguments for the interaction effects between an autonomy-supportive climate and the types of financial incentives (individual and group incentives) on employee satisfaction and firm performance at the organizational level.

Moderating roles of individual incentives

Since employees in organizations with individual incentive plans are paid according to their own performance rather than their team or organizational performance, individual incentives provide them with clear information about the performance-rewards relationship. This pay system signals that if individual employees make appropriate decisions and execute their tasks with high skills, good ideas and enthusiasm, they will be compensated for such actions (Fang & Gerhart, 2012; Lee, 1988). Thus, if individual incentives are given to employees with considerable autonomy, they will appreciate the financial incentives because this means that they can conduct their task activities according to their own volition and that they will be compensated according to the results of such activities. When employees conduct their production activities according to their will in an autonomy-supportive climate and they are compensated in return for their own performance, they will be more satisfied with their organization than when they are not compensated accordingly despite their own high performance or when they are compensated according to other criteria (e.g. organizational performance). Thus, we expect that individual incentives are likely to strengthen the effect of an autonomy-supportive climate on employee satisfaction.

On the other hand, individual incentives may diminish the effect of an autonomy-supportive climate on organizational performance. In companies with individual incentives, employees try to improve their own performance and are willing to use the autonomy granted to them for this purpose. Employees working under these plans pay most of their attention to their own performance to earn a higher income. Since their own income is little influenced by their co-workers' behaviors or the organization's overall performance, the employees are less motivated to cooperate with each other and to share tacit knowledge with co-workers

even if co-workers have work-related problems (Rynes et al., 2005). Consequently, in companies with individual incentives, employees may be willing to utilize their autonomy mainly to augment their own performance rather than to cooperate with each other and improve co-workers' or the organization's performance and the use of autonomy in such a way will interfere with organizational performance. Pendleton and Robinson (2017) argued that where employees have much task discretion, individual incentives have less effect on productivity because employees can manipulate the scheme to their own advantage. Thus, we expect that individual incentives will negatively influence the effect of an autonomy-supportive climate on firm performance:

Hypothesis 2a: Individual incentives strengthen the effect of an autonomy-supportive climate on employee satisfaction.

Hypothesis 2b: Individual incentives undermine the direct effect of an autonomy-supportive climate on firm performance.

Given the role of employee satisfaction as a positive mediator and the role of individual incentives as a positive moderator, we further expect that the indirect effect of an autonomy-supportive climate on firm performance through employee satisfaction will be stronger in firms with individual incentives than in those without individual incentives. Specifically, we suggested that the effect of an autonomy-supportive climate on organizational performance is accomplished via its effect on employee satisfaction (Hypothesis 1) and that the effect of an autonomy-supportive climate on employee satisfaction is strengthened by individual incentives (Hypothesis 2a). These hypotheses represent a first-stage moderated mediation model (Edwards & Lambert, 2007), where individual incentives are hypothesized to moderate the indirect effect of an autonomy-supportive climate on organizational performance through employee satisfaction. Thus, we establish the following hypothesis:

Hypothesis 2c: The indirect effect of an autonomy-supportive climate on organizational performance via employee satisfaction is stronger in organizations with individual incentives than in organizations without individual incentives.

Moderating roles of group incentives

Since employees in organizations with group incentive plans are paid according to their team or organizational performance rather than their own performance, group incentives do not provide them with clear information about the performance-rewards relationship. Rather, since employees under these plans are aware that their own behaviors influence the incomes of co-workers, they may feel pressure to work hard and to work in specific ways (i.e. peer pressure; Gomez-Mejia et al.,

2000; Kruse, 1993). Thus, group incentives may function in different directions from individual incentives in terms of their interactions with an autonomy-supportive climate. Even if employees under group incentive plans are in an autonomy-supportive climate, they may feel pressure to use their autonomy to achieve organizational goals and enhance team or organizational performance rather than to fulfill their own goals and enhance their own performance. Since group incentive plans may prevent employees from using their autonomy for personal gain due to peer pressure, we expect that group incentives will reduce the effect of an autonomy-supportive climate on employee satisfaction.

On the other hand, group incentives may have a different effect on the relationship of an autonomy-supportive climate with firm performance than on its relationship with employee satisfaction. As noted earlier, employees in organizations with these plans are likely to feel pressure to use their autonomy to improve team or firm performance rather than their own performance because incomes of their co-workers depend on their own efforts and overall organizational performance (Barnes et al., 2011). To improve organizational efficiency and performance, they should use the autonomy granted to them in cooperating with each other and sharing tacit knowledge (Hatcher & Ross, 1991). This use of autonomy in companies with group incentives will ultimately lead to enhancement of organizational performance. Pendleton and Robinson (2017) found that group incentives had a greater effect on productivity in organizations where employees had much task discretion. Thus, we expect that group incentives will positively influence the effect of an autonomy-supportive climate on organizational performance. These arguments and previous findings lead to the following hypotheses related to the moderating effects of group incentives:

Hypothesis 3a: Group incentives undermine the effect of an autonomy-supportive climate on employee satisfaction.

Hypothesis 3b: Group incentives strengthen the direct effect of an autonomy-supportive climate on organizational performance.

Given the role of employee satisfaction as a positive mediator and the role of group incentives as a negative moderator, we further expect that the indirect effect of an autonomy-supportive climate on organizational performance through employee satisfaction will be weaker in firms with group incentives than in those without group incentives. Specifically, we suggested that the effect of an autonomy-supportive climate on organizational performance is accomplished via its effect on employee satisfaction (Hypothesis 1) and that the effect of an autonomy-supportive climate on employee satisfaction is weakened by group incentives (Hypothesis 3a). These hypotheses represent a first-stage

moderated mediation model (Edwards & Lambert, 2007), where group incentives are hypothesized to moderate the indirect effect of an autonomy-supportive climate on organizational performance through employee satisfaction. Thus, we establish the following hypothesis:

Hypothesis 3c: The indirect effect of an autonomy-supportive climate on organizational performance via employee satisfaction is weaker in organizations with group incentives than in organizations without group incentives.

Methods

Sample

To investigate our hypotheses, we used the Human Capital Corporate Panel (HCCP) surveys carried out by the Korean Research Institute for Vocational Education and Training (KRIVET). The HCCP surveys have been conducted every two years since 2005 to investigate the human capital levels and HR practices of Korean companies (Kim & Keane, 2021; Park & Kim, 2019). In this study, we conducted the panel analyses with the HCCP survey data that were collected in 2009, 2011, 2013 and 2015 because the survey items underwent many changes before the 2009 survey. The KRIVET has matched the survey data with financial performance data from the Korean Information Service (KIS), which are collected every year.

The HCCP surveys are composed of employee surveys and corporate surveys. The employee surveys were conducted with low- to middle-level managers as well as rank-and-file employees. The respondents to the employee surveys may be different in every wave even though they came from the same organizations. Thus, the variables measured in the employee surveys (e.g. autonomy-supportive climate and employee satisfaction) had to be aggregated to the firm level for panel analyses. The employee surveys obtained information about employees' experiences, perceptions, attitudes and the like. The corporate surveys were administered with top managers in four departments (HR, HR development, strategic planning and R&D). These surveys obtained information about the company's HR practices, organizational strategy, personnel situation and the like.

The sample was selected from companies with more than 100 employees within South Korea that were listed in the KIS corporate data. However, companies in the primary industries (agriculture, fishing and mining), government-owned organizations and foreign company subsidiaries were excluded from the surveys. For the 2009 surveys, 500 companies were contacted, including companies that were involved in the 2007 surveys and 473 companies participated in the 2009 surveys, constituting a 95% response rate. Of the 473 companies, 321 remained in subsequent surveys until 2015, constituting a 68% retention rate. In each

wave, 6,761 to 8,087 employees were involved in the employee surveys and 21 to 25 employees participated in each organization on average. In each organization, 3 to 74 employees were involved.

The final sample ($n=321$) comprises 74% manufacturing industry, 7% finance industry and 20% service industry companies. The sample companies employed 933 employees on average ($SD=2,214$).

Measures

Autonomy-supportive climate

An autonomy-supportive climate is an organizational climate in which employees are granted considerable discretion and are encouraged to take personal initiative (Deci et al., 2001). It was measured in the employee surveys with three items, which were adapted from the decision authority subscale in the Job Content Questionnaire (Karasek et al., 1998), with 'the job' changed to 'your firm.' Using a five-point Likert scale, the employees rated how much autonomy their firm grants to employees: How much does your firm allow employees to make decisions? How much do employees in your firm have a say over what happens? and How much do employees in your firm have freedom as to how to work? Since a number of employees in each firm answered the questions, their responses may reflect an organization-wide autonomy-supportive climate.

Data collected from individual respondents should satisfy two criteria to assess an organizational attribute (Edmondson, 1999; Kenny & La Voie, 1985): the construct should be conceptually meaningful at the organizational level; and the data should converge or consent among the respondents. Since the items refer to the organizational-level construct of autonomy-supportive climate by using 'firm' referents, these items may more appropriately reflect the collective construct than mere aggregation of individual perceptions (Fulmer & Ostroff, 2016; Kirkman et al., 2001). The justification for the aggregation of this construct was tested by agreement within organizations, using an intraclass correlation coefficient, ICC1, and a within-group interrater agreement index, r_{wg} (James et al., 1993). The ICC1 value was .18 ($p < .01$), and the r_{wg} value was .81 for autonomy-supportive climate. The ICC1 value exceeded the medium ICC1 value of .10, and the r_{wg} value was strong (LeBreton & Senter, 2008), thus justifying the aggregation. Cronbach's alpha of these items was .73.

Employee satisfaction

Using a five-point Likert scale, the employees rated their satisfaction with the job itself, their compensation, company practices and their firm, in general (Motowidlo, 1984). Among these four items, two items

assessing organizational attributes were selected: satisfaction with company practices and satisfaction with their firm in general. Since satisfaction with the job itself and compensation may differ considerably according to each employee's job characteristics and compensation level, the first two items may not be appropriate to measure collective satisfaction levels and thus were not included in our study. Employees in an autonomy-supportive climate will have higher levels of satisfaction with their organization since they perceive autonomy support from their top management and the organization in general. The items for employee satisfaction were aggregated within organizations to assess it at the organizational level. Since this construct was assessed by employees in several teams or departments within each organization, aggregation of their answers could represent the organization-wide satisfaction level. The justification for this aggregation was tested by agreement within organizations, using ICC1 and r_{wg} (James et al., 1993). The ICC1 value was .14 ($p < .01$), and the r_{wg} value was .64 for employee satisfaction. The ICC1 value exceeded the medium ICC1 value of .10, and the r_{wg} value was moderate (LeBreton & Senter, 2008), thus justifying the aggregation. Cronbach's alpha of these items was .78.

Financial incentives

This construct was measured by HR managers in the corporate surveys. The surveys asked whether their companies grant financial incentives based on individual performance or group performance. The individual incentive variable was coded 1 for companies that grant individual performance-based incentives and 0 otherwise. The group incentive variable was coded 1 for companies that grant team, department or organizational performance-based incentives and 0 otherwise.

Organizational performance

Previous studies have assessed organizational performance with a variety of measures, such as labor productivity, product quality and financial performance. In this study, it was assessed with sales per employee, which has been used as a proxy for organizational performance in a number of previous studies (e.g. Ettlie, 1995; Gahan et al., 2012; Han et al., 2019; Huselid, 1995). This index was used to measure organizational performance because employees who are granted more autonomy and are more satisfied with the organization may exert every effort to produce and sell more products and services. This information was obtained from the KIS data. For simplicity, these values were divided by 1 billion Korean won (approximately 1 million U.S. dollars).

Control variables

In this study, we controlled for variables that may affect employee satisfaction or organizational performance. We controlled for firm size, which was measured by the logarithm of the number of employees. Larger firms may achieve higher organizational performance using market power and economies of scale (Sun et al., 2007). We also controlled for wage, which was measured by HR managers. They were asked to assess relative wage levels by comparing their employees' wages with average wages in the same industry. Higher wages may be linked to higher employee satisfaction and organizational performance (Jaskiewicz et al., 2017). In all the regression models, we included firm fixed effects to control for time-invariant firm fixed effects (e.g. industry and geographical location) and year fixed effects to control for time-related factors (e.g. macroeconomic environment).

Analysis

Using LISREL 8.7 (Joreskog & Sorbom, 2004), we conducted confirmatory factor analyses to evaluate the construct validity of autonomy-supportive climate and employee satisfaction. The goodness-of-fit indexes for the two-factor model indicated a good fit with the data ($SRMR = .03$, $NFI = .99$, $CFI = .99$ and $AGFI = .96$). Furthermore, the two-factor model showed a better fit than the one-factor model, in which all the items for two constructs were loaded on one factor ($\Delta\chi^2_{(1)} = 331.08$, $p < .01$). In addition, we calculated average variance extracted (AVE) with a formula that Fornell and Larcker (1981) proposed. The AVE values were .59 for autonomy-supportive climate and .76 for employee satisfaction, which were larger than the .50 suggested by Fornell and Larcker (1981) as a threshold. These results confirmed the construct validity of these measures.

Fixed effects models were employed in all the equations to test the hypotheses of this study, since null hypotheses that random effects models are preferred to fixed effects models were rejected by Hausman tests. The p -values in all the equations of this study were less than .05 in chi-square tests (Green, 2008). The hypotheses of this study were examined with a moderated mediation model (Hayes, 2013). The indirect effects were assessed by bootstrapping approaches with Stata 16.

Results

Table 1 reports descriptive statistics and correlations between variables. Autonomy-supportive climate was positively correlated with employee satisfaction ($r = .40$, $p < .01$), firm performance ($r = .16$, $p < .01$), group

Table 1. Descriptive statistics and correlations.

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. LnSize	6.00	1.12									
2. Wage	2.92	.87	.23**								
3. Manufacturing industry	.74	.44	-.10**	.00							
4. Finance industry	.07	.25	.27**	.08**	-.44**						
5. Service industry	.20	.40	-.06	-.05	-.83**	-.13**					
6. Individual incentive	.43	.50	.22**	.11**	-.15**	.16**	.07*				
7. Group incentive	.64	.48	.18**	.11**	-.00	.08*	-.05	.03			
8. Autonomy-supportive climate	3.85	.33	.25**	.05	-.04	.08**	-.00	.16**	.08**		
9. Employee satisfaction	3.39	.40	.39**	.35**	-.08**	.18**	-.02	.16**	.13**	.40**	
10. Organizational performance	.61	.71	.19**	.10**	.01	.32**	-.21**	.04	.08**	.16**	.23**

Note: Number of observations = 1,107.

* $p < .05$.

** $p < .01$.

Table 2. Results to examine the moderated mediation model.

	Satisfaction	Performance	Satisfaction	Performance
	Model 1	Model 2	Model 3	Model 4
Constant	2.05 (.31)**	.55 (.22)*	1.83 (.30)**	.70 (.28)*
LnSize	-.01 (.05)	-.05 (.03)	-.00 (.03)	-.06 (.03)
Wage	.05 (.01)**	.01 (.01)	.06 (.01)**	.01 (.01)
Individual incentive	-.02 (.02)	-.02 (.02)	-.52 (.25)**	.28 (.23)
Group incentive	-.00 (.03)	-.02 (.02)	.71 (.24)**	-.49 (.22)*
Autonomy-supportive climate	.31 (.05)**	.04 (.03)	.36 (.06)**	-.00 (.05)
Employee satisfaction		.05 (.02)*		.06 (.03)*
Autonomy \times Individual incentive			.13 (.07)*	-.08 (.06)
Autonomy \times Group incentive			-.19 (.06)**	.12 (.06)*
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
F	9.62**	5.05**	13.14**	5.04**
R ² _{within}	.12	.06	.14	.07
Number of obs. (Number of firms)	1,170 (321)	1,107 (318)	1,170 (321)	1,107 (318)

* $p < .05$; ** $p < .01$.

incentives ($r = .08$, $p < .01$) and individual incentives ($r = .16$, $p < .01$). Employee satisfaction had significant correlations with organizational performance ($r = .23$, $p < .01$), group incentives ($r = .13$, $p < .01$) and individual incentives ($r = .16$, $p < .01$). Organizational performance was significantly correlated with group incentives ($r = .08$, $p < .01$), but not with individual incentives ($r = .04$, *n.s.*).

Hypothesis 1 posits a mediation effect of employee satisfaction in the relationship between autonomy-supportive climate and organizational performance, and Models 1 and 2 of Table 2 examine this hypothesis. Model 1 shows that an autonomy-supportive climate had a significant effect on employee satisfaction ($b = .31$, $p < .01$). Model 2 indicates that employee satisfaction positively affected organizational performance ($b = .05$, $p < .05$). To test the significance of the indirect effect of an autonomy-supportive climate on organizational performance via satisfaction, we employed the bootstrapping approach with replacements to generate 5,000 subsamples of the entire dataset. The indirect relationship was significant ($b = .02$; 95% confidence interval = .0027 to .0354). These results support Hypothesis 1.

Hypothesis 2a suggests the moderating role of individual incentives in the effect of an autonomy-supportive climate on employee satisfaction. In Model 3, the interaction between autonomy-supportive climate and individual incentives was positively related to employee satisfaction ($b = .13$, $p < .05$). This indicates that when firms have individual incentive plans, the effect of an autonomy-supportive climate on satisfaction was strengthened. This result supports Hypothesis 2a.

The result for Hypothesis 2a can more easily be interpreted by plotting the simple slopes for the effect of an autonomy-supportive climate on employee satisfaction in the firms with individual incentives and in those without individual incentives (Cohen et al., 2003). Figure 2 shows

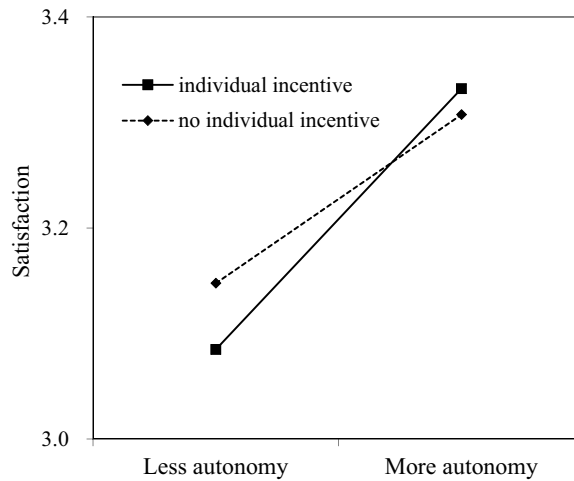


Figure 2. Moderating role of individual incentives in the effect of autonomy-supportive climate on employee satisfaction.

that an autonomy-supportive climate positively affected satisfaction both in firms with individual incentives ($b = .38, p < .01$) and in those without individual incentives ($b = .24, p < .01$). However, the strength of this effect varied depending on whether a company had an individual incentive plan. Individual incentives augmented employee satisfaction when employees were in a more autonomy-supportive climate, whereas individual incentives reduced employee satisfaction when employees were in a less autonomy-supportive climate. Employees were most satisfied in firms with both a more autonomy-supportive climate and individual incentive plans.

Hypothesis 2b suggests the role of individual incentives as a moderator in the effect of an autonomy-supportive climate on firm performance. In Model 4 of Table 2, the interaction between autonomy-supportive climate and individual incentives on organizational performance was negative but not significant ($b = -.08, n.s.$). Thus, Hypothesis 2b was not supported.

We next tested whether the indirect effect of an autonomy-supportive climate on organizational performance via satisfaction is stronger in firms with individual incentives than in those without them, using the bootstrapping approach with replacements to generate 5,000 subsamples. Since individual incentives and group incentives were hypothesized to have opposite influences on the effects of an autonomy-supportive climate on employee satisfaction and organizational performance, their conditional indirect effects were analyzed separately (Tables 3 and 4). Table 3 presents the conditional indirect effect by individual incentives together with conditional direct effects and conditional total effects. The indirect effect of an autonomy-supportive climate on organizational

Table 3. Results for conditional effects by individual incentives.

Dependent variable	Moderator:	Conditional indirect effect		
	Individual incentive	Coefficient	95% confidence interval	
Performance	Yes	.020*	.0047	.0503
	No	.013*	.0017	.0323
	Difference	.007*	.0001	.0292
Dependent variable	Moderator:	Conditional direct effect		
	Individual incentive	Coefficient	95% confidence interval	
Performance	Yes	-.006	-.1240	.0951
	No	.071*	.0030	.1606
	Difference	-.077*	-.2358	.0479
Dependent variable	Moderator:	Conditional total effect		
	Individual incentive	Coefficient	95% confidence interval	
Performance	Yes	.015	-.0981	.1169
	No	.085*	.0193	.1790
	Difference	-.070	-.2265	.0573

Note. All estimates were tested for significance using bias-corrected confidence intervals from 5,000 bootstrap samples.

* $p < .05$.

Table 4. Results for conditional effects by group incentives.

Dependent variable	Moderator:	Conditional indirect effect		
	Group incentive	Coefficient	95% confidence interval	
Performance	Yes	.014*	.0040	.0342
	No	.025*	.0069	.0558
	Difference	-.011*	-.0352	-.0011
Dependent variable	Moderator:	Conditional direct effect		
	Group incentive	Coefficient	95% confidence interval	
Performance	Yes	.095*	.0102	.2063
	No	-.033	-.1291	.0347
	Difference	.128*	.0145	.2980
Dependent variable	Moderator:	Conditional total effect		
	Group incentive	Coefficient	95% confidence interval	
Performance	Yes	.109*	.0245	.2245
	No	-.009	-.0939	.0578
	Difference	.117*	.0046	.2835

Note. All estimates were tested for significance using bias-corrected confidence intervals from 5,000 bootstrap samples.

* $p < .05$.

performance via satisfaction was significant both in companies with individual incentives ($b = .020$, $p < .05$) and in companies without individual incentives ($b = .013$, $p < .05$). The indirect effect, however, was stronger in firms with individual incentives than in those without them ($b = .007$; 95% confidence interval = .0001 to .0292), which supported Hypothesis 2c.

Interactions of autonomy-supportive climate with group incentives display totally different patterns from those with individual incentives. In Model 3 of Table 2, the interaction between autonomy-supportive climate and group incentives had a negative effect on satisfaction ($b = -.19$, $p < .01$). In other words, when firms had group incentives, the effect of an autonomy-supportive climate on satisfaction was undermined, which supports Hypothesis 3a. Figure 3 shows that the effect of

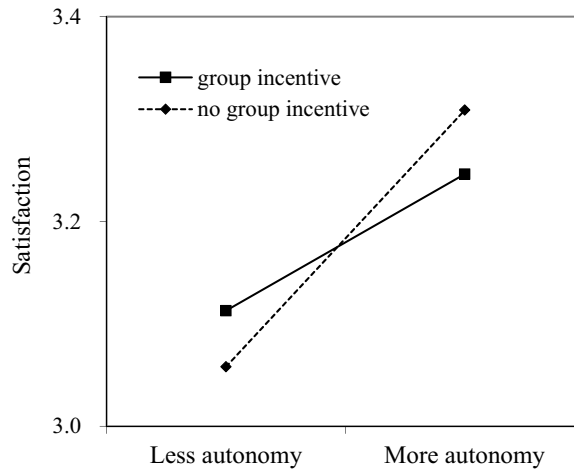


Figure 3. Moderating role of group incentives in the effect of autonomy-supportive climate on employee satisfaction.

an autonomy-supportive climate on satisfaction was weaker in companies with group incentive plans ($b = .20, p < .01$) than in companies without them ($b = .38, p < .01$). In contrast to the moderating effects of individual incentives, when employees were in a less autonomy-supportive climate, their satisfaction level was higher in companies with group incentives than in those without them, but when employees were in a more autonomy-supportive climate, their satisfaction level was lower in companies with group incentives than without them.

In Model 4 of Table 2, the interaction of an autonomy-supportive climate with group incentives had a positive effect on organizational performance ($b = .12, p < .05$). In other words, an autonomy-supportive climate had a stronger effect on organizational performance in companies with group incentive plans than in companies without them. Thus, Hypothesis 3b was also supported. This moderating role of group incentives is presented in Figure 4. An autonomy-supportive climate made little contribution to organizational performance in firms without group incentives ($b = -.01, n.s.$), but it made a significant contribution to organizational performance in firms with group incentives ($b = .11, p < .05$).

Using the bootstrapping approach, we tested whether the indirect effect of an autonomy-supportive climate on organizational performance via employee satisfaction is weaker in firms with group incentives than in firms without them. The results are presented in Table 4 with conditional direct effects and conditional total effects. The indirect effect of an autonomy-supportive climate on organizational performance via employee satisfaction was significant both in companies with group incentives ($b = .014, p < .05$) and in companies without group incentives ($b = .025, p < .05$). However, the indirect effect was weaker in

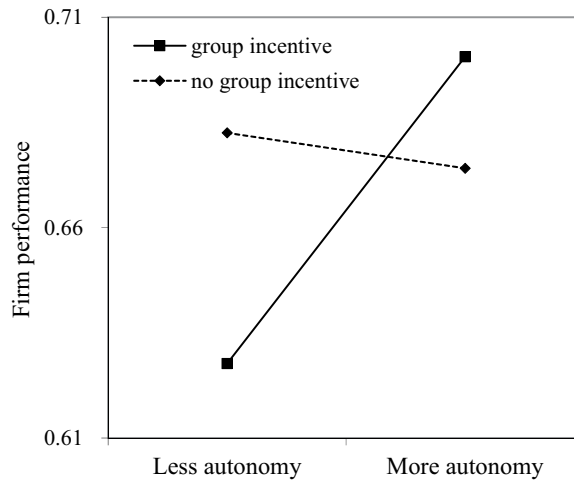


Figure 4. Moderating role of group incentives in the effect of autonomy-supportive climate on firm performance.

firms with group incentives than in firms without them ($b = -.011$; 95% confidence interval = $-.0352$ to $-.0011$). Thus, Hypothesis 3c was supported.

Next, we conducted two supplemental analyses in which financial incentives were assessed in other ways. Although some firms may simultaneously introduce individual incentives and group incentives, we did not categorize those firms distinctively because we hypothesized that the moderating effects of those incentives would work in opposite directions. In reality, however, some companies may have both types of incentive plans, some may have only individual incentives or only group incentives, and others may have no individual or group incentives. Among our sample companies, these proportions were 29%, 15%, 34% and 22%, respectively. Thus, we performed additional analyses to determine whether the interaction effects differ from the above results depending on whether a company had both types of incentives, only individual incentives or only group incentives. The results are presented in Table 5.

The interaction effects of an autonomy-supportive climate with individual incentives and group incentives on employee satisfaction and firm performance are not much different from the results in Table 3. Surprisingly, the effects of an autonomy-supportive climate on satisfaction and organizational performance in companies with both types of incentives were not significantly different from those in companies without any incentives ($b = -.05$, $p > .05$; $b = .07$, $p > .05$, respectively).

In another supplemental analysis, we assessed financial incentives with the percentage of individual employees' income represented by

Table 5. Results of the supplemental analyses.

	Satisfaction	Performance
	Model 1	Model 2
Constant	1.93 (.28)**	.73 (.24)**
LnSize	.01 (.03)	-.06 (.03)
Wage	.04 (.01)**	.03 (.01)*
Both incentives	.19 (.30)	-.29 (.29)
Individual incentive	-.65 (.32)*	.25 (.25)
Group incentive	.63 (.27)*	-.54 (.24)*
Autonomy-supportive climate	.37 (.05)**	-.02 (.03)
Employee satisfaction		.04 (.03)
Autonomy \times Both incentives	-.05 (.08)	.07 (.08)
Autonomy \times Individual incentive	.17 (.08)*	-.06 (.07)
Autonomy \times Group incentive	-.16 (.07)*	.15 (.06)*
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
<i>F</i>	15.95**	3.93**
R^2_{within}	.19	.07
Number of obs. (Number of firms)	1,170 (321)	1,107 (318)

* $p < .05$; ** $p < .01$.

each incentive plan, although these data were not collected in the 2015 wave. An autonomy-supportive climate interacted with individual incentives to enhance employee satisfaction ($b = .005$, $p < .01$) but to decrease firm performance ($b = -.004$, $p < .05$). On the other hand, the interactions of an autonomy-supportive climate with group incentives did not affect employee satisfaction ($b = .001$, $p > .05$) but did enhance firm performance ($b = .002$, $p < .05$). These results support Hypotheses 2a, 2b and 3b but do not support Hypothesis 3a. No matter how financial incentives were measured (i.e. by their presence or by income percentage), two hypotheses were unwaveringly supported: individual incentives strengthen the effect of an autonomy-supportive climate on employee satisfaction, and group incentives strengthen the effect of an autonomy-supportive climate on firm performance.

Discussion

Using national panel data, we find that an autonomy-supportive climate positively affected employee satisfaction, which in turn has a positive effect on organizational performance. The results provide evidence that individual incentives and group incentives exert differential impacts on the effects of an autonomy-supportive climate on employee satisfaction and organizational performance. The moderation analyses show that individual incentives strengthened the effect of an autonomy-supportive climate on satisfaction. Group incentives, on the other hand, undermined the effect of an autonomy-supportive climate on employee satisfaction and strengthened the effect of an autonomy-supportive climate on organizational performance.

Implications

This study makes important contributions to the literature on self-determination theory. While most previous studies on self-determination theory have focused on individual autonomy, the current study found that an organization-wide autonomy-supportive climate positively affects employee satisfaction and firm performance. Although Deci and colleagues (Deci et al., 1989; Ryan & Deci, 2000a) view autonomy as a participative HR practice, meaning that self-determination theory can be applied to an organizational approach as well, most previous studies have applied the theory only to individual autonomy, and thus we have relatively little knowledge about the effects of autonomy at the organizational level (Park, 2018). This study is significant because it reveals that autonomy support at the organizational level has effects on employee satisfaction and organizational performance, similarly to the effects of individual autonomy on job satisfaction and job performance.

Deci and Ryan (1987) admitted that financial incentives may enhance motivation if the incentives are granted in an autonomy-supportive context, but self-determination theory has not yet provided a clear proposition about the interaction effects between autonomy and financial incentives. Moreover, most literature on self-determination theory regarding the effects of financial incentives on motivation has been restricted to individual incentives (Deci et al., 1999). On the other hand, the findings of the current study indicate that employees may perceive and use autonomy differently depending on which type of financial incentives are granted to them, and that individual incentives and group incentives interact with an autonomy-supportive climate to differently affect employee satisfaction. Specifically, the present study contributes to self-determination theory by suggesting that (1) because individual incentives provide employees with the message that they will be compensated if they achieve high performance using the autonomy granted to them, individual incentives may interact with an autonomy-supportive climate to increase employee satisfaction, and (2) because group incentives put pressure on employees to use their autonomy in ways that can improve firm performance instead of their own performance, group incentives may interact with an autonomy-supportive climate to decrease employee satisfaction.

This study also contributes to research on self-determination theory by cultivating a new area: the differential interaction effects between an autonomy-supportive climate and financial incentives on firm performance. In other words, while individual incentives may interact with an autonomy-supportive climate to decrease firm performance, group

incentives may interact with an autonomy-supportive climate to increase firm performance. Thus, further research is required to investigate how these differential interaction effects of financial incentives with an autonomy-supportive climate are linked to employee behavior, such as organizational citizenship behavior (OCB) and job withdrawal behavior. For example, individual incentives may interact with an autonomy-supportive climate to decrease OCB because employees under these incentive plans may be more willing to use their autonomy to enhance their own performance than to cooperate with their co-workers. In contrast, group incentives may interact with an autonomy-supportive climate to increase OCB because employees under these incentive plans may be willing to use their autonomy to enhance co-workers' and the organization's performance.

The findings of this study do not support the undermining hypothesis of self-determination theory, which posits that extrinsic rewards undermine intrinsic motivation and satisfaction. As indicated in Table 2, neither individual incentives nor group incentives had significant effects on employee satisfaction ($b = -.02$, $p > .10$; $b = -.01$, $p > .10$, respectively), despite their positive correlations with employee satisfaction in Table 1 ($r = .16$, $r = .13$, $p < .01$, respectively). In the same manner, the data do not support arguments for the positive effects of financial incentives on autonomy and motivation (e.g. Balkin et al., 2015; Eisenberger et al., 1999; Fang & Gerhart, 2012). When we conducted panel analyses to test the effects of individual incentives and group incentives on an autonomy-supportive climate, neither individual incentives nor group incentives affected an autonomy-supportive climate ($b = .01$, $p > .10$; $b = .00$, $p > .10$, respectively). These results indicate that despite the controversy surrounding the relationships of financial incentives with autonomy perception, job satisfaction and intrinsic motivation, neither type of financial incentives significantly decreases or increases them.

The results of this study suggest various practical implications. First, the results indicate that organizations can expect a significant performance effect by granting substantial autonomy to employees as an organization-wide HR practice. As found in the simple mediation model (Table 2), when employees were in an autonomy-supportive climate, they were more satisfied with the organization, and the organization enjoyed higher sales per employee. Although there may be costs involved in adopting self-managing teams or autonomy-supportive HR practices, such as resistance from middle managers (Langfred & Rockmann, 2016), providing autonomy to employees appears to be beneficial for individual employees and the whole organization.

Since individual incentives positively influence the effect of an autonomy-supportive climate on satisfaction and group incentives

positively influence the effect of an autonomy-supportive climate on organizational performance, top managers may want to introduce both individual incentives and group incentives in order to simultaneously improve employee satisfaction and organizational performance. In fact, Rynes et al. (2005) recommended offering both types of incentives to utilize the advantages and minimize the disadvantages of each. However, supplemental analyses in Table 5 demonstrated that companies with both individual and group incentives did not enjoy any advantage in terms of the effects of an autonomy-supportive climate on employee satisfaction or organizational performance, as compared with companies with only one type of incentives and those without any incentives. These results are consistent with those of Barnes et al. (2011), who pointed out that mixing individual incentives and group incentives could create a conflict between individual interests and group interests because this leads to a social dilemma. The differential interaction effects of individual and group incentives with an autonomy-supportive climate on employee satisfaction and firm performance imply that top management should be circumspect with regard to which combination of practices they adopt among less or more autonomy-supportive practices and individual or group incentives. Figure 5 provides some guidelines for strategic choice according to organizational goals.

It seems to be a reasonable choice for top managers to create a more autonomy-supportive climate because both employee satisfaction and firm performance tend to be higher in such a climate than in a less autonomy-supportive climate. In a more autonomy-supportive climate, top managers should choose whether to adopt individual incentives or group incentives. To increase employee satisfaction, they should introduce individual incentives (Figure 2). However, this approach may lead

		<u>Financial incentives</u>	
		Individual	Group
<u>Autonomy-supportive climate</u>	More	Satisfaction ↑	Satisfaction ↓
		Performance ↓	Performance ↑
	Less	Satisfaction ↓	Satisfaction ↑
		Performance ↑	Performance ↓

Figure 5. Guidelines for strategic choices according to organizational goals. *Note.* Solid arrows refer to significant effects in both measures (presence and income percentage of financial incentives). Dotted arrows refer to significant effects in one measure but nonsignificant effects in the other measure.

to poor firm performance. If top managers have strategic goals of improving firm performance, they should introduce group incentives (Figure 4).

Next, if top managers cannot grant considerable autonomy to their employees for reasons such as resistance from middle managers or complete automation of production processes, they may introduce group incentives to enhance employee satisfaction (Figure 3). However, they are likely to witness decreased organizational performance if they grant group incentives to employees in a less autonomy-supportive climate (Figure 4). Because individual incentives are also not very helpful for enhancing employee satisfaction and firm performance in a less autonomy-supportive climate, the best option may be not to provide any financial incentives. Thus, top management should choose which practices they will adopt depending on whether or not they can create an autonomy-supportive climate and depending on whether their HR strategy aims at enhancing employee satisfaction or improving organizational performance.

Limitations and future research

Although the current study makes important contributions to the literature, it has several limitations, and future research should consider these limitations. The first limitation is that individual incentives and group incentives were measured by their existence and by the percentage of individual employees' income represented by each financial incentive plan (in the supplemental analyses), but not by the percentage of employees covered by each financial incentive plan within an organization. If some employees in a company with financial incentives were not covered by those incentives, for example part-time workers, the results of this study might have been biased. However, since most employees in the sample companies were full-time workers (93%), we assumed that most respondents in companies with financial incentives were covered by the financial incentives. Nonetheless, future research needs to measure financial incentives by the percentage of employees covered by each financial incentive plan, as well as by the presence of financial incentives and by the share of financial incentives among individual employees' income.

A second limitation may come from the fact that manufacturing companies were somewhat overrepresented in the sample (74%). Since the surveys targeted companies with 100 or more employees and manufacturing companies are relatively larger than companies in other industries, the sample companies were concentrated in the manufacturing industry. If future research includes companies with fewer employees, more service firms will be included in the survey.

While this study provided evidence that an autonomy-supportive climate can enhance firm performance through an affective process (i.e. employee satisfaction), it could not examine the indirect effect through a cognitive process, such as the necessity of cooperation and knowledge exchange among employees. When employees are in a very autonomy-supportive climate, they feel responsible for the accomplishment of organizational goals, and they are stimulated to cooperate with each other to accomplish the goals (Janz, 1999). Employees can also increase efficiency by sharing more tacit knowledge and information when they are granted substantial autonomy and responsibility than when they are controlled by managers (Jiang & Chen, 2018). Moreover, employees may use their autonomy to cooperate with each other and to transfer tacit knowledge and information when they are granted group incentives, but they may not use their autonomy in such activities when they are granted individual incentives. Thus, it will be worthwhile to further examine the interaction effects of individual and group incentives with an autonomy-supportive climate on those cognitive variables.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Data availability statement

The data that support the findings of this study are openly available from the Korean Research Institute for Vocational Education and Training at <https://www.krivet.re.kr/eng/eu/eh/euDDALs.jsp>.

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