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How middle managers' participation in decision-making influences firm innovation performance: Evidence from China Employer-Employee Survey Data

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Abstract

Purpose – This paper aims to re-examine the effect of middle managers' participation in decision-making (DM) on the innovation performance of Chinese manufacturing firms. It also testifies the intermediation channels regarding how middle managers' participation influences firm innovation performance by testing the mediating effect.

Design/methodology/approach – This paper constructs a model that determines firm innovation and tests the hypotheses with econometric regressions using first-hand data from the China Employer–Employee Survey. Semiparametric and intersectional regressions are used to show how middle managers' participation in DM influences Chinese firm innovation after controlling for the characteristics of middle manager personnel, entrepreneurs, frontline workers, firm, industry and country.

Findings – This paper empirically shows that middle managers' participation in DM has a significantly positive effect on firm innovation. After testing the mediating effect, the findings show that the improvement of middle managers' DM participation leads to a certain increase in technicians and a reduced dependence on government. In this regard, middle managers' participation is complementary to the human capital of entrepreneurs.

Originality/value – This paper measures the degree of middle managers' participation in DM according to four indicators. It focuses on the influence mechanisms of middle managers' participation in DM on firm innovation performance, based on their ability to allocate external and internal resources. These findings will be useful for investigating management resource reallocation within firms for developing countries.

Keywords Innovation performance, Middle manager, Participation in decision-making

Paper type Research paper

1. Introduction

Middle managers are essential to firm innovation (Wooldridge and Floyd, 1989). Unlike first-line workers, middle managers in firms represent intermediate management, which is subordinate to executive management and responsible for at least two lower levels of junior staff (Aucoin, 1989). Huy (2001) defined middle management as lower than the senior management team but higher than first-line workers, including professional and technical

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workers. According to this definition, middle managers include department managers, regional managers and deputy general managers.

Because middle managers are the intermediaries between the senior management and the lower levels of an organization, they have the opportunity to provide valuable information and suggestions that aid executives when making major decisions. Middle managers can even delegate the major decisions and the main goals of an organization to lower-level employees. In addition, the validity of firm innovation performance can differ without considering the behaviors of corporate middle managers (Ferlie and McNulty, 2004).

However, there is still the question in the current literature of whether middle managers' participation in decision-making (DM) has a significant influence on firm innovation performance. Some scholars have indicated that middle managers' participation in DM does not create practical values for firms. Instead, it only consumes resources. Meanwhile, flat management theory contends that middle managers will bloat the management organization and lengthen the chain of principal-agent, thus reducing overall efficiency (Delmestri and Walgenbach, 2005). Conversely, other scholars have viewed the role of middle managers' participation in DM as positive. Middle managers' participation and commitment to certain strategies bear a significantly positive correlation with the overall operational performance of an organization (Parnell, 2008).

Existing literature has generally focused on the effect of middle managers' participation in DM on organizational performance, based on their roles as transmitters of information and executors of tasks. According to such positioning, middle managers' ability to allocate external–internal resources has become a necessary condition of their positive effect on firm innovation performance. Whereas the Chinese government has seized the "lion's share" of market resources and regulations, middle managers in Chinese firms are characterized by their access to abundant social capital and connection, especially their access to certain governmental resources. The individual firms rely heavily on the relationships (*Guanxi*) with government officials in China, thus their innovation ability has been restrained (Cheng and Hu, 2016). Accordingly, the role of middle managers in innovation is typically crowded out to some extent. Based on the aforementioned information, the following two questions are raised:

Q1. To what extent do middle managers of Chinese firms participate in DM?

Q2. How do middle managers utilize internal-external resources to improve firm innovation performance when they participate in DM?

To answer these questions, the present study analyzes the effect of middle managers' participation in DM on firm innovation performance based on their resource allocation capability.

There are practical implications of this study for Chinese firms to delve into this research. Under the challenge of slowing economic growth, Chinese firms urgently need to improve total factor productivity through the integration of production factors. According to Aoki (2015), the professionalization of corporate governance bears the brunt. Because of institutional factors left over from history, the endogenous governance ability of Chinese firms is insufficient as a whole. More specifically, the "bosses grip the helm", whereas middle managers have few opportunities to participate in DM. As a result, the question of how to forge a professional team of middle managers and achieve modern corporate governance have become significant issues for Chinese firms.

Compared with previous literature, the present study further explores the following two aspects. First, it measures the degree of middle managers' participation in DM and conducts a comparative analysis of four indicators:

(1) dismissal or employment of workers;
(2) subordinate remuneration;
(3) business investment decisions; and
(4) company share transfers.

Second, after controlling for the characteristics of middle manager personnel, entrepreneurs (bosses), frontline workers, firm, industry and country, it focuses on the influence mechanisms of middle managers' participation in DM on firm innovation performance based on their ability to allocate external and internal resources.

2. Literature review and hypotheses

2.1 The relationship between middle managers' participation in decision-making and firm innovation performance

Bower (1970) was one of the first researchers to focus on the importance of middle managers as agents of change in contemporary organizations. However, limited systematic research has been undertaken to define the nature and scope of middle managers' contributions in a firm's innovation. Quinn (1985), who identified some of the roles and contributions of middle managers in the innovation process, contended that middle managers use formal and informal approaches to encourage diverse employees to achieve firm goals and innovation. Floyd and Wooldridge (1992) concluded that middle managers frequently play a key role in making strategic innovation accessible to senior executives. Additionally, Nonaka and Takeuchi (1995) emphasized the central role of middle managers in creating new knowledge in the innovation process which, in turn, fuels organizational growth.

West (2000) focused on team members' participation in DM and testified that it was important to share ideas without fear in innovation. Zahra *et al.* (1999) noted the importance of middle managers in facilitating efforts toward corporate entrepreneurship. Middle managers can also create social capital and the trust required to foster the corporate entrepreneurial process. Mintrom (2003) suggested that a more inclusive and participative DM process in organizations can promote innovation. Furthermore, Sahay and Gupta (2011) found a positive and significant relationship between participation in DM and innovation. Additional studies have discussed the relationship between employee participation and innovation from the perspective of a corporation's structure. Khandwalla (1995) argued that decentralization had a positive motivational effect on employees, whereas Kanter (2004) found that innovative organizations were more decentralized than non-innovative organizations. Finally, Ferlie and McNulty (2004) concluded that decentralization is a requirement for firm innovation.

Based on the aforementioned research, the following hypothesis is proposed:

H1. Middle manager participation in decision-making has a positive effect on firm innovation performance in Chinese manufacturing firms.

2.2 The influencing mechanism between middle manager participation and firm innovation performance

By analyzing the relevant literature, it was found that middle managers' participation influences enterprise innovation in the following ways. Keys and Bell (1982) pointed out that middle managers impose their impacts on enterprise performance through the following roles: facing upward, facing downward and facing outward. Facing upward means to enhance the influence on superiors, whereas facing outward means to enhance the influence on subordinates and become the agents of the organizational boundaries. Huy (2001) assumed that middle managers can have an influence on enterprise performance by their

four roles as entrepreneurs, communicators, therapists and stabilizers. Based on previous research, Floyd and Wooldridge (1997) contended that middle managers play a key role in improving performance, which is decided by their active participation and effective implementation of their senior managers' strategies.

According to the current literature, the majority have analyzed the influence mechanisms of middle managers from the perspective that they can gain more strategic information from their superiors and organize and manage their subordinates. Generally, middle managers' influence on enterprise performance is based on their role as "linking pins", which can enhance their abilities to utilize external resources and integrate internal resources.

In regard to resource utilization, there are three influence mechanisms, the first of which is the allocation of social capital. In China, more social capital means more government resources. Because middle managers can obtain and relocate enough external market information and social resources as well as reduce the dependence on government resources, their participation can affect enterprise innovation performance. Metz and Tharenou (2001) reported that social capital has obvious effects on promoting enterprise performance. Through empirical analysis, Davidsson and Honig (2003) found that social capital, rather than education, is the key to managers' success. King and Zeithaml (2001) evaluated senior and middle managers' ability to utilize social capital and found that there are high consistencies between social capital utilization and enterprise performance. Park and Luo (2001) pointed out that the network of enterprises built on the capital resources of middle managers can largely promote enterprise performance.

Furthermore, scholars have pointed out that the social capital related to external market information can help promote innovation performance, whereas the social capital related to government resources tend to "crowd out" enterprise innovation. Link (1982) stated that instead of promoting innovation performance, government subsidies obtained by social capital have reduced the intensity of research and development (R&D) in enterprises. After a detailed analysis, Lichtenberg (1987) found a complementary relationship between government subsidies and enterprise R&D; that is, the more the enterprises depend on government resources, the lower their output of innovation performance (Lu and Liu, 2015). In consideration of political connection, the government may provide subsidies because of briberies and rent-seeking activities instead of enterprise efficiency (Shleifer and Vishny, 1994). Similarly, Zhao *et al.* (2015) claimed that enterprises tend to use government resources by "rent-seeking" and "free-riding" under the institutional background of China. Such "uses" reduce the expenditure of R&D not only in enterprises but also that in the entire industry. Thus, the following hypothesis is proposed:

H2. Dependency on government has negative intermediate effects on middle managers' participation in decision-making.

The second influence mechanism is the allocation of enterprise technical human capital. Middle managers' participation can promote enterprise innovation performance because they can clearly implement enterprise strategies and future goals, thus relocating the technical human capital of a firm. After an empirical analysis on the correlation between human capital and enterprise performance, Bates (1990) indicated that high-tech workers' knowledge and experience have significantly positive effects on enterprise performance. From the perspective of human capital management, Hatch and Dyer (2004) found that the improvement of technical human capital can enhance enterprise performance. Hsu and Lawler (2007) indicated that the differences in enterprise performance come from different internal resources. Such resources, including technical

human capital attached to employees have an influence on enterprise performance. Similarly, Unger *et al.* (2011) found significantly positive relationships between human capital and enterprise performance.

Because technical human capital promotes enterprise performance to some extent, how do managers allocate enterprise human capital? Cooper and Kleinschmidt (1995) pointed out that managers should allocate more technical employees with high market sensitivity to grasp instant market information and transform innovation theories into innovative outcomes. Managers should also provide opportunities and choices for technical employees, set examples for them and design challenging jobs to stimulate their intelligence and enthusiasm (Edvinsson and Sullivan, 1996). Mumford (2000) stated that the improvement of enterprise performance depends on the work environment provided by managers, which benefits technicians' knowledge discovery, knowledge sharing and exchange of innovation ideas. Gilley *et al.* (2004) contended that managers generally improve the recruitment system and employment mechanism to allocate human capital which, in turn, help retain high-tech employees and increase the core competitiveness of an enterprise. Based on such research, the following hypothesis is proposed:

H3. Human capital allocation has positive intermediate effects on middle managers' participation in decision-making.

The third influence mechanism is the allocation of a promotion competition system. Middle managers' participation can promote enterprise innovation performance because they can obtain more information of first-line workers and create a more active promotion competition system for them. Khan *et al.* (2011) suggested that managers need to use promotion incentives to enhance the sense of belonging and accomplishment among first-line workers which, in turn, can enhance their spirit of cooperation and positively affect enterprise performance. Similarly, Xu and Gao (2006) concluded that the promotion incentive mechanism can improve enterprise performance by encouraging knowledge sharing and the organizational citizenship behaviors of employees. Middle managers play the role of influencing subordinates' behavior patterns and create a competitive environment for their subordinates, thereby reducing their resistance to certain strategies (Floyd and Wooldridge, 1992). Zhang and Chen (2006) stated that there are two channels for the incentive mechanism: internal and external. The external channel contains personnel recruitment, whereas the internal channel includes promotions, job rotations and elimination. Overall, these two channels are inseparable from the roles of middle managers.

Conversely, some scholars have indicated that the lack of a promotion system will have negative effects on enterprise performance. Rich (1997) pointed out that without the trust mechanism built by middle managers through appropriate methods (such as material incentives, etc.), the managers cannot effectively increase the satisfaction and commitment of first-line workers. In fact, employees' cognitive resources will focus on unproductive behaviors, particularly on self-protection and defensive behaviors, which can lead to reduced enterprise performance (Dirks and Ferrin, 2001). Charness and Kuhn (2006) stated that employees focus much attention on the reciprocity mechanism between the managers and them. In this regard, the lack of a long-term reciprocity mechanism cannot guarantee the employees' job satisfaction and enterprise performance. Thus, based on the aforementioned findings, the following hypothesis is proposed:

H4. A promotion competition system has positive intermediate effects on middle managers' participation in decision-making.

3. Methodology

3.1 Analysis model

Figure 1 presents the logical framework of this study. First, this study will testify the relationships between middle managers' participation in DM and firm innovation performance in Chinese manufacturing firms. Then, it will analyze the intermediate effects of *dependency on government*, *human capital allocation* and *promotion competition system*, respectively.

3.2 Data source

The data used in this study to test the hypotheses come from the 2015 China Employer–Employee Survey (CEES), which was jointly conducted by Wuhan University, Tsinghua University, the Chinese Academy of Social Sciences and Hong Kong University of Science and Technology. This survey utilized a list of firms from the third Economic Census (2014) in Guangdong Province, which accounts for the largest proportion of China's economy. Based on random stratified sampling, the survey selected 19 counties from 13 prefecture-level cities in Guangdong, covering the different development levels of various districts, including the Pearl River Delta and western and eastern Guangdong. In each firm, six to ten workers were randomly selected using employee numbers. To ensure a heterogeneous and representative sample, 30 per cent of the participants were middle managers and 70 per cent were non-management staff, of which the majority of the latter were first-line workers. The survey consists of first-hand matched data on firms, entrepreneurs, middle managers and non-management workers from developing economies[1].

Compared with previous research, the data used in the present study include two advantages. First, the CEES data consist of employer- and employee-matched data. In addition to the characteristics of middle managers, the data also cover basic attributes such as firm nature, innovation, boss human capital, front-line workers, government subsidies, etc. Second, a random survey sampling is strictly implemented in the CEES to ensure an objective analysis of the questionnaire results.

3.3 Variables

3.3.1 Dependent variables

3.3.1.1 Firm innovation performance. This study uses the number of patents granted in 2012-2014 to measure firm innovation performance. Because the number of patents is used as a measure of technological innovation in most fields and countries (Jaffe, 2000; Lanjouw and Schankerman, 2004; Motohashi, 2009), this number is used as the proxy for firm innovation in the present study. Moreover, this number is measured by the number of patents granted within and outside mainland China in recent years (2012–2014). This variable is hereafter referred to as *lninnovation*.

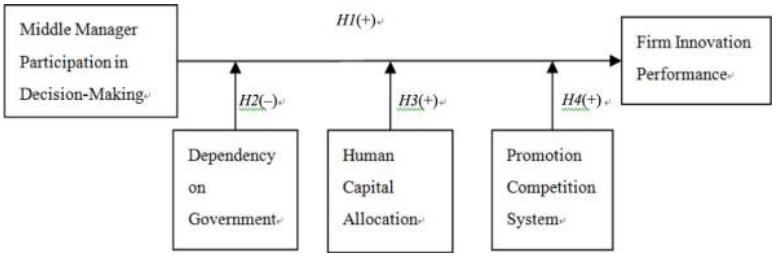

Figure 1.
Logical framework

3.3.2 Independent variables

3.3.2.1 Middle managers' participation in decision-making. Participation in DM is the degree to which an individual is actually involved or his/her control/power is in the business decision process (Allport, 1946; Zopiatis *et al.*, 2014). In the present study, a Likert questionnaire is used to measure the participation of middle managers. For middle managers, their business decisions not only include dismissal or employment of workers and subordinate remuneration but also include the company's investments (including investments in products) and equity transfers. Thus, the overall degree of middle managers' participation in DM can be determined by four indicators:

(1) the decision power in hiring or dismissing employees ("p_1");

(2) subordinate remuneration ("p_2");

(3) business investments ("p_3"); and

(4) company share transfers ("p_4").

These four DM aspects were scored from 1 (*not decided by them*) to 5 (*entirely decided by them*). The mean score of the four variables reflects the participation of middle managers in DM and its symbol is "*participate*":

$$participate = \sum (p_1 + p_2 + p_3 + p_4)/4 \quad (1)$$

3.3.3 Intermediation variables. Based on the literature review, this study includes the following variables:

- *Dependency on government*: This variable means firm dependence on government resources. It is possible to use the subsidies that the firm has obtained from the government to evaluate them according to the literature review. This variable is hereafter referred to as *depend_govern*.
- *Human capital allocation*: This variable represents how middle managers allocate technical human capital. It is possible to use the changes in such human capital to evaluate them according to the literature review. This variable is hereafter referred to as *human_capital*.
- *Promotion competition system*: This variable means the allocation of a promotion competition system in a firm. It is possible to use the number of personnel for the promotion of employees in order to evaluate it according to the literature review. This variable is hereafter referred to as *compete_system*.

3.3.4 Control variables. The control variables include the individual characteristics of middle manager, boss, front-line workers and the characteristics of firm, industry and region (Table I). Moreover, the control variables of middle managers' individual characteristics include education and age. Carmen (2005) found that there were specific relationships between the characteristics of senior managers and the innovation activities of firms. For example, older middle managers tend to take fewer risks in DM. Because middle managers are lower than the senior management (boss), it is important to control for the variable of the firm boss, which is the boss's education. The control variables of firm characteristics include firm age, profitability, capital, investment, sales, intermediate goods, export, processing trade and firm nature. Furthermore, this study also controls for the fixed effects of industry and region.

Variable name		Variable symbols	Statistical definitions
Dependent variable	Innovation	*lninnovation*	Logarithm of the no. of patents granted in 2012-2014
Independent variables	Middle managers' participation in decision-making	*Participate (1: Not decided by them; 5: entirely decided by them)*	Mean of the following four indicators: (1) p_1: How much is your control/power regarding dismissal or employment of workers? (2) p_2: How much is your control/power regarding subordinate remuneration? (3) p_3: How much is your control/power regarding major business investments? (4) p_4: How much is your control/power regarding company share transfers?
Mediation variables	Dependency on government	*depend_govern*	Government subsidies
	Human capital allocation	*human_capital*	Changes in technical human capital
	Promotion competition system	*compete_system*	The number of personnel for the promotion of employees
Control variables	*(1) Characteristics of middle manager personnel*		
	Education	*middle_edu*	Years of education
	Age	*middle_age*	Age of the middle managers in 2014
	(2) Characteristic of boss human capital		
	Education of boss	*boss_edu*	Years of education
	(3) Characteristic of front-line staff		
	Education of front-line workers	*frontline_edu*	Years of education
	(4) Characteristics of Firms		
	Firm age	*firm_age*	Age of firm
	Firm size	*firm_size*	Number of employees
	Profitability	*profit*	Amount of profit in 2014
	Capital	*capital*	Amount of capital in 2014
	Investment	*invest*	Firm investments of fixed assets in 2014

(*continued*)

Table I. Variable symbols and definitions

Table I.

Variable name		Variable symbols	Statistical definitions
Dependent variable	Innovation	*lninnovation*	Logarithm of the no. of patents granted in 2012-2014
	Sales	*sales*	Total amount of sales in 2014
	Intermediate goods	*inter*	Imported intermediate inputs in 2014
	Export	*export*	1 = have exports, 0 = no exports
	Processing trade	*process_trade*	1 = processing trade, 0 = not processing trade
	Firm nature	*nature*	1 = state-owned enterprises, 2 = private enterprises, 3 = foreign enterprises, 4 = others
	(5) Industry characteristic		
	Industry	*industry*	Dummy variable
	(6) Region characteristic		
	Country	*country*	Dummy variable

Notes: According to "Notice on printing and distributing the prescribed standards for small- and medium-sized enterprises", we classifies large, medium and small firms on the basis of the number of employees: small firms < 300; $300 \leq$ medium-sized firms $< 1{,}000$; large firms $> 1{,}000$

3.4 Econometric model

Based on the above analysis, the model used in this study is described by the following formula:

$$\text{In innovation}_{ijd} = \alpha_0 + \alpha_1 participate_{ijd} + \alpha_2 Z_{ijd} + D_j + D_d + \varepsilon_{ijd} \quad (2)$$

In equation (2), where i, j and d represent the sample firm i of industry j in the sample district d, Z_{ijd} represents the series of control variables, whereas D_j and D_d represent the industry and the region fixed effect, respectively.

4. Descriptive analysis

4.1 Basic statistical results

After eliminating any missing values and using the number of patents to represent firm innovation, the effective sample includes responses from 201 firms and 456 middle managers. Table II presents the variable statistics for this study.

As shown in Figures 2-4, firms with different characteristics have different degrees of middle managers' participation in DM. For example, their participation in small firms is much higher than that in medium- and large-sized firms. In fact, the degree of participation decreases as the firm size increases. For the firms that export and process trade, their middle managers' participation is almost two times less than the firms that do not export and process trade. According to Figure 5, firms with a firm age of 40-60 years have the highest degree of middle managers' participation, followed by those with a firm age of 0-20 years and 20-40 years.

5. Empirical results

5.1 Basic regression

Based on equations (1) and (2), this section analyzes the influence of middle managers' participation in DM on firm innovation. By controlling for the industry effect and the district effect, Models (1) to (3) are created to verify the relationship between the core explanatory variables (middle managers' participation) and the explained variable (firm innovation). Table III presents the regression results for these models.

The index of the dependent variable firm innovation is the number of patents (which is greater than zero), whereas the independent variable is participation in DM (which is from 1 to 5). The effect of middle managers' participation in DM on firm innovation is measure by semiparametric regression. As shown in Table III, the effect of middle managers' participation in DM on firm innovation performance is significantly positive, and the significance and coefficients become larger after controlling for more variables through Models (1) to (3). The results indicate that middle managers' participation in Chinese manufacturing firms has a significant influence on firm innovation performance. More specifically, the higher the middle managers' participation in DM, the better the firm innovation performance. This finding supports *H1*, and it is consistent with some previous studies. In sum, rather than simply relying on higher authorities to make decisions, middle managers can enhance the influence of lower organization levels on senior management which, in turn, can improve firm innovation performance.

5.2 Endogeneity problem

The regression results in Table III confirm *H1*. To ensure the causality of the influence of the middle managers' participation in DM on firm innovation and avoid the bias and inconsistency caused by endogeneity, this section further analyzes this problem. In general, endogenous problems occur based on two reasons: the first is that the direction of causality

Variable	Observation	Unit	Mean	SD	Minimum	Maximum
innovation	167	/	14.47	29.89	0	266.67
participate	184	/	1.94	0.64	1	5
depend_govern	186	billion RMB	0.0009749	0.0087601	0	0.1175
human_capital	187	person	78.41	394.34	0	5,000
compete_system	186	person	4.07	22.43	0	300
middle_edu	186	year	12.33	2.34	9	19
middle_age	186	year	37.57	8.01	20	70
boss_edu	191	year	14.88	3.15	0	22
frontline_edu	194	year	10.30	1.86	5.57	16.14
firm_age	170	year	14.75	6.99	4	58
firm_size	198	person	1304.73	4263.41	7	50,000
profit	163	billion RMB	0.04361607	0.1716974	−0.037038	1.540358
capital	192	billion RMB	0.1274188	2.5942370	0	60.3
inter	188	billion RMB	0.0052361	0.1209238	0	2.802214
invest	190	billion RMB	0.0398191	0.7736184	0	17.9
sales	193	billion RMB	0.1054843	0.7465462	0	13.5
export	201	/	0.647	0.478	0	1
process_trade	200	/	0.268	0.443	0	1
firm_nature	197	/	2.550	0.700	1	4

Table II.
Variable statistics

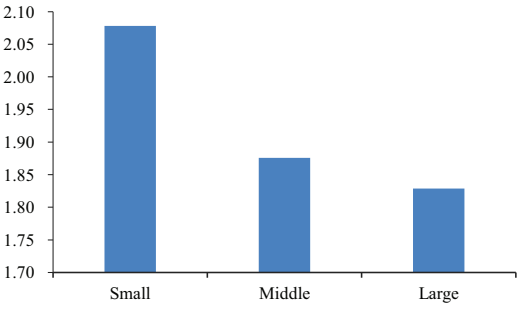

Figure 2.
Middle managers' participation in DM by firm size

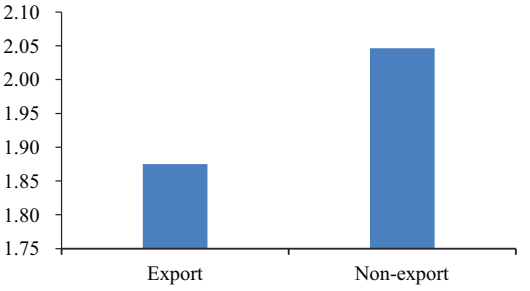

Figure 3.
Middle managers' participation in DM by firm export

between dependent variables and independent variables is unclear, and the second is because of omitted variables. As for the research problem and the building models in this study, there may be endogeneity issues between the dependent and independent variables based on the aforementioned reasons.

Next, the mean of the middle managers' participation in DM of other firms in the same two-dimensional industry (OTHER_PIDM) is used to testify the endogeneity of Model (3) in Table III. The reason for choosing OTHER_PIDM as an instrument variable (IV) is that OTHER_PIDM is an exogenous variable of middle managers' participation in DM for a firm, and it is highly relative to such participation because it is in the same industry. At the same time, OTHER_PIDM is not significantly relative to firm innovation performance. The data of OTHER_PIDM also come from the CEES.

Replacing the independent variable of Model (3) as "OTHER_PIDM", the result of the regression is shown in Table IV. According to the results of Table IV, OTHER_PIDM has significant positive effects on firm innovation performance at a significance level of 10 per cent. The results in Table IV also indicate that the regression of Model (3) in Table III meets the requirements of the robustness of causal inference.

5.3 Interactional regression

Another question, based on the regression results in Tables III and IV, is what are the influencing channels of middle managers' participation on firm innovation? According to previous studies, a possible answer is that middle managers possess a greater ability to allocate resources. In addition, they can promote firm innovation performance by allocating technicians, government resources and workers. To validate this possible answer, this section introduces the intermediary variables of *dependency on government* (*depend_govern*), *human capital allocation* (*human_capital*), *promotion competition system* (*compete_system*) and their interactions with middle managers' participation in DM to empirically test the intermediary effect. The regression results in Table V indicate that the intermediate effect of the number of technicians is positive at a significance level of 5 per cent; the intermediate effect of dependence on government is negative at a significance level of 10

Figure 4.
Middle managers' participation in DM by firm processing trade

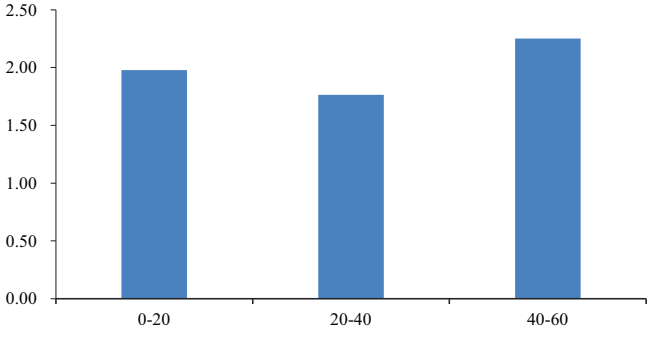

Figure 5.
Middle managers' participation in DM by firm age

Innovation performance	Model (1) (OLS)	Model (2) (OLS)	Model (3) (OLS)
participate	0.375* (0.204)	0.509** (0.203)	0.442** (0.220)
firm_ age	0.033* (0.018)	0.037* (0.019)	0.036* (0.019)
firm_size	−7.518*** (2.025)	−7.108*** (2.045)	−7.338*** (2.068)
invest	−0.0900 (0.093)	−0.110 (0.097)	−0.126 (0.096)
capital	−0.0490 (0.082)	−0.0600 (0.081)	−0.0700 (0.081)
inter	−0.139*** (0.045)	−0.102* (0.052)	−0.126** (0.056)
profit	−1.067** (0.410)	−0.433 (0.465)	−0.581 (0.480)
boss_edu	0.0530 (0.043)	0.0520 (0.045)	0.0420 (0.047)
sales	0.153*** (0.047)	0.111** (0.049)	0.132** (0.053)
process_trade	−0.268 (0.306)	−0.333 (0.305)	−0.325 (0.307)
export	−0.101 (0.286)	−0.0870 (0.292)	−0.153 (0.302)
Reference: Group:SOE			
private_firm	1.220*** (0.416)	0.956** (0.437)	1.021** (0.428)
foreign_ firm	1.299*** (0.403)	1.138*** (0.423)	1.204*** (0.407)
other_ firm	1.414** (0.547)	1.386** (0.566)	1.437** (0.558)
middle_edu		−0.00500 (0.061)	−0.00400 (0.062)
middle_age		−0.030* (0.017)	−0.0280 (0.017)
firstline_edu			−0.0590 (0.066)
Industry Dummies	controlled	controlled	controlled
County Dummies	controlled	controlled	controlled
Observations	156	155	154
R^2	0.2615	0.2903	0.2927

Table III.
Basic regression results

Notes: Values in brackets are Robust Standard Errors; *** indicates the significant level of 1%, ** indicates the significant level of 5% and * indicates the significant level of 10%

per cent, whereas the intermediate effect of the promotion possibility is not significant. These findings support *H2* and *H3*.

Based on these results, it is possible to conclude that the more the middle managers participate in DM, the more that the technical staff and firm innovation are positively affected. Meanwhile, with the increase of middle managers' participation in DM, the firm's dependence on the government decreases significantly which, in turn, positively affects firm innovation. Additional studies have shown that Chinese firms tend to obtain more resources and privileges from the Chinese government because the latter has greater authority regarding various aspects such as land and approvals for certain measures. However, the present study finds that the middle managers of Chinese firms tend to promote endogenous innovation abilities due to their DM participation. Based on the firms' development demands, they also tend to increase the technical staff while decreasing their reliance on the government. In other words, many Chinese firms focus on improving the quality of their products and increasing the number of patents to promote innovation performance. The results demonstrate that decentralization to middle managers can stimulate resource allocation abilities (based on product quality) which, in turn, positively affects firm innovation performance.

6. Conclusions and implications

Using matched data from the 2015 CEES, this study re-examined the effect of middle managers' participation in DM on the innovation performance of Chinese manufacturing

Innovation performance	Model (4) (OLS)
OTHER_PIDM	0.461* (1.71)
firm_age	0.0373* (1.92)
firm_size	−7.164*** (−3.36)
invest	−0.115 (−1.19)
capital	−0.0655 (−0.80)
inter	47.95* (1.84)
profit	−0.705 (−1.48)
sales	0.126** (2.33)
process_trade	−0.332 (−1.04)
middle_edu	−0.00252 (−0.04)
middle_age	−0.0237 (−1.27)
boss_edu	0.0246 (0.50)
firstline_edu	−0.0744 (−1.07)
export	−0.143 (−0.46)
Reference Group: SOE	
private_firm	0.979** (2.32)
foreign_ firm	1.200*** (3.02)
other_ firm	1.417** (2.50)
Industry Dummies	controlled
County Dummies	controlled
Observations	150
R^2	0.2886

Notes: Values in brackets are robust standard errors; *** indicates the significant level of 1%, ** indicates the significant level of 5% and * indicates the significant level of 10%

Table IV.
IV Regression results

Innovation performance	Model (5) (OLS)	Model (6) (OLS)	Model (7) (OLS)
participate	0.402* (1.74)	0.546** (2.38)	0.449** (2.01)
depend_govern	0.00433* (1.72)		
depend_govern × participate	−0.00182* (−1.80)		
human_capital		−0.00305** (−2.54)	
human_capital × participate		0.000893** (2.10)	
compete_system			−0.0345 (−0.95)
compete_system × participate			0.0979 (1.05)
middle manager characteristic	controlled	controlled	controlled
boss human capital	controlled	controlled	controlled
frontline workers characteristic	controlled	controlled	controlled
firm characteristic	controlled	controlled	controlled
Industry Dummies	controlled	controlled	controlled
County Dummies	controlled	controlled	controlled
Observations	152	154	155
R^2	0.2946	0.2788	0.2906

Notes: Values in brackets are robust standard errors; ** indicates the significant level of 5% and * indicates the significant level of 10%

Table V.
Intersectional regression results

firms. Given that missing variables will have a potential impact on the parameter estimation efficiency of core variables, this study controlled for individual level factors of middle managers (e.g. age and education) and firm level factors, including bosses' education, profit rate, assets, investment, sales, whether the firm engages in processing and trade, whether it is state-owned and whether it exports to draw a causal inference. On this basis, it also testified the intermediation channels regarding how middle managers' participation influences firm innovation performance by testing the mediating effect.

First, the findings show that middle managers' participation in DM in Chinese industrial firms has a robustly positive effect on firm innovation performance. With other conditions being the same, the higher the level of middle managers' participation, the higher the firm innovation performance. The results verify the "role" theory in which middle managers play an important role in firm innovation performance. Second, the mediating effect test indicates that improvement of middle managers' participation in DM can increase the number of technicians while reducing the dependence on the Chinese government. As a result, the firms can focus more on improving the quality of their products and increasing the number of patents, both of which positively affect firm innovation performance.

Based on these findings, several policy implications are proposed. First, firms should encourage middle managers to actively participate in DM, especially based on their ability to allocate external-internal resources. Such involvement by middle managers is vital for improving firm innovation performance. Currently, there is a wide gap in science and technology between Chinese firms and their counterparts in developed countries. Besides increasing investments in technology, Chinese firms should constantly strengthen the competence of professional middle managers to "catch up" with advanced industrial countries.

Second, Chinese firms should make a concerted effort to promote the extent of middle managers' participation in DM. To date, the DM ability of middle managers in China is relatively limited, which not only restricts the development of such personnel but also hampers the improvement of firm innovation performance. Thus, entrepreneurs should strengthen the middle managers' participation in DM and delegate powers to them to stimulate the firm's ability of resource allocation (based on product quality) rather than simply relying on speculations regarding the government and various policies.

Finally, Chinese firms ought to fully acknowledge the complementary role between middle managers' resource allocation abilities and entrepreneurs' human capital. For small- and medium-sized enterprises with a lower level of entrepreneur human capital, they should focus on the potential of middle managers and their role in the DM process. This can spur middle managers to transform from single "skilled" managers to all-powerful "operational" managers, which can have a positive and long-lasting effect on firm innovation performance.

Note

1. Similar surveys have been conducted in smaller (developed) economies such as Denmark and Norway.

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