Quantitative Finance and Economics

QFE, 9(2): 400–424.
DOI: 10.3934/QFE.2025013
Received: 18 February 2025
Revised: 20 April 2025
Accepted: 30 April 2025
Published: 19 May 2025

https://www.aimspress.com/journal/QFE

Research article

Incentive mechanism of supply-demand equilibrium in science and technology talent policies on innovation willingness: An empirical study from China based on the perceived benefit-risk framework

Zhang Shijing[1], Wang Mengzi[2,3] and Liu Fang[2,4]*

[1] Department of Human Resources, Central South University, Changsha 410083, China
[2] School of Public Administration, Central South University, Changsha 410083, China
[3] Zhengzhou Public Utility Investment Development Group Co., Ltd., Zhengzhou 450003, China
[4] Audit Division, Central South University, Changsha 410083, China

* **Correspondence:** Email: liuf@csu.edu.cn; Tel: +8613873161959; Fax: 0731-88879602.

Abstract: The crux of scientific and technological innovation is talent, thus, examining the impact of the supply-demand equilibrium of talent policies in science and technology on innovation willingness provides a theoretical foundation for refining government innovation policies and enhancing human capital efficiency in technological innovation. In this study, we proposed a theoretical framework integrating the Expectancy Theory of Motivation and the Policy Acceptance Model, with the objective of investigating this incentive mechanism. Empirical analysis, facilitated by two mediating variables, policy perceived benefits and administrative burden, revealed that only supply-side policy supply-demand equilibrium has a significant positive impact on innovation willingness, while the supply-demand equilibrium of demand-based policies and the supply-demand equilibrium of institutional-environmental policies have no significant impact. This is likely due to the fact that supply-side policy equilibrium directly and substantially enhances the valence, expectancy, and instrumentality of innovation behaviors among scientific and technological talents. It is important to note that administrative burden significantly moderates the impact of policy perceived benefits, and both factors serve as fully mediating internal mechanisms in this process. This research proffers novel evidence pertaining to the primacy of supply-side instruments in motivating innovation. Moreover, it provides a public economics foundation for the optimization of talent policies and the advancement of efficient innovation resource allocation.

Keywords: perceived benefit-risk; incentive mechanisms; technological innovation; science and technology talent policies

JEL Codes: E71, O38, H83

1. Introduction

In the context of a global economic slowdown, structural transitions, and the emergence of new industries, innovation policy has once again become a central focus of research in the field of public economics (Edler and Fagerberg, 2017). Within this discourse, human capital emerges as a crucial component of innovation policy analysis (Geels, 2004). A significant challenge arises from the fact that, without effectively stimulating the enthusiasm of potential researchers, additional investments may result in inflated wages rather than enhanced innovation outputs. It is therefore imperative to stimulate researchers' innovation willingness in order to circumvent such inefficiencies (Karlson et al., 2021).

At present, Chinese governments at all levels attach great importance to talent development, believing that policy interventions and resource investments can directly influence talent attraction and industrial innovation. Local governments have been enthusiastic in their implementation of successive "new talent policies." Nevertheless, challenges pertaining to practical aspects of talent work in China continue to hinder the innovation fervor of scientific and technological talent (Ni & Zhang, 2021), chiefly expressed in two domains: First, most policies exhibit superficial innovations characterized by homogenized incentive measures and mismatched incentive structures. This results in "policy ineffectiveness" that fails to significantly enhance innovators' sense of resource acquisition. Second, the implementation of policies can be hindered by excessive administrative burdens, including fragmented departmental coordination, cumbersome procedures, and a management system that prioritizes control over service. These factors create substantial obstacles for talents to access policy benefits, thereby hindering policy goal attainment (Eriksson et al., 2019).

Researchers have focused predominantly on the evaluation of talent policy effectiveness through input-output calculations. However, there is a critical need to stimulate individual innovators' motivation, which is the fundamental objective of talent policies. Researchers have analyzed policy effectiveness from the perspective of stakeholders, neglecting the attempt to measure the alignment between policy supply and demand, and have not identified implementation factors affecting policy outcomes.

The fundamental principle of incentives is predicated on the satisfaction of human needs in order to motivate behavior (Bloom et al., 2019). The mere increase in policy quantity is inadequate for enhancing effectiveness (Jiang & Shi, 2023); achieving a supply-demand equilibrium between policy inputs and talent needs is imperative for optimal policy outcomes. According to the findings of Garrod and Olczak (2021), academic research suggests that balanced policy portfolios are conducive to the maximization of incentive effects. Content-based motivation theories posit that managers should identify specific incentive factors through organizational arrangements to fulfill hierarchical needs and guide target behaviors. These theories emphasize that recognition and satisfaction form the foundation of effective incentives.

The Policy Acceptance Model (PAM) posits that behavioral attitudes are shaped by individual cognitive systems, where external incentives must influence personal perceptions to ultimately affect actions. Two pivotal factors have been identified: Policy usefulness and policy ease-of-use. Cho et al.

(2022) integrated the Technology Acceptance Model with the Technology-Organization-Environment framework to examine digital advertising policy adoption in South Korea, confirming the significant impacts of perceived usefulness and ease-of-use on policy acceptance. It is evident that a number of additional factors have a significant impact on the issue under discussion. These include organizational innovation culture, perceived cost burdens, and industry pressure perceptions. Zhu et al. (2022) combined the Technology Acceptance Model with benefit-risk perceptions, empirically demonstrating that policy perception dimensions, perceived benefits, and risks collectively affect government data openness willingness. These findings emphasize the importance of conducting research within a specific context to gain a comprehensive understanding of the behavioral and attitudinal factors that influence policy. This approach necessitates a thorough examination of external factors and cognitive elements that extend beyond policy perceptions.

Here, we investigate how supply-demand matching in science and technology talent policies incentivizes innovation willingness through their transmission pathways. We put forward the hypothesis that government-regulated external incentives have the capacity to effectively stimulate innovation by authentically addressing talent needs. The effective implementation of talent policies is predicated on the enhancement of perceived policy benefits, while concomitantly mitigating risk perceptions, thereby fostering innovation (Lucas et al., 2018).

Integrating the Expectancy Theory of Motivation with the Policy Acceptance Model, we construct a benefit-risk perception framework that introduces policy benefit perception and administrative burden as mediating variables between policy equilibrium and innovation willingness. This approach facilitates a more profound examination of three critical dimensions: Policy activation mechanisms, optimal policy instrument combinations, and key influencing factors requiring control during implementation. The research provides novel perspectives for both academic investigations on policy incentives and governmental practice in policy innovation.

2. Theory and hypotheses

2.1. Policy supply-demand equilibrium and innovation willingness

The policy supply-demand equilibrium in science and technology talent governance is defined as the equilibrium between the policy provisions offered by the government and the demand for such policies in the field of scientific and technological talent. Academic discourse identifies two major forms of policy disequilibrium: The terms “policy surplus” and “policy insufficiency” are employed to describe this phenomenon. The former refers to an excess of policy supply, which is inefficient, while the latter refers to an excessive demand for policies coupled with inadequate policy provision.

In academic research on the supply-demand balance of policies, scholars classify policy content into different incentive dimensions based on the categories of innovation activity models. The most frequently cited framework by Rothwell and Zegveld categorises policy instruments into three types according to their functional orientation: Supply-side, demand-side, and institutional-environmental policies (Rothwell and Zegveld, 1981). Supply-side policies provide resource support to scientific and technological talents to reduce their innovation risks (Tang et al., 2022); demand-side policies stimulate R&D investment by promoting regional and industrial development, providing appropriate innovation opportunities and guidance for talents, while reducing market uncertainties for innovative products; institutional-environmental policies address the social-environmental support required for talent innovation (Rothwell and Zegveld, 1981). The innovation readiness of S&T talent refers to the psychological state in which individuals are willing to invest personal time and effort in acquiring, learning and developing innovative knowledge. It represents their subjective inclination and attitude towards engaging in creative activities and includes two major aspects: Their "desire and ability to innovate" and their "ability to realize research achievements and self-realisation" (Schot and Steinmueller, 2018).

The expectancy theory of motivation is a cognitive theory of motivation, which posits that motivation is determined by the product of three factors: valence, expectancy, and instrumentality (Vroom, 1964). Current supply-side, demand-side, and institutional-environmental policies for scientific and technological talent include many innovative incentives. Although they objectively provide abundant resources and support for scientific and technological talent, the policies can only increase their willingness to innovate if they fulfill the following conditions: The talent believes that completing an innovative task will lead to substantial rewards (high valence), they have the confidence and ability to complete the task (high expectancy), and they believe that completing the task will inevitably lead to rewards (high instrumentality) (Kuhlmann and Rip, 2018). Therefore, it can be concluded that the equilibrium between policy supply and demand is the basic guarantee for stimulating the innovation motivation of S&T workers and plays a crucial role in promoting innovation investment. It can effectively stimulate the innovation motivation of scientific and technological talents.

Specifically, the equilibrium of supply and demand in supply-side policies provides resource support for the innovation efforts of scientific and technological talent. The provision of direct resource support has been demonstrated to engender a reduction in the risks associated with innovation, while concomitantly increasing expectations of success. Furthermore, it has been shown to enhance both the valence and instrumentality of the innovation process. As Lerner (2009) demonstrated, the provision of resources has been shown to result in increased output and more direct reward subsidies, thereby significantly enhancing both valence and instrumentality (Che et al., 2022). The equilibrium of supply and demand in demand-side policies has been demonstrated to stimulate research and development investments by promoting regional and industrial development, providing scientific and technological talent with appropriate innovation opportunities and guidance. This has the effect of reducing market uncertainty associated with innovative products and encouraging talent to innovate in response to industry and regional needs. The result is an increase in their sense of innovation value and, consequently, their innovation willingness. The equilibrium of supply and demand in institutional-environmental policies refers to the fulfillment of social environmental support needs for the innovation activities of scientific and technological talent. Research has indicated that an inadequate innovation environment support can distort decision-making processes and lead talent to perceive that innovation will not yield substantial rewards. This, in turn, has been shown to reduce their innovation willingness (Rothwell and Zegveld, 1981). Conversely, a well-supported innovation environment has been shown to enhance intrinsic innovation effectiveness, thereby increasing innovation willingness.

In academic research on the equilibrium of policy supply and demand, policies are classified based on different motivational dimensions. These can be categorized into supply-side policies, demand-side policies, and institutional-environmental policies. Thus, we posit the following hypotheses:

H1: The equilibrium between policy supply and demand has a significant positive effect on innovation willingness.

H1a: The equilibrium of supply and demand in supply-side policies has a significant positive effect on innovation willingness.

H1b: The equilibrium of supply and demand in demand-side policies has a significant positive effect on innovation willingness.

H1c: The equilibrium of supply and demand in institutional-environmental policies has a significant positive effect on innovation willingness.

2.2. The Mediating role of administrative burden

Administrative burden can be defined as the significant demands placed on citizens by formal and informal policy designs during the implementation of policy. Scientific and technological talent, as rational economic agents, evaluate options from a cost-benefit perspective in order to select the optimal method for meeting their resource needs (Baekgaard et al., 2021). According to the Existence, Relatedness, and Growth (ERG) theory, the lower the degree of need fulfillment, the higher the individual's desire for that need. The presence of talent is contingent upon a propensity to evaluate policy requirements, in addition to the administrative demands associated with accessing policy resources, in order to ascertain the associated benefits and costs. Individuals who demonstrate robust perceptual control are characterized by a pronounced awareness of their activities and a strong orientation towards outcomes. The focus of these studies is less on the negative aspects of policy processes, and, as a result, the administrative burdens are given a lower rating (Johnson, 2022). In other words, administrative burden is seen as an inevitable cost in the process by which scientific and technological talent obtain the desired and mandated policy resources (Dimand et al., 2023). The more balanced the policy supply and demand, the greater the perceived accessibility of policy support by the talent. Consequently, in interactions with government entities, individuals demonstrate a propensity to allocate less cognitive resources to the undesirable facets of the procedure, thereby encountering a diminished perceived administrative load. Conversely, in circumstances where equilibrium between policy supply and demand is sub-optimal; for instance, when policy supply is lower than demand,the "competition" for policy resources intensifies. Consequently, scientific and technological talent is compelled to allocate a greater proportion of their time and effort to the preparation of the application process, thereby diminishing their sense of autonomy and augmenting the administrative load. In a similar manner, an excess of policy supply relative to demand has been shown to result in the multiplication of available resources, thus giving rise to an augmentation in learning and application procedures (Hattke, 2020). This, in turn, has been demonstrated to engender a diminution in the perceived control over resources, while concomitantly increasing the administrative burden. It is imperative to acknowledge the significance of time as a precious resource for scientific and technological talent. When administrative burdens, such as repetitive reporting in research management, continuous performance evaluations, and obstacles in resource acquisition, encroach upon researchers' time and energy without providing affirmation and support for innovation, it can gradually erode their research interest and self-identity, reducing their willingness to innovate. The equilibrium between policy supply and demand has been demonstrated to influence the administrative burden experienced by scientific and technological talent. A lower degree of match has been shown to result in a greater administrative burden, and consequently, a diminished willingness to innovate (Bozeman and Youtie, 2020).

The Existence, Relatedness, and Growth (ERG) theory posits that individuals simultaneously harbor multiple need dimensions. The degree to which scientific and technological talent requires supply-side, demand-side, and institutional-environmental policies varies. In the absence of an equilibrium between policy supply and demand, whether characterized by excessive or insufficient supply, talent is compelled to dedicate additional time and effort to the pursuit of and application to these resources. This increased policy cost further encroaches upon their time and energy, significantly reducing their work motivation. It is the contention of this study that, in consideration of the aforementioned arguments, the following hypotheses are proposed:

H2: Administrative burden mediates the impact of the equilibrium between policy supply and demand on innovation willingness.

H2a: Administrative burden mediates the effect of the equilibrium in supply-side policies on innovation willingness.

H2b: Administrative burden mediates the effect of the equilibrium in demand-side policies on innovation willingness.

H2c: Administrative burden mediates the effect of the equilibrium in institutional-environmental policies on innovation willingness.

2.3. The mediating effect of policy perceived benefits

The concept of perceived policy benefits signifies the subjects' cognitive evaluations of the policies, which is divided into two dimensions: Perceived ease of use and perceived usefulness. The concept of perceived ease of use in the context of policy implementation pertains to the clarity of the policy content and the perceived costs associated with responding to the policy. In contrast, perceived usefulness is defined as the policy subjects' understanding of the effectiveness and specificity of a policy in addressing issues (Davis, 1985).

The policy acceptance model posits that behavioral intention is contingent on perceived policy benefits. The subjects of policy have been shown to exercise considerable agency in forming attitudes towards the policy environment. This is due to different cognitive evaluations leading to varying behavioral tendencies. Technological innovation is an intrinsically driven, complex activity. The equilibrium between policy supply and demand provides scientific and technological talent with resource instruments of interest (Edquist, 2019). When such talent perceives that this resource support aligns with the challenges they face, they exhibit heightened enthusiasm and willingness to innovate. In other words, the process by which policy supply-demand equilibrium motivates scientific and technological talent is that objective policy incentives affect the individuals' cognitive systems; through perceiving, understanding, and interpreting the policy, the talent forms a psychological reality of policy perceived benefits, a key factor influencing innovation willingness (Anderson et al., 2014). Thus, the equilibrium between policy supply and demand can affect innovation willingness by influencing the policy perceived benefits of scientific and technological talent.

Based on the aforementioned findings, this study proposes the following hypotheses:

H3: Policy perceived benefits mediate the impact of the equilibrium between policy supply and demand on innovation willingness.

H3a: Policy perceived benefits mediate the effect of the equilibrium in supply-side policies on innovation willingness.

H3b: Policy perceived benefits mediate the effect of the equilibrium in demand-side policies on innovation willingness.

H3c: Policy perceived benefits mediate the effect of the equilibrium in institutional-environmental policies on innovation willingness.

2.4. The chain mediation effect of administrative burden and policy perceived benefits

The process of government provision of regulatory services often increases the administrative burden on citizens through complex and time-consuming administrative procedures. Procedural institutions, which embody administrative burden, refer to the formal and informal rules and regulations present at various stages of citizen participation in political processes. Ideally, these procedures should be standardized and streamlined; however, when they gradually evolve into bureaucratic red tape, they significantly elevate citizens' administrative burden (Moynihan et al., 2015), thereby affecting the policy recipients' favorable evaluations of the policy.

The establishment of management and service rules for scientific and technological talent has involved the incorporation of complex procedural institutions with the objective of screening groups that are deemed to be "irresponsible or unethical" and not aligned with policy objectives. Nevertheless, these measures have the potential to impede the processes for talent acquisition (Wang et al., 2023). On the one hand, the cumbersome administrative procedures require scientific and technological talent to access and comprehend an increasing amount of information. On the other hand, the difficulty of obtaining informal procedural information further elevates their learning costs. Conversely, elaborate procedures increase the number of steps in the qualification application process, necessitate visits to multiple departments, and prolong waiting times, thus heightening their compliance costs (Bozeman and Feeney, 2011) and encroaching on the time available to talent. In the course of policy implementation, the presence of complex, opaque, and high-barrier procedural institutions has been demonstrated to result in an increase in the administrative burden on scientific and technological talent. This has been demonstrated to weaken the perceived accessibility of policy support, thereby substantially diminishing their appraisals of the policy (Carrigan et al., 2020). Consequently, the intrinsic motivation for innovation is diminished by these institutional barriers, which significantly reduce internal motivation and suppress the willingness to innovate. In summary, scientific and technological talent process objective support elements cognitively and perceive external policy, material, and cultural supports, which they then internalize as an intrinsic sense of support. This, in turn, affects their innovation willingness.

Based on the above findings, this study proposes the following hypotheses:

H4: Administrative burden and policy perceived benefits play a chain mediating role in the impact of the equilibrium between policy supply and demand on innovation willingness.

H4a: Administrative burden and policy perceived benefits play a chain mediating role in the impact of supply-side policy on supply-demand equilibrium on innovation willingness.

H4b: Administrative burden and policy perceived benefits play a chain mediating role in the impact of demand-side policy supply-demand equilibrium on innovation willingness.

H4c: Administrative burden and policy perceived benefits play a chain mediating role in the impact of institutional-environmental policy supply-demand equilibrium on innovation willingness.

Based on the above assumptions, the theoretical framework is shown in Figure 1:

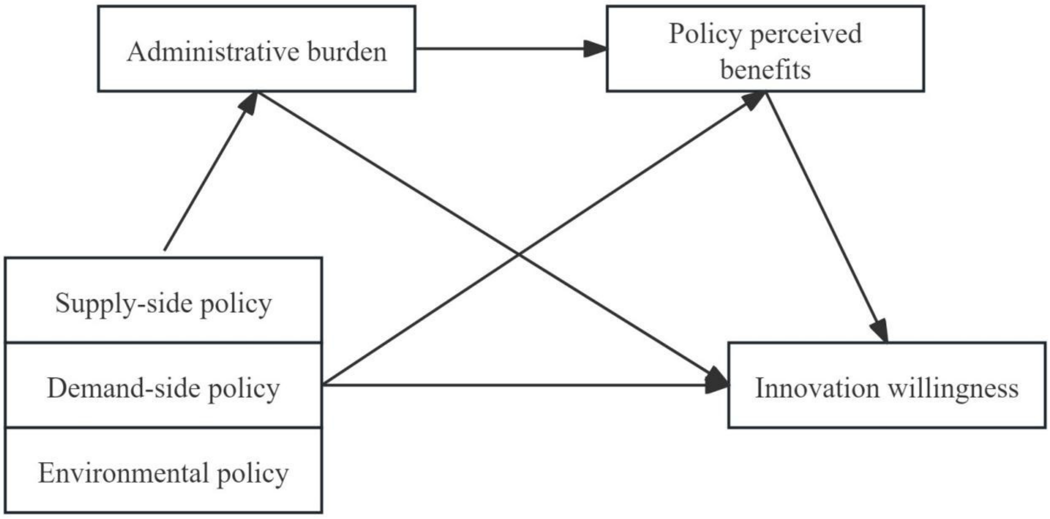

Figure 1. The theoretical framework diagram.

3. Materials and methods

3.1. Research samples and data sources

3.1.1. Policy sample and sources

This study commenced in 2012 and concluded in 2022. A textual search was conducted on the official website of the Hunan Provincial Government, with the objective of identifying policies relating to science and technology, talent, projects, and talent recruitment. The search was conducted using keywords, and policies from Hunan Province, China, were identified. Duplicate entries and documents with a low relevance to the research topic were excluded, resulting in a final total of 179 target policy documents.

3.1.2. Questionnaire sample and sources

This study was conducted in the form of online research to select the workplace for Hunan Province. The study population comprised universities, hospitals, research institutes, and enterprises that specialize in scientific and technological talent. A total of 721 questionnaires were collected, and after deleting the invalid ones, a total of 700 valid questionnaires were obtained, resulting in a questionnaire validity rate of 97%.

3.2. Variables and measurements

3.2.1. Measurement of policy supply

First, the classification of policy instruments proposed by Rothwell and Zegveld (Rothwell and Zegveld, 1981) was utilized to establish a two-dimensional analytical framework for the analysis of policies concerning scientific and technological talent. In this framework, the X-dimension represents the policy instrument dimension, while the Y-dimension represents the policy target dimension. Second, a policy content analysis was conducted in which the policy texts were coded to extract policy information that aligned with the research objectives, as demonstrated in Table 1 (due to space constraints, selected first-level coding keywords are listed in parentheses). The results obtained from the two-dimensional analysis of the policy texts were counted and summarized. The statistics of the three types of policy instruments are shown in Table 2. Finally, based on the frequency of usage of each type of policy instrument, a ranking value representing policy supply was derived, as shown in Table 3.

Table 1. Classification of scientific and technological talents.

Third-level coding	Second-level coding	First-level coding
Policy target	Early-stage Scientific and Technological Talent in Public Institutions	35 years old and below, working in universities, hospitals, or research institutes as scientific research staff.
	Early-stage Scientific and Technological Talent in Enterprise Units	35 years old and below, working in enterprise technology research and development.
	Development-stage Scientific and Technological Talent in Public Institutions	36–45 years old, working in universities, hospitals, or research institutes as scientific research staff.
	Development-stage Scientific and Technological Talent in Enterprise Units	36–45 years old, working in enterprise technology research and development.
	Established-stage Scientific and Technological Talent in Public Institutions	45 years old and above, working in universities, hospitals, or research institutes as scientific research staff.
	Established-stage Scientific and Technological Talent in Enterprise Units	45 years old and above, working in enterprise technology research and development.
Policy instrument	Supply-side policy	Research Projects and Funding Support (Financial Support, Project Funds); Research Equipment Platforms (Platform Enhancement, Research Bases); Team (Team Building, Team Rewards); Evaluation System and Promotion Channels (Categorical Evaluation, Evaluation Criteria); Research Exchange Platforms (Academic Seminars, Visiting Scholars); Talent Honorary Titles (Furong Talent, Provincial and Municipal Talent); Talent Services (Connection and Coordination, Information Resource Services); Compensation and Benefits (Income Distribution, Performance Rewards, Returnee Innovation Revenue)
	Demand-side policy	Industrial Strategic Positioning and Development Prospects (Leading the province in science and technology, Strong Focus on Manufacturing Development); Industrial Development Ecosystem (Industry Chain, Industrial Parks, Upstream and Downstream Industries, Pilot Programs); Tax Incentives (Tax Reductions, Tax Exemptions);

Institutional-environmental policy	commercialization of scientific and research findings (Industry-Academia-Research Collaboration and Exchange, Technology Transfer); Entrepreneurship Incubation Platforms (Innovation-driven entrepreneurship, Technology Driven Entrepreneurship); Institutional Quotas (Quota system of public institutes); Talent Mobility Channels (Grassroots Mobility, Part-time Positions, Talent Recruitment). Talent-Friendly Environment (Respect for Talent, Tolerance for Entrepreneurship and Innovation); Welfare and Benefits (Family Welfare, Educational Resources for Children, Spouse Employment Placement, Medical Insurance, Housing supply and support); Research Autonomy (Autonomy, Institutional and Systemic Reforms, Independent Decision-making); Intellectual Property Services (Intellectual Property, Recognition of Independent Innovation Products, Patent Rights); Tech Finance Services (Tech Finance, Financing Guarantees, Credit System).

Source: Organized by the authors based on the coding of the policy text.

Table 2. Statistical results of the scientific and technological talent policy supply.

	Supply-side policy	Demand-side policy	Institutional-environmental policy
Early-stage Scientific and Technological Talent in Public Institutions	307	357	147
Early-stage Scientific and Technological Talent in Enterprise Units	289	352	144
Development-stage Scientific and Technological Talent in Public Institutions	287	349	116
Development-stage Scientific and Technological Talent in Enterprise Units	263	333	156
Established-stage Scientific and Technological Talent in Public Institutions	290	386	144
Established-stage Scientific and Technological Talent in Enterprise Units	263	336	155

Table 3. Policy supply ranking values for scientific and technological talent.

	Supply-side policy	Demand-side policy	Institutional-environmental policy
Early-stage Scientific and Technological Talent in Public Institutions	1	2	3
Early-stage Scientific and Technological Talent in Enterprise Units	3	3	4
Development-stage Scientific and Technological Talent in Public Institutions	4	4	5
Development-stage Scientific and Technological Talent in Enterprise Units	5	6	1
Established-stage Scientific and Technological Talent in Public Institutions	2	1	4
Established-stage Scientific and Technological Talent in Enterprise Units	5	5	2

3.2.2. Policy demand measurement and calculation

The Measurement of Policy Demand. We build on the demand measurement scale for overseas returnee young faculty by Zhu Junwen and Wang Linchun (Zhu and Wang, 2019). The measurement of demand is divided into four questions: The first part consists of three multiple-choice questions (selecting the top three most important items), such as "What type of research support do you most expect to receive?" The second part consists of one ranking question, asking participants to rank the expected level of support from three types of policies, from strongest to weakest.

Policy Demand Calculation. Based on the demand data from the survey, the first step is to calculate the demand index. Each participant selected nine items from a list of 20 sub-policy instruments and ranked the importance of three policy instruments. Thus, the demand index for each of the three policy instrument categories can be calculated. The specific calculation method is as follows: Demand Index = (Σ Frequency × Weight) / Number of Responses to this Question. Next, the demand scores are calculated. Since the survey did not restrict the number of respondents across the six categories of talent, the demand data includes responses from different sample sizes. Therefore, the demand count for each talent group must be divided by the number of individuals in that group. Also, because respondents were required to select from three policy instrument categories, the range is narrowed to the sub-instruments within each policy tool category, making it impossible to directly observe the demand for each participant within the 20 sub-policy instruments. Therefore, the demand calculated in the previous steps is multiplied by the demand index of each respective sub-policy instrument. Finally, the results are summed and ranked to obtain the demand ranking values for the six types of scientific and technological talent and three policy instrument categories, as shown in Table 4.

Table 4. Policy demand ranking values for scientific and technological talent.

	Supply-side policy	Demand-side policy	Institutional-environmental policy
Early-stage Scientific and Technological Talent in Public Institutions	3	6	4
Early-stage Scientific and Technological Talent in Enterprise Units	1	3	1
Development-stage Scientific and Technological Talent in Public Institutions	2	5	5
Development-stage Scientific and Technological Talent in Enterprise Units	6	2	2
Established-stage Scientific and Technological Talent in Public Institutions	4	4	3
Established-stage Scientific and Technological Talent in Enterprise Units	5	1	6

3.2.3. Policy supply-demand equilibrium degree calculation

Firstly, the total number of three types of policy tools corresponding to the six types of scientific and technological talents is counted, and then the ordinal value is determined according to the number of policy tools, which are sorted from 1 to 6. Then, the policy supply-demand equilibrium degree is calculated according to the following formula:

$$D_{sde} = 6 - |O_s - O_d|$$

Here, D_{sde} is Policy supply and demand equilibrium degree, O_s is policy supply ordinal value, O_d is policy demand ordinal value. $D_{sde} \in [1,6]$; the worst is 1, and vice versa is the best.

3.2.4. Administrative burden measurement

We employ the administrative burden scale developed by Herd and Moynihan (Herd and Moynihan, 2019), which is used internationally. This scale incorporates modifications based on relevant interview content to tailor the scale to the specific context of scientific and technological talent administrative burdens in China. The scale consists of 7 items, as shown in Table 5. The scale consists of 7 questions, as shown in Table 5. The measurement uses a Likert 5-point scale, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree." The Cronbach's α coefficient for this measurement is 0.873. Additionally, the CITC (Corrected Item-Total Correlation) values for the items range from 0.652 to 0.809, all greater than 0.5. The α values after deleting any item were all lower than the overall α coefficient.

Table 5. Administrative burden measurement scale.

Dimension	Question	Scale source
Learning Cost	You are aware of the relevant talent policies and the channels for accessing related services.	Herd & Moynihan (2019)
	You can easily, promptly, and accurately access relevant talent policies.	
	The specific content of the relevant talent policies, such as application conditions and procedures, is easy to understand.	
Compliance Cost	The administrative processes related to research activities are simple.	
	The materials you need to prepare, the forms you need to fill out, and the documents you need to obtain for relevant research and talent funding are clear and straightforward.	
Psychological Cost	The current research management system hinders you from focusing on research activities.	
	The current administrative processes take up too much of your time.	

3.2.5. Policy perceived benefits measurement

We adapt the policy perceived benefits scale developed by Venkatesh et al. (2003) and modifies it according to the context of this study. The scale consists of 6 questions, as shown in Table 6. The Cronbach's α coefficient for this measurement is 0.91. The CITC (Corrected Item-Total Correlation) values for the individual items range from 0.652 to 0.809, all greater than 0.5. The α values after removing any measurement item are all lower than the overall α coefficient.

Table 6. Measurement scale for policy perceived benefits.

Dimension	Question	Scale source
Policy perceived ease of use	I find the content of talent policies to be specific and practical.	Ran et al. (2020)
	I believe the thresholds for obtaining relevant talent policy funding are set reasonably.	
	I think the implementation of talent policies is thorough and well-executed.	
Policy perceived usefulness	I feel that talent policies are highly targeted in meeting talent needs.	
	I believe talent policies can address many challenges in my work and life.	
	I think talent policies can create a favorable environment for innovation incentives.	

3.2.6. Innovation willingness measurement

We draw on the innovation willingness measurement scale developed by Fishbein and Ajzen (1975) and the innovation performance scale by Scott and Bruce (1994). Based on these, some items were removed and integrated, resulting in a scale with 6 questions, as shown in Table 7. The Cronbach's α coefficient for this measurement is 0.922. The CITC (Corrected Item-Total Correlation) values for the individual items range from 0.652 to 0.809, all greater than 0.5. The α values after removing any measurement items are all lower than the overall α coefficient.

Table 7. Measurement scale of willingness to innovate.

Variable	Question	Scale source
Innovation Willingness	I am willing to proactively seek new work methods and related tools. I am willing to solve new problems and challenges. I strive to turn innovative ideas into practical applications. I have a basic plan for carrying out innovative work.	Fishbein & Ajzen (1975)
Innovation Performance	In order to achieve innovation goals, I actively work to obtain the necessary resources. I strive to find original solutions to problems.	SCOTT & BRUCE (1994), Han et al. (2007)

4. Empirical analysis

4.1. Policy supply-demand equilibrium

Using the formula for policy supply and demand, the policy supply-demand equilibrium degree and direction are calculated, as shown in Table 8. The supply-demand equilibrium of supply-side policy is the best, followed by the environmental policy, and the worst supply-demand equilibrium of demand- side policy. For scientific and technological talents in public institutions, talents in the early-stage are faced with excessive supply of demand-side policy, the supply and demand of the three types of policies for talents in the development-stage and the established-stage are relatively balanced. For the scientific and technological talents of enterprise units, the supply and demand of the three types of policies for talents in the early-stage are relatively balanced, and the supply of demand-side policy for talents in the development-stage is insufficient, during the established-stage, talents face the oversupply of demand-side policy and the undersupply of institutional-environmental policy.

Table 8. Statistics on the degree of equilibrium between supply and demand for policies.

	Supply-side policy	Demand-side policy	Institutional-environmental policy
Early-stage Scientific and Technological Talent in Public Institutions	4	2	5
Early-stage Scientific and Technological Talent in Enterprise Units	4	6	3
Development-stage Scientific and Technological Talent in Public Institutions	4	5	6
Development-stage Scientific and Technological Talent in Enterprise Units	5	2	5
Established-stage Scientific and Technological Talent in Public Institutions	4	3	5
Established-stage Scientific and Technological Talent in Enterprise Units	6	2	2

4.2. Common method bias test

Since the data for this study were all self-reported by scientific and technological talent, there may be potential common method bias. To test for this, we use the Harman single-factor test. Factor analysis is performed on all measurement variables, and three factors are extracted. The variance explained by the single largest factor is 25.633%, which is below the 50% threshold. Therefore, this study does not have significant common method bias issues.

4.3. Construct validity test of variables

Following the recommendations of Podsakoff et al. (Hayes, 2013), confirmatory factor analysis is used to test the discriminant validity of the variables (see Table 9). The fit indices for the three-factor model are optimal among the measurement models ($X^2/df = 4.715$, CFI = 0.946, TLI = 0.936, RMSEA = 0.073), reaching the standard values. Therefore, the baseline model demonstrates good discriminant validity and is suitable for subsequent testing and analysis.

Table 9. Confirmatory factor analysis.

Model fitting index	X^2	df	X^2/df	RMSEA	CFI	TLI	SRMR
three-factor model	546.903	116	4.715	0.073	0.946	0.936	0.039
two-factor model[1]	2949.651	118	24.997	0.185	0.642	0.588	0.164
two-factor model[2]	1060.635	118	8.988	0.107	0.881	0.863	0.059
two-factor model[3]	2372.629	118	20.107	0.165	0.715	0.672	0.208
single-factor model	3502.505	119	29.433	0.202	0.573	0.512	0.176

4.4. Correlation among variables

To understand the distribution of the sample, we use SPSS 22.0 software to perform descriptive statistics and Pearson correlation analysis on the variables of policy perceived benefits, administrative burden, and innovation willingness. The results are shown in Table 10. Administrative burden is significantly negatively correlated with policy benefit perception ($r = -0.669$, $p < 0.01$) and innovation willingness ($r = -0.262$, $p < 0.01$). Policy perceived benefits are significantly positively correlated with innovation willingness ($r = 0.348$, $p < 0.01$). These results provide preliminary support for the hypotheses of this study.

Table 10. Correlation analysis.

Variable	M	SD	1	2
1 Administrative burden	2.4949	0.68403		
2 Policy perceived benefits	3.5198	0.67582	−0.669**	
3 Innovation willingness	4.0214	0.54893	−0.262**	0.348**

4.5. Hypothesis testing

Our theoretical model is a chain multiple mediation model; therefore, the Bootstrap sampling method is used to test the mediation effects.

4.5.1. The impact of policy supply-demand equilibrium on innovation willingness

Hypothesis 1 posits that policy supply-demand equilibrium significantly affects innovation willingness. We use linear regression analysis in SPSS 22.0 to test the relationship between the supply-demand equilibrium of the three types of policies and innovation willingness. Innovation willingness of scientific and technological talent is set as the dependent variable, with supply-side policy supply-demand equilibrium as the independent variable, forming Model 1 (M1). In Model 2 (M2), the dependent variable remains unchanged, and the independent variable is the demand-side policy supply-demand equilibrium. In Model 3 (M3), the dependent variable remains unchanged, and the independent variable is institutional-environmental policy supply-demand equilibrium.

Table 11. Regression analysis of supply-demand equilibrium and innovation willingness.

	M1		M2		M3	
Variable	β	t	β	t	β	t
supply-side policy supply-demand equilibrium	0.088*	2.346				
demand-side policy supply-demand equilibrium			−0.051	−1.348		
institutional-environmental policy supply-demand equilibrium					−0.017	−0.457
R^2	0.008		0.003		0.000	
$\triangle R^2$	0.006		0.001		−0.001	
F	5.503(p=0.019)		1.817(p=0.178)		0.208(p=0.648)	

Note: Two-Tailed Test *p<0.05 **p<0.01.

Model 1 (M1) shows that the supply-demand equilibrium of supply-side policies has a significant positive impact on the innovation willingness of scientific and technological talent (β = 0.088, p < 0.05). In contrast, Model 2 (M2) indicates that the supply-demand equilibrium of demand-side policies does not significantly affect innovation willingness (β = −0.051, p > 0.05), and Model 3 (M3) reveals that the supply-demand equilibrium of institutional-environmental policies also has no significant effect on innovation willingness (β = −0.017, p > 0.05). Consequently, Hypothesis 1a is supported, whereas Hypotheses 1b and 1c are rejected. Demand-side policies set the direction for innovation and can increase the regulatory pressure on scientific and technological talent; however, they do not stimulate spontaneous innovation. Institutional-environmental policies serve as a maintenance factor within the incentive framework, positively influencing talent retention in urban areas but having no effect on innovation motivation. In contrast, only supply-side policies provide direct support for innovative activities by supplying the necessary preliminary resources for scientific and technological talent (Lewis, 2020). When this support is appropriately calibrated, it can enhance the intrinsic motivation for innovation; if too weak, it fails to offer sufficient incentive, whereas if too strong, it may lead to an over justification effect, resulting in faster diminishing marginal returns.

In summary, the hypothesis testing confirms that the supply-demand equilibrium of supply-side policies significantly influences innovation willingness, while the supply-demand equilibrium of demand-side and institutional-environmental policies does not. Therefore, subsequent empirical analyses will focus solely on the impact of supply-side policy supply-demand equilibrium on the innovation willingness of scientific and technological talent.

4.5.2. Test of the mediating effects of administrative burden and policy perceived benefits

A model was constructed with innovation willingness as the dependent variable, supply-side policy supply-demand equilibrium as the independent variable, and administrative burden and policy perceived benefits as mediators. A bootstrap resampling procedure with 5,000 iterations was implemented, and the confidence level for the confidence intervals was set at 95%. The results of the mediation effect tests are presented in Table 12. Specifically, the indirect effect of supply-side policy supply-demand equilibrium on innovation willingness via administrative burden is 0.037, with a bias-corrected confidence interval of [0.008, 0.051]. Since this interval does not include zero, the mediating effect of administrative burden is supported by the data, further confirming H2a. Similarly, the indirect effect via policy perceived benefits is 0.037, with a bias-corrected confidence interval of [0.006, 0.054]. Because this interval also does not include zero, the mediating effect of policy perceived benefits is supported, further confirming H3a.

Table 12. Test of the mediating effects.

mediation path	Effect Value	Bootstrap CI Lower Bound	Bootstrap CI Upper Bound
Supply-side Policy Supply-Demand Equilibrium → Administrative Burden → Innovation Willingness	0.037	0.008	0.051
Supply-side Policy Supply-Demand Equilibrium → Policy Perceived Benefits → Innovation Willingness	0.037	0.006	0.054

4.5.3. Test of the chain mediation effect

Innovation willingness was used as the dependent variable, supply-side policy supply-demand equilibrium as the independent variable, and administrative burden and policy perceived benefits as mediating variables to construct the model. The test results are shown in Table 13. Under the condition of controlling for supply-side policy supply-demand equilibrium, the effect of administrative burden on policy perceived benefits was significant ($\beta = -0.668$, $t = -23.626$, $p < 0.0001$). After including the mediating variables in the overall model, the direct effect of supply-side policy supply-demand equilibrium on the innovation willingness of scientific and technological talent was not significant ($\beta = 0.057$, $t = 1.593$, $p = 0.112 > 0.05$); the effect of administrative burden on innovation willingness was not significant ($\beta = -0.043$, $t = -0.888$, $p = 0.375 > 0.05$); however, the effect of policy perceived benefits on innovation willingness was significant ($\beta = 0.312$, $t = 6.523$, $p < 0.001$).

Table 13. Chain mediation tests of administrative burden and policy perceived benefits.

	Administrative burden		Policy perceived benefits		Innovation willingness	
Variable	β	t	β	t	β	t
Supply-side policy supply-demand equilibrium	−0.110**	−2.929	0.013	0.444	0.057	1.593
Administrative burden			−0.668***	−23.626	−0.043	−0.888
Innovation willingness					0.312***	6.523
R^2	0.012		0.449		0.124	
$\triangle R^2$	0.011		0.447		0.120	
F	8.580(p=0.004)		283.791(p=0.000)		32.723(p=0.000)	

Table 14. Summary of chained mediation effects of administrative burden and policy perceived benefits.

	Effect Value	Boost SE	Bootstrap CI Lower Bound	Bootstrap CI Upper Bound	relative effect value
aggregate effect	0.117	0.050	0.019	0.214	—
direct effect	0.075	0.047	−0.017	0.167	—
Indirect effects1	0.006	0.006	−0.007	0.018	—
Indirect effect2	0.005	0.009	−0.015	0.021	—
Indirect effects3	0.030	0.010	0.007	0.044	100%

Based on the Bootstrap 95% confidence intervals shown in Table 14, the following results are observed. The confidence interval for the direct effect is [−0.017, 0.167], which includes zero. This indicates that the direct effect of supply-side policy supply-demand equilibrium on the innovation willingness of scientific and technological talent is not significant. The confidence interval for indirect effect 1 (supply-side policy supply-demand equilibrium → administrative burden → innovation willingness) is [−0.007, 0.018]. Since this interval also includes zero, the mediation effect of administrative burden alone is not significant. The confidence interval for indirect effect 2 (supply-side policy supply-demand equilibrium → policy perceived benefits → innovation willingness) is [−0.015, 0.021], which again includes zero. This shows that the mediation effect of policy perceived benefits alone is not significant. The confidence interval for indirect effect 3 (supply-side policy supply-demand equilibrium → administrative burden → policy perceived benefits → innovation willingness) is [0.007, 0.044]. Since this interval does not include zero, it indicates that the chain mediation effect through both administrative burden and policy perceived benefits is significant. Therefore, administrative burden and policy perceived benefits together fully mediate the effect of supply-side policy supply-demand equilibrium on innovation willingness. This indirect effect (0.030) accounts for 100% of the total effect, thereby supporting H4a. Furthermore, since innovation is an extremely high-risk endeavor, scientific and technological talent does not have a fixed level of innovation willingness. Upon entering the local policy environment, they rationally assess the potential costs associated with obtaining resource support, which in turn influences their tendency to engage in high-investment, uncertain-yield innovative behaviors (Borst, 2018).

4.6. Robustness testing

4.6.1. Replacement study models

We employ the Maximum Likelihood Estimation method to compare the goodness-of-fit of models and test their robustness. In addition to the previously validated hypothesized model (Model 4), we construct two alternative models: A non-chained complete mediation model (Model 5) featuring supply-side policy supply-demand matching → administrative burden → innovation intention and supply-side policy supply-demand matching → policy perception → innovation intention; and a non-chained partial mediation model (Model 6) containing supply-side policy supply-demand matching → administrative burden → innovation intention, supply-side policy supply-demand matching → policy perception → innovation intention, and supply-side policy supply-demand matching → innovation intention.

The model testing conducted through path analysis via SPSSAU yielded the results presented in Table 15. Comparative analysis reveals that Model 4 demonstrates superior goodness-of-fit indices compared to both Model 5 and Model 6 (X^2/df=2.547, RMSEA=0.047, CFI=0.997, TLI=0.982, and SRMR=0.018). These findings substantiate the robustness of the previously verified chained mediation model in maintaining stable structural relationships across alternative model specifications.

Table 15. Results of model fitness.

Structural Equation Modeling	X^2	df	X^2/df	RMSEA	CFI	TLI	SRMR
Model 4	2.547	1	2.547	0.047	0.997	0.982	0.018
Model 5	414.321	2	207.161	0.543	0.195	−1.416	0.22
Model 6	411.774	1	411.774	0.767	0.198	−3.815	0.219

4.6.2. Replacement study models

For robustness Tests, 70% of the samples were randomly selected to conduct chained mediation analysis using PROCESS v3.5 in SPSS 22.0. The results are summarized in Table 16.

Table 16. Chained mediation regression analyses for selected samples.

	Administrative burden		Policy perceived benefits		Innovation willingness	
Variables	β	t	β	t	β	t
Supply-side policy supply-demand equilibrium	−0.108*	−2.355	0.034	0.985	0.054	1.240
Administrative burden			−0.660***	−19.11	−0.060	−1.042
Innovation willingness					0.297***	5.147
R^2	0.108		0.665		0.350	
$\triangle R^2$	0.012		0.442		0.123	
F	5.546(p=0.019)		187.223(p=0.000)		21.967(p=0.000)	

Note: Two-Tailed Test *p<0.05 **p<0.01.

Table 17. Bootstrap 95% confidence interval for selected samples.

	Effect Value	Boost SE	Boot CI Lower Bound	Boot CI Upper Bound	relative effect value
aggregate effect	0.116	0.058	0.002	0.231	—
direct effect	0.068	0.055	−0.040	0.177	—
Indirect effects1	0.008	0.021	−0.010	0.034	—
Indirect effect2	0.013	0.013	−0.012	0.040	—
Indirect effects3	0.027	0.014	0.002	0.057	100%

The analysis results obtained from the reduced sample demonstrate consistency with the full-sample analysis presented earlier, as evidenced by identical directionality of path coefficients and statistically insignificant differences. Notably, administrative burden and policy perception exhibit complete chained mediation effects between supply-side policy supply-demand matching and innovation intention. These findings collectively confirm the robust nature of the full-sample analysis in this study.

4.6.3. Normality test

A normality test is conducted on policy perception, ease of use, usefulness, administrative burden, learning costs, compliance costs, psychological costs, and innovation willingness. As shown in Table 18, with all variables demonstrating sample sizes exceeding 50, the Kolmogorov-Smirnov (K-S) test is applied. The results reveal statistically significant deviations from normality for all variables ($p<0.05$), leading to the rejection of the null hypothesis that the data follow a normal distribution. However, given the stringent requirements of formal normality tests, which are often difficult to satisfy in practice, we adopt the empirical criterion that data can be considered approximately normal when the absolute kurtosis values remain below 10 and absolute skewness values under 3. All examined variables meet these threshold requirements, thereby supporting the statistical acceptability of treating the data as normally distributed for subsequent analyses in this research.

Table 18. Normality test.

Variable	Skewness	Kurtosis	Kolmogorov-Smirnov Test	
			Sample D Value	*p*
Policy perception	−0.486	0.263	0.180	0.000**
Ease of use	−0.680	0.495	0.308	0.000**
Usefulness	−0.586	0.225	0.291	0.000**
Administrative burden	0.434	−0.035	0.137	0.000**
Learning costs	0.584	0.290	0.297	0.000**
Compliance costs	0.600	0.155	0.280	0.000**
Psychological costs	−0.281	−0.367	0.242	0.000**
Innovation willingness	−0.849	3.983	0.240	0.000**

Note: **$p<0.01$

5. Discussion

The research findings reveal that in the incentive mechanism of supply-demand matching in science and technology talent policies on innovation motivation, only supply-side policy matching demonstrates a statistically significant positive effect, whereas demand-side and environment-oriented policy matching show no significant impact on innovation willingness. Administrative burden and policy perception act as full mediators in this relationship. These results partially align with other studies while presenting intriguing divergences, particularly regarding the differential effects across policy dimensions. Notably, this study provides empirical evidence that the mediating mechanism operates through complete pathway mediation than partial mediation, offering new insights into the policy optimization framework for enhancing innovation ecosystems.

The findings indicate that supply-side policies directly supporting innovation through resource provision can enhance proactive innovation among science and technology talent (Chen et al., 2022). However, policy supply must align with actual needs to avoid the over justification effect (Amrita et al., 2017) that could trigger diminishing marginal returns on incentives (Moller and Sheldon, 2020). The insignificant impact of demand-side policies on innovation motivation presents an intriguing paradox. This may stem from current demand-side policies' primary focus on regional/industrial development planning and innovation chain orchestration; such semi-mandatory, mission-oriented research tasks lack effective mechanisms to support spontaneous innovation. Nevertheless, they might indirectly stimulate innovation through increased normative pressure and economic incentives, potentially transforming into supply-side policies to drive directed or reactive innovation (Manso, 2011). Environment-oriented policies, while providing stable working and living conditions essential for talent recruitment and retention, demonstrate no statistically significant effects on innovative behaviors according to empirical studies examining employment equity, talent-friendly culture, and autonomy (Bandiera et al., 2018). This corroborates research by positioning institutional-environmental policies as "hygiene factors" that primarily enhance job satisfaction than directly incentivize innovation.

6. Conclusions

We propose a novel innovation incentive mechanism model, which is based on the incentive expectation theory and policy acceptance model. The model is outlined as follows: "Policy supply-demand equilibrium-administrative burden-policy benefit perception-innovation willingness". The empirical study revealed that a supply-type policy supply-demand equilibrium exerts a significant positive effect on the innovation willingness of scientific and technological talents. In contrast, demand-type and environment-type policy supply-demand equilibria have no significant effect on innovation willingness. Furthermore, the administrative burden and the perception of policy benefits can play a complete mediating role in the effect of a supply-type policy supply-demand equilibrium on innovation willingness. The following practical insights are provided by this:

First, it is imperative that the government implements policies with precision and provides adequate resource support to scientific and technological talents. In the first instance, the government should establish a classification and stratification of a scientific and technological talent support system, providing personalized policy support for scientific and technological talents of differing ages, units, and disciplines. In addition, the government should increase the all-around support for scientific and technological talents, systematically deploying funds, equipment, teams, and other resources. Furthermore, the government should stimulate its external motivation through remuneration, talent support programs, and so on. Conversely, the reform of 'management and service' has been deepened, the autonomy of policy supply has been decentralized, and the major employers, including universities, hospitals, research institutes, and enterprises, have been granted autonomy to formulate policies for scientific and technological talents. Furthermore, it has been posited by scientific and technological experts that the content, tools, and means of the policy should be reviewed and revised when appropriate, with a view to enhancing its relevance and adaptability to contemporary circumstances.

Second, a multi-dimensional policy benefit perception system has been constructed to enhance the policy benefit perception of scientific and technological talents. In order to enhance the efficacy of the policy information transfer mechanism, it is imperative to reduce the threshold of policy perception among scientific and technological talents. This can be achieved by expanding the channels of policy propaganda and improving the precision of policy interpretation. Furthermore, the utilization of big data and information technology to automatically match policy provisions with the specific needs of scientific and technological talents can contribute to the enhancement of the efficiency of policy perception among these talents. Conversely, tools designed to facilitate the understanding of policy are intended for diverse groups, including young scientific and technological talents who have recently entered the workforce. These individuals express a heightened concern regarding early career support, a measure that has the potential to enhance their sense of access by providing stable scientific research start-up funds, housing protection, preferential treatment for children's education, and other similar benefits. It is evident that scientific and technological talents who have been in the workforce for a considerable time are increasingly preoccupied with the evaluation of the necessity to alter the "five only" policy. Therefore, it is necessary to change the "five only" evaluation mode, with a view to ensuring that all forms of innovative achievement are recognized. Concurrently, there is a necessity to fortify policy coordination, institute an efficacious communication apparatus between government departments, between the government and employers, and between the government and scientific and technological talents. This will ensure seamless integration of policies from formulation to implementation, thereby eliminating redundancies and conflicts.

Third, the concept of reducing the burden for talents and reducing the administrative burden of scientific and technological talents must be established. Simplification of the application process for scientific and technological talent resources is imperative. This should include the reduction of form-filling and financial reimbursement obligations, as well as other non-academic affairs. Additionally, the elimination of redundant approval links and the unification of declaration materials should be considered. These measures aim to minimize the administrative burden on scientific and technological talent, thereby reducing the formalism in the implementation of the policy. Conversely, a unified talent service platform has been established to integrate the resources of various departments and implement the 'one-window acceptance and one-stop settlement' of talent policies. This initiative aims to enable scientific and technological talents to expeditiously and efficiently obtain funds, equipment, and other innovative resources, thereby enabling them to prioritize their efforts on scientific research and innovation. Concurrently, the establishment of a regular adjustment mechanism to systematically collect the pain points in the implementation of policies and to make timely adjustments, the real policy of efficient synergy, and accurate service, stimulates the innovation vitality of talents and promotes the emergence of scientific and technological achievements.

Author contributions

Zhang Shijing: Methodology, investigation, formal analysis, writing review & editing and funding acquisition. Wang Mengzi: Software, investigation, data collection, and writing original draft. Liu Fang: Conceptualization, validation, supervision and funding acquisition.

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Acknowledgments

The authors wish to express their gratitude for the support provided by the Social Science Foundation of Hunan Province (21YBA003); Hunan Provincial Pilot Project of Deepening the Reform of Education Evaluation in the New Era (2023); Special Project of Education Management and Reform of the Ministry of Education (24JGWT0010).

Conflict of interest

All authors declare no conflicts of interest in this paper.

References

Amrita D, Antonio N, Xu F (2017) Corruption, intrinsic motivation, and the love of praise. *J Public Econ Theory* 19: 1077–1098. https://doi.org/10.1111/jpet.12278

Anderson N, Potočnik K, Zhou J (2014) Innovation and creativity in organizations: A state-of-the-science review, prospective commentary, and guiding framework. *J Manage* 40: 1297–1333. https://doi.org/10.1177/0149206314527128

Baekgaard M, Moynihan D, Thomsen M (2021) So Why Do Policymakers Support Administrative Burdens? The Roles of Deservingness, Political Ideology, and Personal Experience. *J Public Adm Res Theory* 31: 184–200. https://doi.org/10.1093/jopart/muaa033

Bandiera O, Lemos R, Prat A, et al. (2018) Managing the Family Firm: Evidence from CEOs at Work. *Rev Finan Stud* 31: 1605–1653. https://doi.org/10.1093/rfs/hhx138

Bloom N, Reenen J, Williams H (2019) A Toolkit of Policies to Promote Innovation. *J Econ Perspect* 33: 163–184. https://doi.org/10.1257/jep.33.3.163

Borst R (2018) Comparing work engagement in people-changing and people-processing serviceproviders: A mediation model with red tape, autonomy, dimensions of PSM, and performance. *Public Pers Manage* 47: 287–313. https://doi.org/10.1177/0091026018770225

Bozeman B, Feeney M (2011) *Rules and Red Tape: A Prism for Public Administration Theory and Research*. New York: Routledge. https://doi.org/10.4324/9781315701059

Bozeman B, Youtie J (2020) Robotic bureaucracy: Administrative burden and red tape in university research. *Public Admin Rev* 80: 157–162. https://doi.org/10.1111/puar.13105

Carrigan C, Pandey S, Ryzin G (2020) Pursuing Consilience: Using Behavioral Public Administration to Connect Research on Bureaucratic Red Tape, Administrative Burden, and Regulation. *Public Adm Rev* 80: 46–52. https://doi.org/10.1111/puar.13143

Che X, Zhou P, Wang M (2022) The policy effect on photovoltaic technology innovation with regional heterogeneity in China. *Energy Econ* 115: 106385. https://doi.org/10.1016/j.eneco.2022.106385

Chen Q, Sun T, Wang T (2022) Synergy effect of talent policies on corporate innovation-Evidence from China. *Front Psychol* 13: 1069776. https://doi.org/10.3389/fpsyg.2022.1069776

Cho J, Cheon Y, Jun J W, et al. (2022) Digital advertising policy acceptance by out-of-home advertising firms: a combination of TAM and TOE framework. *Int J Advert* 41: 500–518. https://doi.org/10.1080/02650487.2021.1888562

Davis D (1985) A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results. *Massachusetts Institute of Technology*.

Dimand A, Abutabenjeh S, Evelyn R (2023) Human Capital Drivers of Employee Intent to Innovate: The Case of Public Procurement Professionals. *Rev Public Pers Adm* 43: 727–753. https://doi.org/10.1177/0734371X221123294

Edler J, Fagerberg J (2017) Innovation Policy: What, Why, and How. *Oxford Rev Econ Pol* 33: 2–23. https://doi.org/10.1093/oxrep/grx001

Edquist C (2019) Towards a Holistic Innovation Policy: Can the Swedish National Innovation Council (NIC) Be a Role Model. *Res Policy* 48: 869–879. https://doi.org/10.1016/j.respol.2018.10.008

Eriksson K, Ernkvist C, Laurell J, et al. (2019) A Revised Perspective on Innovation Policy for Renewal of Mature Economies – Historical Evidence from Finance and Telecommunications in Sweden 1980–1990. *Technol Forecast Soc Change* 147: 152–162. https://doi.org/10.1016/j.techfore.2019.07.001

Fishbein M, Ajzen L (1975) *Belief, attitude, intention and behaviour: An introduction to theory and research.* MA: Addison-Wesley.

Garrod L, Olczak M (2021) Supply- vs. Demand-Side Transparency: The Collusive Effects Under Imperfect Public Monitoring. *J Ind Econ* 69: 537–560. https://doi.org/10.1111/joie.12260

Geels F (2004) From Sectoral Systems of Innovation to Socio-Technical Systems: Insights About Dynamics and Change From Sociology and Institutional Theory. *Res Policy* 33: 897–920. https://doi.org/10.1016/j.respol.2004.01.015

Han Y, Liao J, Long L (2007) Model of development and empirical study on employee job performance construct. *J Manage Sci in China* 2007: 66–81. https://doi.org/10.3321/j.issn:1007-9807.2007.05.007

Hattke F (2020) When the Red Tape Becomes Policy: A Critical Assessment of Administrative Burdens. *J Public Adm Res Theory* 30: 178–180. https://doi.org/10.1093/jopart/muz025

Hayes A (2013) *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach.* New York: Guilford Press.

Herd P, Moynihan D (2019) *Administrative burden: Policymaking by the means.* New York: Russell Sage Foundation. https://doi.org/10.7758/9781610448789

Jiang Z, Shi J (2023) Quantity or quality? Policy effects on innovations in the wind power industry in China. *Manage Decis Econ* 44: 4507–4522. https://doi.org/10.1002/mde.3965

Johnson D (2022) Burdens Are Everybody's Business: Examining the Intersection of Administrative Burdens, Motivation, and Entrepreneurial Culture. *Admin Soc* 54: 1965–1992. https://doi.org/10.1177/00953997221100373

Karlson N, Sandström C, Wennberg K (2021) Bureaucrats or Markets in Innovation Policy? A Critique of the Entrepreneurial State. *Rev Austrian Econ* 34: 81–95. https://doi.org/10.1007/s11138-020-00508-7

Kuhlmann S, Rip A (2018) Next-Generation Innovation Policy and Grand Challenges. *Sci Public Policy* 45: 448–454. https://doi.org/10.1093/scipol/scy011

Lerner J (2009) *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed – And What to Do About It.* Princeton: Princeton University Press.

Lewis P (2020) The Innovation Systems Approach: An Austrian and Ostromian Perspective. *Rev Austrian Econs* 34: 1–18. https://doi.org/10.1007/s11138-020-00507-8

Lucas D, Fuller C, Piano E, et al. (2018) Visions of Entrepreneurship Policy. *J Entrep Public Poli* 7: 336–356. https://doi.org/10.1108/JEPP-D-18-00034

Manso G (2011) Motivating Innovation. *J Finance* 66: 1823–1860. https://doi.org/10.1111/j.1540-6261.2011.01688.x

Moller A, Sheldon K (2020) Athletic Scholarships Are Negatively Associated With Intrinsic Motivation for Sports, Even Decades Later: Evidence for Long-Term Undermining. *Motiv Sci* 6: 43–48. https://doi.org/10.1037/mot0000133

Moynihan D, Herd P, Harvey H (2015) Administrative burden: Learning, psychological, and compliance costs in citizen-state interactions. *J Public Adm Res Theory* 25: 43–69. https://doi.org/10.1093/jopart/muu009

Ni Y, Zhang J (2021) The Perception of Incentive Policies and Innovation Involvement on Scientific and Technological Workers: The Role of Work Value Orientation. *Stud Sci Sci* 39: 632–643. Abstract from: https://journal08.magtechjournal.com/kxxyj/CN/abstract/abstract23268.shtml.

Ran J, Hu P, Tong H (2020) The influence Mechanism of Creator's Policy Perception on Innovation Behavior-The Mediation of Knowledge Acquisition and the Moderation of Self-efficacy of Innovation. *Sci Technol Progress Policy* 37: 1–9. https://doi.org/10.6049/kjjbydc.2019110799

Rothwell R, Zegveld W (1981) Industrial innovation and public policy: preparing for the 1980s and the 1990s. *Am Polit Sci Rev* 76: 699. https://doi.org/10.2307/1963794

Schot J, Steinmueller W (2018) Three Frames for Innovation Policy: R&D, Systems of Innovation and Transformative Change. *Res Policy* 47: 1554–1567. https://doi.org/10.1016/j.respol.2018.08.011

Scott S, Bruce R (1994) Determinants of innovative behavior: A path model of individual innovation in the workplace. *Acad Manage J* 37: 580–607. https://doi.org/10.5465/256701

Tang C, Li Z, Zhang J (2022) Motivation, Competence and Emotion: The Elements of Innovative Vitality of Scientific and Technological Talents and Their Empowerment. *Chinese Public Admin* 2022: 147–149. https://d.wanfangdata.com.cn/periodical/zgxzgl202212027

Venkatesh V, Smith R, Morris M, et al. (2003) User acceptance of information technology: Toward a unified view. *Mis Quart* 27: 425–478. https://doi.org/10.2307/30036540

Vroom H (1964) *Work and motivation.* New York: John Wiley and Sons.

Wang O, Qi D, Liu Y (2023) Administrative Burdens in Chinese Public Services: A Case of Selective Affinity. *China Quart* 255: 734–752. https://doi.org/10.1017/S0305741023000036

Zhu C, Tong P, Chen Y (2022) Research on Government's Behavior and Intention for Its Data Opening: An Empirical Study Based on TAM and BRA. *J Shandong Univ (Philosophy and Social Science Edition)* 2022: 68–78. https://doi.org/10.19836/j.cnki.37-1100/c.2022.02.007

Zhu J, Wang L (2019) Matching Relationship between Introduction Policy Supply and Individual Needs of Young Returnee Academics. *J Higher Educ* 40: 18–24. https://cstj.cqvip.com/Qikan/Article/Detail?id=7002571524