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Can Innovation Incentive Policies Improve the Innovation Performance of Knowledge Workers? Evidence from Chinese State-Owned Enterprises

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Abstract: Innovation by knowledge workers is the foundation of sustainable development within an organization. Chinese policy makers use various innovation incentive policies to improve the innovation performance of knowledge workers at state-owned enterprises, which is in line with China's goal of becoming an "innovative country". This study compares the impacts of incentive policies issued by the central government, by local governments, and at the enterprise level (vertical dimension) and examines the effectiveness of varying policy content (horizontal dimension). The mechanism by which policy supply influences the innovation performance of knowledge workers at state-owned enterprises is theoretically analyzed, and empirical tests based on 1857 samples from field research are then conducted. The results show that incentive policies at each vertical level and each horizontal content level have a significant positive effect on the innovation performance of knowledge workers at state-owned enterprises, although the effects vary. The findings indicate that, along the vertical dimension, local government incentive policies are most effective. Along the horizontal dimension, salary and honor incentive policies are the most impactful. Policy providers should consider the differences in the effects of various innovation incentive policies to formulate relevant incentive policies to improve the innovation performance of state-owned enterprise knowledge workers.

Keywords: innovation incentives; innovation performance; sustainable development; state-owned enterprises; knowledge workers



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1. Introduction

Since the 18th National Congress of the Communist Party of China (CPC), innovation-driven development has become a major strategic objective to promote the in-depth expansion of China's socialist market economy. Building an "innovative country" and promoting the sustainable development of enterprises will continue to be the main goal of China's social and economic construction for a long time to come. The status of state-owned enterprises (SOEs) in China's socialist market economic system is irreplaceable. At present, China has nearly 300 thousand state-owned and state-holding enterprises, accounting for most of the country's economy. Additionally, 96.9% of SOE assets are concentrated in pillar industries related to the national economy and people's livelihoods, including industries such as aerospace, defense and military, steel smelting, and petroleum and electricity. As such, SOEs bear an inescapable responsibility for constricting an "innovative country". However, SOEs are currently facing bottlenecks in the complex innovation environment. For example, it is difficult for industrial manufacturing technology innovation to break through in the international market. Moreover, the initiative to innovate product design technology is limited, and the degree of artificial self-energy coordination is low. To achieve

an innovative country and sustainably developed enterprises, SOEs must make breakthroughs in their innovation capabilities, especially advanced scientific and technological innovation, and this task ultimately falls on SOE knowledge workers.

Peter Drucker first proposed the concept of a knowledge worker. He defined knowledge workers as people who master and use symbols and concepts and work with knowledge and information. Since then, many scholars have studied the concept of knowledge workers from multiple angles. For example, Lee and Maurer [1], Gong et al. [2], and Liu et al. [3] defined knowledge workers from the perspective of job content, whereas Yang et al. [4] defined knowledge workers based on the nature of their work. Wu and Wan [5] defined knowledge workers from the perspective of group characteristics. Although the perspectives of these studies differ, they have reached the following consensus on “knowledge workers”: First, knowledge workers possess solid knowledge and skills. Second, knowledge workers engage in mental work, and third, knowledge workers have the ability to create social wealth. Therefore, this study defines knowledge workers as employees who possess high-level knowledge and skills, and they bring economic and social benefits to their organization through activities such as acquiring, creating, organizing, and applying knowledge.

Knowledge workers are an important resource and a leading force behind the survival and development of modern enterprises [6]. The innovation ability and innovation performance of knowledge workers in SOEs are crucial to the construction of an “innovative country”. Government departments at all levels, including SOEs, are encouraged by innovation incentive policies. Thus, knowledge workers are of great significance for enhancing China’s overall innovation capability and achieving the goal of building an “innovative country”. What, then, are the specific effects of innovation incentive policies on the innovation performance of SOE knowledge workers? This is the core question of this study.

At present, there are many discussions in academic circles about the relationship between knowledge worker incentive policies and innovation performance, and most studies have shown that incentive policies and innovation performance are closely related. However, there are still shortcomings: (1) Most of the existing literature focuses on enterprise-level innovation performance [7–9], with few examining the innovation performance of enterprise employees, especially knowledge workers [10,11]. (2) Most scholars in China only study the impact of incentive policies on the innovation performance of enterprises or employees from a general corporate perspective [12,13]; few studies make a distinction between SOEs and non-SOEs. Exploring the innovation performance of employees at different types of enterprises is important to understanding the “dual structure” of China’s socialist market economy system. It is also important for promoting social innovation from the perspective of employees—the significance of which is obvious. (3) Finally, current research on the supply of innovation incentive policies for knowledge workers is either too general or too singular [14–16]. Innovation incentive policies for SOE knowledge workers are multi-level and multi-content. Existing research only examines such policies from certain angles, which is far from reaching the goal of a comprehensive and in-depth understanding of the effect of innovation incentive policies on the innovation performance of knowledge workers in China’s SOEs. This study directly addresses the deficiencies of the existing research by conducting in-depth research on the supply of innovation incentive policies and their effect on innovation performance. The aim of this study is to explore the rationality and effectiveness of innovation incentive policies for knowledge workers in SOEs in China from the supply side. This can serve as an important basis for policy suppliers, helping them effectively formulate and adjust specific innovation incentive policies. It is also of great significance to improving the rationality of innovation incentive policies, thereby furthering the innovation performance of knowledge workers in SOEs, the competitiveness of SOEs, and China’s transition to an “innovative country”.

2. Literature Review and Hypotheses

Motivation theory asserts that motivation is the internal force that causes individual behavior to change. There are two main reasons for motivation: need and stimulation. A need is a state in which an individual lacks something, mainly within themselves. Stimulation mainly refers to external influences on individual behavior. To improve the innovation performance of knowledge workers in SOEs, the innovation behavior of knowledge workers must change. According to motivation theory, it is necessary to provide external incentives to these workers, while also meeting their internal needs. An innovation incentive policy is a typical external stimulus for the knowledge-based employees of SOEs. Such innovation incentives are issued by a variety of suppliers and contain varying policy contents, and they are designed to meet the needs of different individual employees. From the perspective of the supplying body, there are national-level innovation incentive policies, local government policies, and enterprise-level policies. From the perspective of policy content, these policies have different focuses. Some focus on remuneration, some focus on welfare, and some consider the innovation environment. In order to fully clarify the effect of innovation incentives on innovation performance, this study proposes and tests hypotheses at two levels: policy supply agents and policy content.

2.1. Role of Policy Supply Agents

According to motivation theory, a policy is an important force for stimulating organizational behavior or individual behavioral change [17–19]. Especially for Chinese SOEs, policies are the main form of government intervention [20]. The innovation performance of knowledge workers in SOEs is obviously affected by incentive policies at the enterprise level. However, in China's socialist market economy system, the operation and management of SOEs are subject to strong administrative orders and planning, and government policies also affect the operation of these enterprises [21]. Therefore, this study divides the providers of innovation incentive policies into the central government (including relevant ministries), local governments (provinces and prefectures), and the enterprises themselves.

Innovation incentive policies at the central government level play a programmatic and guiding role in the incentive policy supply system, providing guidance and ideas to other policy suppliers [22]. The 19th Party Congress of the CPC explicitly proposed the building of a grand army of knowledgeable, skilled, and innovative workers and accelerating the creation of a knowledgeable and innovative skilled workforce, giving special recognition to the value of intellectual talent and its role in social innovation. On 31 December 2021, the State Intellectual Property Office issued a notice on the issuance of the "14th Five-Year Plan for Intellectual Property Talent". The Plan proposes that by 2025, the size of the intellectual property talent pool will exceed one million. It notes that the high-level talent pool will be further strengthened, the talent structure will be further optimized, and the effectiveness of talent will be continuously enhanced. These goals underscore the importance of intellectual talent to the state and the respect the state has for it. In addition, the central government has also set up national-level awards and honors such as the "State's Highest Science and Technology Award" and "Advanced Individuals in Science and Technology Progress" as well as the revised "Regulations on the Transfer of Civil Servants" issued by the State Civil Service Bureau in 2020. The government further clarified that eligible employees and managers of SOEs are allowed to transfer to relevant government agencies, and that there is a certain correspondence between the positions of managers of SOEs and the positions of sections, divisions, and departments of government agencies. These innovation incentive policies can motivate knowledge workers in SOEs and contribute to their innovation efficiency.

The mechanism by which the innovation incentive policies of local governments affect the innovation performance of individual knowledge workers at SOEs is similar to that of central government-level policies. Each local government introduces incentive policies applicable to individual SOE knowledge workers in order to stimulate the development of local SOEs and improve regional innovation capacity [23]. The goal of such policies is

to enhance the innovation enthusiasm and innovation performance of SOE knowledge workers in the geographical area.

The human capital theory states that human capital, such as knowledge and skills, is formed through investment and is the most effective investment in the operation of an organization, which is mainly dependent on the organization's knowledge workers [24]. The theory provides a theoretical basis for the innovation investment and innovation incentive policies of SOEs, which are a form of human capital investment. In turn, the innovation performance of knowledge workers, as the main carrier of human capital, reflects the return on investment of human capital [25,26]. Moreover, strong innovation performance by knowledge workers reflects a high return on investment in human capital for SOEs. In other words, the greater the investment in the human capital of knowledge workers, the more obvious the improvement in innovation performance.

Therefore, the following hypotheses are put forward:

Hypothesis 1 (H1). *Innovation incentive policies at different levels have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 1a (H1a). *Innovation incentive policies at the central government level have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 1b (H1b). *Local-government-level innovation incentives have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 1c (H1c). *Firm-level innovation incentive policies have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

The effect of innovation incentive policies on the innovation performance of knowledge workers in SOEs varies across levels [27]. Because of geographical differences and the existence of hierarchical spacing, the ability of high-level policies to accurately assess knowledge workers' needs is limited, and the effectiveness of high-level innovation incentive policies is often not as high as that of lower-level policies [28]. Although the financial rewards and honors given to knowledge workers by central-level government incentives are high, they are out of reach for the vast majority of ordinary knowledge workers, and the effect of such innovation incentives on knowledge workers' innovation performance is limited. However, on the one hand, because resources are more limited at lower levels of government, the scope of incentives that can be provided is also very limited. On the other hand, the standards of innovation incentives at the lower level are generally lower, making them more accessible to knowledge workers, which can limit the ability of such policies to stimulate innovation enthusiasm among knowledge workers. Local government innovation incentives are more realistic than central-level policies and more attractive than enterprise-level policies for average SOE knowledge workers. First, many SOEs are managed by local governments or relevant departments, and their role and contribution to regional economic development are more direct. Local governments also pay more attention to the development of such enterprises, often giving more policy support and resources and providing a higher degree of innovation incentives to SOE knowledge workers [29]. Second, local governments have a more accurate grasp of the actual situation of employees at these SOEs, and the innovation incentive policy supply is more targeted and has a more obvious effect on the innovation performance of knowledge workers. In addition, from the perspective of knowledge workers, innovation incentives at the local government level tend to be more realistic than those at the central level. They also tend to be more rewarding than those at the enterprise level and more capable of stimulating innovation enthusiasm and promoting innovation performance.

Thus, the following hypotheses are put forward:

Hypothesis 1d (H1d). *Different levels of innovation incentive policies have different effects on the innovation performance of knowledge workers in SOEs.*

Hypothesis 1e (H1e). *Local government innovation incentive policies have the most significant effect on the innovation performance of knowledge workers in SOEs.*

2.2. Role of Policy Content

Motivation theory is divided into content-based motivation theory and process-based motivation theory. Content-based motivation theory focuses on what can induce people to change their behavior. A typical content-based motivation theory is Maslow's hierarchy of needs theory. The hierarchy of needs theory states that people have five levels of need: physiological, security, social, respect, and self-realization. Different people have different unmet needs [30], and different policy incentives meet these different needs. Therefore, differences in a country's or region's level of economic development, social culture, institutional environment, and knowledge workers' needs and motivations can result in very different types of innovation incentive policies [31,32]. Although there are differences in the content of knowledge worker innovation incentives, there is also a large degree of overlap. For example, scholars overwhelmingly agree that salary, benefits, and environmental incentives are effective [33,34]. Career- and honor-based incentives are also recognized by scholars [35,36]. Therefore, in terms of incentive content, this study categorizes the content of innovation incentive policies for SOE knowledge workers into five areas: remuneration, benefits, career, honor, and environment, basically covering all the needs in Maslow's hierarchy of needs theory.

Remuneration is the basic reward, and it affirms employees' work achievements and guarantees a basic material life for knowledge workers. A reasonable and fair remuneration system can scientifically reflect the value and contribution of knowledge workers [37,38]. New methods, new processes, and new measures to solve problems proposed by knowledge workers are all manifestations of their innovation, which is a relatively difficult task that requires a lot of energy and time as well as a high level of expertise and knowledge. Thus, appropriate remuneration incentives need to be provided to recognize and reward the innovation achievements of knowledge workers in order to maintain their innovation motivation.

The benefits provided by organizations to employees mainly include basic livelihood benefits, recreational benefits, and education and training benefits, which provide better protection for employees' work, life, and personal career development [39,40]. For example, employee health and other protections provided by the policy provider to SOE knowledge workers convey the humanistic concern of the management, a "people-oriented" management concept [41]. These benefits also reflect the recognition and respect for knowledge workers, which helps to stimulate positive innovations from knowledge workers [42]. Educational and training policies can, to a certain extent, improve the professional and technical level of knowledge workers, which can improve the efficiency of knowledge workers [43]. In addition, welfare policies for knowledge workers' personal and family life can help SOE knowledge workers feel cared for by the organization and government. Benefits such as paid leave and educational facilities for their children can help knowledge workers psychologically feel the care and warmth of the organization [44]. This can help employees approach their work with a happier and more relaxed attitude, which can have a positive effect on their creativity.

Career incentive policies refer to the provision of career development paths for employees by formulating and implementing certain job and position promotion mechanisms [45]. These policies are meant to motivate employees by meeting their need for personal career development. First, career motivation policies help to stimulate innovative attitudes on the part of SOE knowledge workers. When knowledge workers have a clear understanding of their future career prospects, they will be more motivated to work in order to obtain jobs and career goals that match their abilities. Second, career incentive policies have an impact on job satisfaction. Employees' salaries and benefits correspond to their job positions, and the higher the job position, the higher the salary and benefits will be. At the same time, the higher the job position, the greater the employee's sense of achievement and reputation

will be, which, in turn, will increase their degree of satisfaction and personal self-worth. This can improve overall job satisfaction, which will promote innovation enthusiasm and innovation performance among employees [46]. Again, career incentives are conducive to the enhancement of knowledge workers' innovation capabilities [47]. To maintain a competitive advantage in the process of career development and job promotion, knowledge workers will push themselves to enhance their innovation performance by continuously improving their knowledge and professional skills through self-learning [26].

According to Maslow's hierarchy of needs theory, the needs of employees are rising step by step, and only the unmet needs have an incentive effect. Thus, the stimulation effect of material incentives on work efficiency will show a decreasing trend as the incentives increase [48]. For knowledge workers who have been performing well and have a certain material base, higher levels of remuneration and benefits are no longer their main concern; they are more interested in spiritual honor [49]. At the same time, for knowledge workers with higher levels of need, there is often a certain degree of interchangeability between material and spiritual incentives, and the cost of employee motivation can be reduced through honor incentive policies. Therefore, spiritual incentives have a more obvious effect on the innovation performance of knowledge workers, reducing the cost of incentives while enhancing innovation efficiency [50]. SOE knowledge workers are generally well educated and have solid professional skills, and their jobs and incomes are typically high. Their low-level physiological needs and safety needs have been satisfied, so high-level spiritual needs are their mainly pursued goals. The effect of policies targeting these needs on their motivation is more obvious.

Environmental incentives policies include both hard and soft environmental incentives. The hard environment embodies the overall infrastructure of an enterprise, and it is an important part of the overall scale and strength of the enterprise. As such, it plays a fundamental role in guaranteeing the innovation performance enhancement of knowledge workers [51]. The hard environment comprises the basic conditions provided to SOE knowledge workers, and the better the hard environment is, the easier it is for knowledge workers to improve their innovation work and enhance their work efficiency. Corporate culture is an important element of the soft environment, and a harmonious corporate culture helps to share knowledge among employees. This is beneficial to the development of innovative thinking among knowledge workers, which helps them to improve their innovation abilities [52]. At the same time, a quality corporate culture can also, to a certain extent, form moral constraints on the innovative behavior and innovative means of knowledge workers. It can enhance their self-restraint and have a positive impact on the innovation consciousness and initiative of knowledge workers [53].

Based on the above analysis, the following hypotheses are proposed:

Hypothesis 2 (H2). *Different types of innovation incentives have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 2a (H2a). *Pay incentives have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 2b (H2b). *Welfare incentives have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 2c (H2c). *Career incentives have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 2d (H2d). *Honor incentives have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

Hypothesis 2e (H2e). *Environmental incentives have a significant positive effect on the innovation performance of knowledge workers in SOEs.*

3. Study Design

3.1. Definition of Variables

The innovation performance of SOE knowledge workers is set as the explained variable, and each innovation incentive policy as an explanatory variable. The explained variable is calculated using the data envelopment analysis (DEA) method. The explanatory variables are divided into two levels: the vertical dimension, reflecting innovation incentive policies at different levels (central government, local government, and SOEs), and the horizontal dimension, reflecting the different types of incentive policies. To avoid the interference of personal and enterprise-level factors on the analysis conclusions, relevant enterprise background factors, such as enterprise size and establishment period, and personal factors, such as age, education, and job level, are controlled. This solves the problem of related factors interfering with the explained variable. It can also help to avoid endogeneity problems in the model. In addition, to avoid heteroscedasticity problems caused by excessive differences in the absolute values of the variables, all variables are processed logarithmically, and all calculation processes are implemented using Eviews10.0. The specific variables are shown in Table 1.

Table 1. Summary table of variables.

Variable Type	Variable Name	Representative Character	Explanation
Explained variable	Innovation performance	<i>Achi</i>	Comprehensive efficiency—calculated according to the DEA method
Longitudinal dimension explanatory variable	Central government policy	<i>Cpolicy</i>	Sum and logarithm of the corresponding vertical scale item
	Local government policy	<i>Lpolicy</i>	Same as above
	Enterprise-level policy	<i>Epolicy</i>	Same as above
Horizontal dimension explanatory variable	Salary incentive policy	<i>Sala</i>	Sum and logarithm of the corresponding horizontal item
	Welfare incentive policy	<i>Welfa</i>	Same as above
	Career incentive policy	<i>Occup</i>	Same as above
	Honor incentive policy	<i>Honor</i>	Same as above
	Environmental incentive policy	<i>Envi</i>	Same as above
Control variable	size of the enterprise	<i>Size</i>	Total number of employees in SOEs—represented by the lower limit of the questionnaire items
	Years since establishment of the enterprise	<i>Year</i>	Lower limit of the questionnaire items
	The age of the employee	<i>Age</i>	Lower limit of the questionnaire items
	Worker education background	<i>Edu</i>	College degree and below, undergraduate, and postgraduate—assigned 1, 2, and 3, respectively
	Worker job level	<i>Level</i>	1 for basic-level managers, scientific researchers, technical workers, and others; 2 for mid-level managers; and 3 for high-level managers

DEA is the abbreviation of data envelopment analysis.

3.2. Questionnaire Design

The initial questionnaire consisted of basic information about the respondents and their enterprises; measurement terms for innovation incentives at the enterprise level, local government level, and central government level; and measurement terms for innovation performance. The questionnaire included a total of 128 measurement items, of which 8 items were used to gather basic information about knowledge workers, and the remaining four sections included 30 items each. Items were measured using a 5-point Likert scale.

3.3. Formal Survey and Reliability Testing

The formal survey began in mid-April and was completed in early May 2021, lasting three weeks in total. The researchers distributed 2231 questionnaires via WeChat QR codes to knowledge workers in 38 SOEs in a dozen regions and cities, including some

districts and counties in Shanghai, Nanjing, Suzhou, Wuxi, Xuzhou, Hangzhou, Ningbo, Wenzhou, and Shaoxing. Excluding questionnaires with incomplete information, missing important information, or those that did not meet the requirements of knowledge workers, 1857 valid questionnaires were finally returned, with a valid return rate of 83.23%. Among the enterprises in the sample, 9 had more than 5000 employees, accounting for 26.7% of the sample; 11 had 3000 to 5000 employees, accounting for 28.9%; 10 had 1000 to 3000 employees, accounting for 26.3%; and 8 had less than 1000 employees, accounting for 21.1%. The business types cover a wide range of industries, including oil and electricity, non-ferrous metals, telecommunications, and precision instrument manufacturing.

In this study, Cronbach's coefficient was used to test the reliability of the questionnaire, and the critical standard for evaluation was set at 0.7. Factor analysis was used to test the validity of the questionnaire. The Cronbach's coefficient of each cross-sectional scale under the vertical dimension of the innovation incentive policy of SOEs was calculated to be above 0.7, and the overall reliability of each questionnaire scale was high. All the extracted factors can explain the total variance of the original variables well, and the lowest value of the cumulative explanatory variables reached 68.6%, so the overall validity of the questionnaires is high. The data obtained from the formal questionnaire can be used for the analysis of practical issues.

4. Results

4.1. Model Construction

The study tests the effect of different levels of innovation incentive policies on the innovation performance of SOE knowledge workers, and the model is constructed as follows:

$$Achi_i = \alpha + \beta_1 Cpolicy_{1i} + \beta_2 Lpolicy_{2i} + \beta_3 Epolicy_{3i} + \mu_i \quad (1)$$

There are differences in the effect of innovation incentive policies across the different horizontal and vertical dimensions. The explanatory variables for each type of innovation incentive are introduced into the regression model, and regression models for the different policy content at different levels are constructed:

$$Achi_i = \alpha + \beta_1 C_sala_{1i} + \beta_2 C_welfa_{2i} + \beta_3 C_occup_{3i} + \beta_4 C_honor_{4i} + \beta_5 C_envi_{5i} + \mu_i \quad (2)$$

$$Achi_i = \alpha + \beta_1 L_sala_{1i} + \beta_2 L_welfa_{2i} + \beta_3 L_occup_{3i} + \beta_4 L_honor_{4i} + \beta_5 L_envi_{5i} + \mu_i \quad (3)$$

$$Achi_i = \alpha + \beta_1 E_sala_{1i} + \beta_2 E_welfa_{2i} + \beta_3 E_occup_{3i} + \beta_4 E_honor_{4i} + \beta_5 E_envi_{5i} + \mu_i \quad (4)$$

In each formula, α , $\beta_j (j = 1, 2, 3, \dots, k)$ is the partial regression coefficient, and μ_i is the random disturbance term. Formulae (2) through (4) are the models of the different types of incentive policies at the central government, local government, and enterprise levels.

4.2. Empirical Test of the Overall Effect along the Vertical Dimension

First, in calculation model (1), the correlation coefficients between $Achi$ and other variables are relatively high, and the signs of the correlation coefficients are all positive values. This indicates that the innovation incentive policies at all levels are generally consistent with innovation by SOE knowledge workers. The performance changes in the same direction, with the highest absolute value reaching 0.83 and the lowest absolute value reaching 0.64. Therefore, each explanatory variable has a relatively close linear relationship with the explained variable, which is suitable for constructing a multiple linear regression model.

In Table 2, the coefficient of determination fitted by model (1) is 0.8335, the adjoint probability of the F-statistic is 0, and the Durbin Watson (DW) statistic is 1.8923, which is close to 2. The standard error of the partial regression coefficient of each explanatory variable is also relatively small, so the overall goodness of fit of this model is relatively high.

The partial regression coefficients of all explanatory variables are positive. All explanatory variables passed the test at the 5% level, and *Epolicy* reached a significance level of 1%. Thus, all explanatory variables have significant positive effects on the explained variables. Therefore, it is assumed that H1a, H1b, and H1c are all true propositions. The absolute value of each partial regression coefficient is different. The regression coefficient of *Lpolicy* is the largest at 0.1037, followed by *Epolicy*, which reaches 0.0895. The regression coefficient of *Cpolicy* is the smallest, at only 0.0553. Therefore, innovation incentive policies at the central, local, and enterprise levels have different effects on the innovation performance of SOE knowledge workers. This conclusion is consistent with the conclusions of existing research [27]. Local government innovation incentive policies have the greatest effect. Therefore, a large number of studies focus on the impact of local-government policies on enterprises and their employees [54–56]. H1d and H1e are therefore found to be true propositions.

Table 2. Model (1): Fitting results summary.

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
<i>C</i>	0.0241	0.0105	−1.5354	0.0932
<i>Cpolicy</i>	0.0553	0.0246	1.6394	0.0113
<i>Lpolicy</i>	0.1037	0.0534	−0.8612	0.0181
<i>Epolicy</i>	0.0895	0.0803	0.4361	0.0039
<i>R-squared</i>			0.8335	
<i>Prob (F-statistic)</i>			0.0000	
<i>DW</i>			1.8923	
<i>HQ</i>			41.2834	

4.3. Empirical Test of Hierarchical Effects along the Horizontal Dimension

After calculation, the correlation coefficients between *Achi* and the horizontal-dimension explanatory variables at each level are all positive, and there is a positive correlation between the content of innovation incentive policies and the innovation performance of SOE knowledge workers, which is consistent with the theoretical analysis above. The correlation coefficient between each content innovation incentive variable at the central level and *Achi* is above 0.63. The lowest at the local government level is 0.68, and at the enterprise level, the correlation coefficients are all above 0.70. The fitting results of each model are shown in Table 3. It can be seen that the overall fitting coefficients of the three models are all above 0.7835, the adjoint probabilities of the F-statistic are all 0, the DW statistics are all close to 2, and the standard errors of the partial regression coefficients of each explanatory variable are relatively small. Therefore, the overall fitting effect of each model is good.

Table 3. Summary table of fitting results of models (2), (3), and (4).

Variable Model	Model (2)	Model (3)	Model (4)
<i>C</i>	0.033 * (0.0121)	−0.0427 (0.0534)	0.0525 * (0.0072)
<i>C_sala</i>	0.052 * (0.0256)	0.1371 *** (0.0437)	0.1153 ** (0.0069)
<i>C_welfa</i>	0.085 ** (0.0373)	0.0734 *** (0.0204)	0.1069 ** (0.0247)
<i>C_occup</i>	0.117 ** (0.0134)	0.0642 * (0.0136)	0.0731 * (0.0176)
<i>C_honor</i>	0.068 * (0.0086)	0.1061 ** (0.0088)	0.0957 * (0.0341)
<i>C_envi</i>	0.047 * (0.0075)	0.0437 * (0.0255)	0.0688 * (0.0228)
<i>R-squared</i>	0.8073	0.8616	0.7835

Table 3. Cont.

Variable Model	Model (2)	Model (3)	Model (4)
<i>Prob (F-statistic)</i>	0.0000	0.0000	0.0000
<i>DW</i>	2.1053	1.8254	2.2042
<i>HQ</i>	41.0537	64.2084	44.0534

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively; the brackets are standard deviations.

In model (2), under the 10% critical value, the partial regression coefficients of each explanatory variable are significantly positive. At the central government level, various content innovation incentive policies have a significant positive effect on the innovation performance of SOE knowledge workers, so H2a, H2b, H2c, H2d, and H2e are all true propositions. The regression coefficient of *C_occup* is the largest, and the career incentive policy given by the central government has the greatest effect on the innovation performance of SOE knowledge workers. This is mainly related to Chinese characteristics. There is a mutual exchange between SOEs and the civil service system of the government. That is to say, knowledge workers from SOEs are likely to be promoted to government departments if they show good performance [20–57]. In China, many people are keen to work in government, but it is difficult to enter government departments directly through the civil service examination. Therefore, career motivation has great attractiveness for knowledge workers in SOEs. The regression coefficient of *C_welfa* ranks second, and the central government's welfare policy is also relatively powerful. The welfare policies at the central level set out the general framework for the welfare policies that knowledge workers at SOEs can enjoy. Because of the special status of SOEs in China, knowledge workers at these enterprises can also enjoy similar benefits as civil servants, which is very attractive to these workers [58]. The partial regression coefficients of *C_sala* and *C_honor* are 0.052 and 0.068, respectively. The effects of salary and honor incentive policies are average. From a central government perspective, the Chinese government has introduced a macro salary policy. However, at present, the policy is basically to limit the salaries of SOEs' knowledge workers, which is bound to have a strong negative impact on SOEs' knowledge workers [57–59]. Honor incentives at the central level are often highly demanding, and they are expected to remain unreachable for ordinary knowledge workers at state-owned enterprises. Some studies even assert that honor incentives at the central level exist only on paper [60]. Therefore, they are unlikely to produce good incentive effects. The regression coefficient of *C_envi* is the smallest, and the effect of environmental incentive policies is the smallest. Environmental incentive policies from the central government are relatively "empty". It is difficult for individual knowledge workers to feel the effects and benefits of such policies. The role of employee innovation performance is often limited.

In model (3), under the 10% critical value, the partial regression coefficients of each explanatory variable are significantly positive, and the content innovation incentive policies at the local government level and above have a significant positive effect on the innovation performance of SOE knowledge workers. Therefore, H2a, H2b, H2c, H2d, and H2e are all true propositions. The regression coefficient of *L_sala* reached 0.1371, which is the largest among all the explanatory variables. Salary incentive policies at the local government level have the greatest effect on the innovation performance of SOE knowledge workers. At present, local governments in China have realized the important role of SOEs and knowledge workers in local economic development. In order to attract more high-quality talent, local governments have introduced generous salary incentive policies [61,62], and high-quality talent will have better innovative performance. The regression coefficient of *L_honor* is 0.1061, second only to *L_sala*, and the effect of honor incentive policies is also obvious. Compared with honor incentives at the central level, incentives issued by local governments are not as remote. However, they are more authoritative than honor incentives at the enterprise level [63]. The regression coefficients of *L_welfa*, *L_occup*, and *L_envi* are 0.0734, 0.0642, and 0.0437, respectively. Local-government-level welfare incentive policies, occupational incentive policies, and environmental incentive policies have limited

effects; especially so for environmental incentive policies, which are the smallest of all the incentive policies.

In model (4), the partial regression coefficients of each explanatory variable are all positive numbers, and all have passed the 10% critical value of significance. Therefore, the contents of innovation incentive policies at the enterprise level have a significant positive effect on the innovation performance of SOE knowledge workers. H2a, H2b, H2c, H2d, and H2e are all true propositions. The regression coefficients of E_{sala} and E_{welfa} rank among the top two. Salary incentive policies and welfare incentive policies are the most motivating among all the incentive policies provided by SOEs, and they produce the greatest innovation performance [64–66]. For the vast majority of knowledge workers in ordinary SOEs, salary and benefits from the enterprise are their main source of income, and they will pay more attention to the level of salary and benefits provided by the enterprise. Therefore, these have a more obvious effect on workers' innovation performance. The existing research also has objections regarding the incentive effect of compensation and welfare. It is believed that compensation incentives will cause employees to pay attention to observable individual output while ignoring team cooperation, which is not conducive to team production. These studies conclude that enterprises should weaken compensation incentives for knowledge workers [67,68]. The regression coefficients of E_{occup} and E_{honor} are 0.0731 and 0.0957, respectively. Enterprise-level career incentive policies and honor incentive policies have a positive effect on innovation performance. This is because the phenomenon of seniority ranking is relatively serious in SOEs. Therefore, career motivation is also an incentive for knowledge workers in SOEs [69]. At the same time, honor is an important condition for promotion in SOEs. Therefore, knowledge workers also attach equal importance to honor incentives. The regression coefficient of E_{envi} is the smallest, and the effect of environmental incentive policies is the smallest. Although environmental incentive policies at all levels have a certain effect [51–53], the effect is very low. According to Maslow's hierarchy of needs theory, it may be that the level of needs of knowledge workers in most SOEs is still limited, and the requirements for working conditions, organizational atmosphere, corporate culture, and other environmental factors are less. However, it may be that environmental incentive policies at all levels cannot effectively meet the needs and preferences of knowledge workers in SOEs.

Generally speaking, all content innovation incentive policies have a significant positive effect on the innovation performance of SOE knowledge workers. Without considering the vertical dimension factors, H2a, H2b, H2c, H2d, and H2e are still true propositions. Combined with the model (1) fitting results, whether it is the overall effect in the vertical dimension or the effect of different horizontal policy content, innovation incentive policies have a significant positive effect on the innovation performance of SOE knowledge workers, so it is assumed that H is a true proposition.

5. Conclusions and Recommendations

5.1. Main Conclusions and Limitations

This study investigates the influence of innovation incentive policies on the innovation performance of SOE knowledge workers. The results show that innovation incentive policies, as an external stimulus, will not only affect enterprises, but also stimulate workers' innovation performance. At the same time, this study pays attention to the characteristics of the "dual structure" of China's socialist market economy system, distinguishes state-owned enterprises from non-state-owned enterprises, and explores the impact of innovation incentive policies on the innovation performance of state-owned enterprises' knowledge workers from the perspective of state-owned enterprises, which enriches relevant research on the effect of innovation incentive policies. In addition, this study distinguishes between incentive providers, which are divided into three levels: central government, local government, and enterprises. The results show that innovation incentive policies at the central government, local government, and enterprise levels all have significant positive effects on the innovation performance of SOE knowledge workers, but the strength of the

effect differs. Policies at the local government level have the strongest effect, followed by enterprise-level policies, with central government-level policies having the weakest effect. Finally, this study distinguishes the incentive effects of different policy contents. At the central government level, career incentives have the strongest effect, followed by welfare incentives, with pay incentives and honor incentives being average and environmental incentives being the least strong. At the local government level, remuneration incentives have the strongest effect, followed by honor incentives, and environmental incentives are the weakest. At the enterprise level, pay incentives and benefit incentives are the two strongest incentives for knowledge workers, while environmental incentives remain the least strong.

This study has three limitations. First, the vertical dimension of the current supply of innovation incentive policies for knowledge workers in SOEs in China is not sufficiently detailed. The vertical dimension of policy supply is divided into three levels: “central–local–enterprise”. However, in reality, there are many levels of vertical policy supply from the Chinese government, including the State Council; ministries and commissions; provincial, municipal, and district, and county levels. There are differences in the impact of innovation incentive policies formulated at these different levels, which are not strictly distinguished in this study. Second, although the questionnaire used in this study meets the quantity of the study, it also tries to make the sample conform to overall characteristics when sampling. However, in the actual sampling process, sampling was still conducted according to the principle of accessibility, rather than strictly according to the sampling method of simple random, stratified, or classified sampling. Third, the relationship between China’s SOEs and the government is quite special, and the conclusions based on China’s data have certain limitations in terms of external validity.

5.2. Countermeasures and Suggestions

To further improve the innovation performance of knowledge workers, policy providers should consider the following points:

1. Pay attention to the combination of authority and flexibility in the central government’s policies. The policy formulation process at the central government level should give full play to its guidance, strategy, and system in the incentive policy supply system. At the same time, to avoid a “one size fits all” policy, give local governments and SOEs flexibility in supplying innovation incentive policies to accommodate the differences between SOEs in China’s various regions.
2. Highlight the dominant position of policies at the local government level. Innovation incentive policies issued at the local government level have the most obvious effect on the innovation performance of SOE knowledge workers. Local governments should consciously assume the main responsibility and obligation to incentivize innovation among SOE knowledge workers. Under the guidance of the central government, local governments can formulate targeted salary incentive policies and honor incentive policies based on the actual scale and innovative capabilities of local SOE knowledge workers. Because local government policies have the greatest ability to stimulate innovation, increasing the supply of incentives from local governments can maximize the value of these policies.
3. Take advantage of the flexibility of incentive policies at the SOE level. Incentive policies at the enterprise level should be tailored to the specific conditions of the SOE, so SOEs should be empowered to refine, flexibly use, and adjust local government-level policies. At the same time, policymakers should leverage the efforts to increase the effect of incentive policies at the central and local government levels within the enterprise, establish models and examples, strengthen the psychological impact of incentive policies on knowledge workers, and stimulate their enthusiasm for innovation.
4. Further improve the salary and welfare incentive system. Under the premise of full horizontal comparison, policy providers should formulate relatively fair and

reasonable structured compensation and welfare incentive policies based on the characteristics of SOE knowledge workers; policies should also reflect the difficulty of innovation and the characteristics of the talent market. Performance evaluation index setting and index weight setting should emphasize the comprehensive and objective reflection of the innovation achievements of knowledge workers.

5. Expand career promotion channels. The limited number of management positions and the existence of subjective factors in the competition for management positions will dampen the enthusiasm of knowledge workers who have strong intentions to secure management positions. A dual-channel mode of job promotion could be attempted to flatten the organizational structure of SOEs. At the same time, attention should be paid to the dynamic adjustment of management positions to give knowledge workers more opportunities for promotion.
6. Pay attention to honor incentives. The honor incentive policies of local governments have obvious effects on the innovation performance of SOE knowledge workers, while the effects of honor incentive policies at the central government level and enterprise level are not very prominent. However, honor incentives at these levels do promote the improvement in SOE knowledge workers' innovation performance. Policy providers should control the number and value of honor selections and enhance the standardization and fairness of the honor selection process to give adequate attention to honor incentive policies.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in this study. All our questionnaires are anonymous. At the same time, we stated at the beginning of the questionnaire that if you do not want to be the respondent, you can refuse to fill in. We promise the respondents that the data obtained will only be used for academic research.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy and ethical.

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