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Financial Decentralization, Government Attention to STI and SME Growth

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Abstract: Small and medium-sized enterprises (SMEs), as the driving force of job creation and scientific and technological innovation in the new era, play a pivotal role in the growth and development of the enterprises with government support and financial resources rationing. Based on the reconstruction of the financial decentralization index (FEDC) using the CRITIC weight evaluation method, the impacts of financial decentralization and government attention to science and technology innovation on the growth of SMEs at the inter-provincial level in China from 2011 to 2021 are explored in depth with the help of the generalized moments estimation of dynamic panel system (SYS-GMM), extended regression model (ERM) and mediation effect model. The study finds that: (1) financial decentralization and government's attention to science and technology innovation can significantly expand SMEs' staff size and increase asset profitability; (2) government's attention to science and technology innovation is an important mediating variable of financial decentralization on SMEs' growth, which indirectly strengthens the effect of financial decentralization on the growth of SMEs; (3) the impacts of financial decentralization and government's attention to science and technology innovation on SMEs' growth have obvious heterogeneity characteristics; from the point of view of regional heterogeneity, the deepening of the degree of financial decentralization has the strongest incentive effect on the growth of SMEs in the western region relative to the east and central regions; from the point of view of the government size, financial decentralization has the strongest positive impact effect on SMEs' development of large-scale governments, followed by small and medium-sized governments. After conducting robustness tests, the conclusions still hold. Therefore, while continuing to promote the reform of the financial system in depth, it is important to focus on the matching of policies in both financial support and government guidance in order to promote the high-quality development of SMEs.

Keywords: Financial Decentralization；Government Attention to STI；SME Growth；Panel Data

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1 Introduction

By the end of 2023, the number of SMEs in China had exceeded 53 million, an increase of 54% from the end of 2018, and had become the largest and most dynamic market players in China's economic and social development, as well as an important part of China's real economy. It can be seen from China's development practice that most of the innovations of new technologies and new business models originate from SMEs, and supporting the growth of SMEs is regarded by the state as an important hand to maintain the innovation capacity to promote high-quality development in the new development stage. Facing the new era of accelerated evolution of the unprecedented changes in a hundred years, governments at all levels in China have continued to enhance the attention to science and technology innovation, and introduced a large number of policy tools including innovation subsidies, tax incentives, government procurement, civil-military integration and other policy tools to provide strong support for the cultivation of SMEs' scientific and technological innovation capacity. However, due to the characteristics of science and technology innovation itself, such as high cost, high risk, and long cycle, it forms a high requirement for the financial strength of enterprises, so it must be complemented by corresponding financial policies to tend to provide financial support for SMEs and help enterprises avoid and cope with innovation risks. To this end, the "Opinions of the State Council of the Central Committee of the Communist Party of China on Promoting the Development and Strengthening of the Private Economy", which was issued in July 2023, clearly puts forward the following: we should improve the financing support policy and system for private small and medium-sized micro-enterprises, and improve the market-based risk-sharing mechanism for financing that is participated by banks, insurance, guarantees, brokerage firms, etc.; and at the same time, the construction of a financial powerhouse emphasizes the importance of "adhering to the real economy as the fundamental purpose of financial services, and increasing financial support for the real economy. At the same time, the construction of a strong financial country emphasizes "insisting on taking financial services for the real economy as the fundamental purpose, and increasing financial support for the private economy and small, medium and micro enterprises", which further highlights the significance of continuing to promote the reform of the supply side of financial services and improving the financial system for the growth of small and medium-sized enterprises. The above analysis shows that: realizing the strong support of financial institutions for small and medium-sized enterprises is an inevitable requirement for enhancing the sustainability of China's financial support for the real economy. In recent years as China continues to deepen the reform of the financial system, the allocation of financial power has gradually realized the trend of decentralization between the government and the market, the central government and local governments. At the same time, the Party Central Committee continues to consolidate the centralized and unified leadership of the financial work, not only to promote the overall financial stability and development of the top-level design work, the unification of the central and local financial regulatory system and standards; at the same time a certain degree of release of financial power to the local community, the local financial show vitality and vitality. However, the problem of insufficient competitiveness of SMEs has not yet been completely solved, and the relationship between the government's attention to scientific and technological innovation and the influence of the current financial system on SMEs remains to be explored. In particular, as an important phenomenon in China's financial transformation and development (Hong and Hu, 2017), financial decentralization is still controversial among academics through what kind of indexes to be measured, and whether the reform of China's financial system can really promote the growth of SMEs remains to be confirmed empirically. Based on this, the study focuses on the relationship between the government's attention to science and technology innovation and financial decentralization on the one hand, and verifies the guiding role of China's financial decentralization on the policies of local governments; on the other hand, it examines the realistic possibility of China's financial decentralization on effectively promoting the growth of SMEs by means of empirical investigations, and uses this to deduce whether the reform of China's financial system is adapted to the growth of SMEs, which helps to correctly understand and grasp the effectiveness of China's This will help to correctly understand and grasp the effectiveness of China's financial system reform, and further optimize China's financial decentralization reform by putting forward policy recommendations, so as to provide relevant support for promoting the stable and healthy development of SMEs and accelerating the construction of a new development pattern.

2 Literature Review and Research Hypotheses

2.1 Impact of financial decentralization on SME growth

After more than 40 years of reform and opening up, China's economy has entered a new stage of high-quality development, and the growth of domestic enterprises requires a better business environment, forcing China's financial system to enter a comprehensive reform of the "deep-water zone", in which financial decentralization is an institutional phenomenon that has continued to receive attention from the academic community in recent years. Theoretically, financial decentralization gives local governments the power to intervene in the financial market, which is the main channel for enterprises to obtain funds for innovation and growth (Zheng and Lu, 2018). Under China's decentralized system, the intervention of the central government and local governments in the financial market and financial institutions will affect the growth of small and medium-sized enterprises (SMEs) to a certain extent. As for how financial decentralization affects SMEs' growth, summarizing the relevant literature at home and abroad, the representative views are mainly summarized in the following three aspects:

One is the view that financial decentralization is conducive to the growth of SMEs. Scholars holding this view further divide the positive effects into direct and indirect effects. By direct effects, it is emphasized that financial decentralization has a direct positive impact on the value creation or innovation performance of the firms themselves. For example, scholars have argued that MSMEs benefit from informal and unhealthy financial regulation, which allows them to gain additional qualifications to participate in economic activities that were previously only allowed to be undertaken by large firms, broadening profit acquisition channels and obtaining cash inflows (Corti et al., 2019); and under a moderate financial decentralization regime, firms are able to introduce more science and technology innovations through increased investment in cutting-edge technological equipment, thus increasing product productivity and developing new products (He et al., 2019). The so-called indirect effect is mainly manifested in the fact that the development of local finance can alleviate the problem of insufficient funds for SMEs to a certain extent. For example, some studies have shown that: the increase in the number of local branches of banks can have a more in-depth understanding of local enterprises, thereby reducing the risk of bank defaults and losses caused by information asymmetry, and making it easier for enterprises to obtain credit opportunities; at the same time, local financial institutions can provide differentiated value-added financial services by virtue of their own mastery of relevant information about local enterprises (Monzur et al. 2021), thereby increasing the source of profits for SMEs.

The second is that financial decentralization inhibits the growth of SMEs. Scholars holding this view argue that both explicit and implicit financial decentralization have a significant inhibiting effect on local innovation. This is because the externality formed by cost shifting under the financial decentralization system is not conducive to the improvement of the level of local innovation (Li and Xie, 2020), and given that the level of local innovation is a controlling factor for the improvement of firms' economic revenues and innovations (Chang et al., 2022), financial decentralization may have a negative impact on firm growth. Other studies have found that financial decentralization can also significantly inhibit the growth of firms' innovation investment by strengthening local officials' incentives (Zheng and Lu, 2018), while triggering firms' overinvestment and reducing their investment efficiency (Xiong Hu and Shen Kunrong, 2019), and ultimately weakening SMEs' ability to grow.

Third, it is believed that financial decentralization has an "inverted U-shaped" relationship on SME growth. For example, scholars believe that financial decentralization has a clear "inverted U-shaped" relationship in its positive impact on the rate of technological progress and total factor productivity of enterprises, i.e., under moderate decentralization, the decentralization of financial power can be conducive to the optimization of resource allocation and the promotion of enterprise innovation (He et al., 2019). Other studies have also confirmed the existence of the typical fact that financial decentralization has an "inverted U-shaped" relationship on the innovative activities of enterprises within a region, thus emphasizing that the rapid expansion of financial power in China's regions may have a non-linear impact on the innovation investment of enterprises, especially privately owned enterprises, which is inhibited first and then facilitated (Zhang et al. 2021).

2.2 The relationship between government attention to STI and the growth of SMEs

For the research on the relationship between government's attention to science and technology innovation and SMEs' growth, most scholars focus on examining the impact of one or several specific science and technology innovation policies on enterprises in China, and often use enterprise innovation performance as an indicator of enterprise growth. Summarizing the existing research results, it is found that their core viewpoints are mainly reflected in the following three aspects:

First, government attention to STI can promote SME growth. This promotion includes multiple effects. On the one hand, government STI policies provide resources and channels for enterprises. Due to the existence of technological externalities in the market competition, financing difficulties and other problems, the government innovation policy as a tangible hand, can correctly guide the direction of the enterprise's R & D and reduce the financial risks faced by the enterprise implementation of innovation projects, such as the lack of funds, and positively regulate the performance of the enterprise, to achieve the effect of enhancing enterprise value (Yang et al., 2021). At the same time, the government can also directly provide financial support for the innovation activities of enterprises, through financial subsidies and interest rate subsidies and other behaviors to enhance the confidence of enterprises to invest in technological research and development, and to promote enterprises to actively carry out innovative research and development (Soogwan and Byungkyu 2014; Guo et al. 2018; Dou et al. 2018); other scholars have found that the government procurement tool facilitates the acquisition of technology and product sales channels, and is conducive to the expansion of enterprise value. product sales channels at the same time, it is conducive to broadening enterprises' financing channels and helping them realize sustainable profitability (Yang, 2012), etc. On the other hand, some scholars have explored the positive impact of the government's attention to science and technology innovation on the business performance of enterprises through intermediary mechanisms. For example, some studies take the R&D investment within the enterprise as the mediating variable and find that the enhancement of the government's attention to science and technology prompts the government to introduce relevant policies to support enterprises to carry out innovative behaviors, which changes the R&D intensity of the enterprise to affect the growth of the enterprise (Kyung-Nam and Hayoung, 2012; Dong et al., 2021; Xu et al., 2015). Other scholars start from the external environment of enterprises, recognizing that government policy support can have the effect of improving the external environment of enterprises' innovation and development (Liu et al., 2023; Cen et al., 2023), which can help enterprises to expand their energy and efficiency.

Second, government attention to science, technology and innovation can adversely affect the growth of SMEs. Studies upholding this conclusion have focused on the business consequences of government innovation subsidies, the establishment of science and technology parks, civil-military integration and other policy measures. For example, scholars have argued that the government will select enterprises to receive subsidies according to its own preferences and development strategies, while enterprises, with their knowledge of government preferences, will cater to the eligibility requirements for initiating subsidy applications, which may lead to deviation from optimal business strategies (Wang et al., 2022). At the same time, the behavior will divert the internal attention of firms, causing managers to over-analyze and satisfy the strategic dynamics of the government when they should be focusing on innovation outputs such as patents and new products, leading to a decline in operational efficiency (Yi et al., 2021); on the other hand, accepting a large number of subsidies will make firms dependent on the government, which will inhibit innovation growth dynamics (Sun et al., 2016). Similarly, as science and technology parks provide more preferential and protective measures for enterprises, it makes such enterprises unable to face the real and effective market environment, which further contributes to the slack mentality of enterprises, while science and technology parks reduce the connection between enterprises and external social resources, which is prone to triggering barriers to production and innovation activities (Syed et al., 2018; Yang et al., 2015). In addition, in terms of civil-military integration, some scholars have found that although enterprises have increased their innovation output with the help of civil-military integration policies, innovation activities have a significant crowding-out effect on production activities, which can lead to damage to the final profits of enterprises (Yang et al., 2019).

Third, there is heterogeneity in the impact of government STI attention on SME growth. Scholars holding this type of view generally believe that the emergence of heterogeneity is related to the basic nature of the firms, such as the stage of operation (Duan and Yang, 2020), size, nature of the industry, and whether it is state-owned (Geng et al., 2016; Geng et al.,

2018), and that the differences in the basic nature of the firms can lead to inconsistencies in the significance of the impact of different policies on firm growth. In addition, other scholars have found that factors related to the external environment of enterprises, such as the level of development of different regions, geographic location (Zhu and Sun, 2023), and the degree of market distortion (Yang et al., 2015), also play an important role in moderating the relationship between the two.

Generally speaking, existing studies have paid attention to the differentiated impacts of financial decentralization and government STI policies on SMEs' growth, but have neglected the common impacts of the two on SMEs' growth, and there is no literature that directly involves the relationship between financial decentralization, the government's attention to STI and SMEs' growth. At the same time, most of the studies only take one or several government STI policies as the research object, which cannot completely reflect the government's STI attention; in addition, previous studies have not examined the unique role of the government's STI attention in the process of financial decentralization affecting SMEs' growth, and its intermediary mechanism still needs to be explored in depth. Therefore, the marginal contributions of this paper are: first, based on financial decentralization, a Chinese-style financial system phenomenon, the impact of financial decentralization on SMEs' growth is examined from the perspective of the government's attention to scientific and technological innovation, which enriches the study of the mechanism of financial decentralization transmitting the process of enterprises' operation; second, combining with China's national conditions, we construct the localized index system and the evaluation system of the government's attention to scientific and technological innovation that are adapted to the relationship of China's financial decentralization, which provides a good basis for Secondly, we build a localized indicator system and government's attention to science and technology innovation evaluation system that fit China's financial decentralization relationship, which provide effective criteria for objectively and accurately evaluating China's financial decentralization and the government's attention to science and technology innovation; thirdly, we re-examine the relationship between China's financial decentralization, the government's attention to science and technology innovation, and SMEs by using the most recent data, which clarifies and clarifies the theoretical controversy of the current research, and also provides reference for China to deepen the reform of its financial system and to consolidate the results of the development of SMEs.

2.3 Theoretical Analysis and research hypotheses

From the literature review, it is not difficult to find that most of the existing literature involves only one of the aspects when studying the related topics, either focusing only on the impact of financial decentralization on the resource allocation of enterprises and ignoring the differences in the size of enterprises, or focusing on the analysis of the mechanism of the government's science and technology innovation policy on the innovation behavior and scientific and technological output of SMEs, and considering financial decentralization as an external environmental factor of SMEs' operation. This leads to a relative ambiguity in the mechanism of the impact of financial decentralization and government STI attention on the growth of SMEs. In addition, when local governments act as regional STI policy makers, they often have the right to intervene and regulate part of the financial resources and financial markets, and it is worth paying attention to whether this expansion of financial decentralization can strengthen the driving effect on SMEs' growth by increasing the government's attention to STI. In order to solve this puzzle, we need to construct a new theoretical framework to categorize the logic of transmission between financial decentralization, government attention to STI and SME growth.

According to the theory of financial development, moderate financial reform and deepening can optimize the allocation of local financial resources under the action of the market mechanism, so that funds can be directed to productive investment to meet the capital needs of enterprises; with the advancement of financial development, financial deepening is manifested in the innovation of financial instruments and the expansion of the number of financial institutions on the one hand, and in the gradual improvement of the order of the financial market on the other. Financial decentralization, as one of the contents of financial system deepening, can to a certain extent alleviate the problems of financing difficulties and financing costs of SMEs in terms of capital demand, and also help to improve the financing environment of SMEs, which will have a positive impact on the growth of SMEs. Accordingly, this paper proposes hypothesis 1:

H1: Financial decentralization will promote the growth of SMEs.

Meanwhile, according to the theory of diffusion of innovation, local governments act as an important member of the innovation network in the process of promoting social innovation development. This main role is manifested in the government's increased attention to scientific and technological innovation, which can consciously promote social innovation through institutional innovation and the development of related technological innovation policies, thus providing policy support and creating a favorable atmosphere for the development of SMEs' scientific and technological innovation activities. Accordingly, this paper puts forward hypothesis 2:

H2: Increased attention to STI by the government promotes the growth of SMEs.

Finally, based on the revelation of decentralization theory, financial decentralization, as one of the important manifestations of China's economic decentralization (Hong and Hu, 2017), embodies the power and responsibility relationship between the central government and the local government in terms of the right to control and supervise financial resources. In the context of financial decentralization, local governments have greater autonomy in the allocation of financial resources, while the government tends to take advantage of the opportunity of the national implementation of the innovation-driven development strategy to take the initiative to enhance the attention to science and technology innovation in order to promote the high-quality development of the local economy, based on its governing objectives of economic growth and performance enhancement.

In addition, according to the theory of local government competition, by increasing the attention to science and technology innovation, the local government can more effectively guide financial resources to tilt to enterprises with innovation potential, and combined with the actual situation of economic development of the territory, formulate a policy system that is more in line with the needs of local science and technology innovation, and cultivate a number of local small and medium-sized enterprises (SMEs), so as to realize the effect of financial decentralization indirectly pulling SMEs to grow. Accordingly, this paper puts forward hypothesis 3:

H3: Government STI attention plays a mediating role in financial decentralization for SME growth.

3 Study design

According to the theoretical framework, we need to answer the following three key questions in our research design: first, what role does government attention to science and technology innovation, an indicator closely related to SME growth, play in the mechanism of financial decentralization on SME growth; second, how are the indicators measuring the relationship between financial decentralization in China established and how is this relationship scientifically evaluated; third, what is the relationship between financial decentralization and SME growth in China, and how is this relationship further understood? Secondly, how to establish the measurement index of the relationship between financial decentralization in China and how to evaluate the government's attention to science and technology innovation; thirdly, what kind of relationship between financial decentralization and the growth of SMEs in China, and how to further understand this relationship. To this end, the author first needs to define the relevant variables.

3.1 Definition of variables

3.1.1 Dependent variable: definition of SME growth

The current academic definition of SME growth is complex. Generally speaking, SME growth emphasizes the ability of SMEs to achieve comprehensive development and expansion within a certain period of time by continuously tapping the potential of internal and external resources. When measuring the growth of SMEs, most studies prefer to use financial indicators or indicators related to the size of the enterprise; there are also a few studies focusing on the current and potential development capacity of the enterprise, of which the enterprise's technological innovation capacity is often the focus when measuring the potential development capacity (Shen, 2017). On the whole, the current SME growth measurement indicators adopted by academics are still mostly financial indicators. Therefore, this paper combines enterprise size indicators with financial indicators, and adopts two indicators, enterprise average number of employees (AWK) and profitability of assets (POA) to measure SME growth. Combined with the availability of data, the author adjusted the statistical caliber of SMEs, selected

SMEs belonging to industrial enterprises above the scale as the research object, and classified them into medium-sized enterprises and small-sized enterprises according to the standards of the National Bureau of Statistics of China (NBSC) and the Ministry of Industry and Information Technology (MIIT) for the delineation of SMEs[①]. The relevant index data were obtained from the official website of the National Bureau of Statistics of China and the China Industrial Enterprise Database.

3.1.2 Core independent variable: definition of financial decentralization

In recent years, financial decentralization has been paid attention to by more and more scholars, but the definition of the degree of financial decentralization still has not formed a measurement index that is widely recognized by academics. Currently, some scholars use the indicator of the ratio of loans from local financial institutions to loans from financial institutions in each province (Chen and Deng, 2017) as a measure of financial decentralization in each province; while the proportion of regional bank loans to national bank loans (Xie et al., 2022; Wang et al., 2020), and the proportion of loan balances of the four major state-owned banks in each province to the loan balances of all banks (Qi and Wen, 2019), etc. are also often used by researchers. Because of the obvious limitations of using a single factor to measure financial decentralization, some scholars have chosen three indicators, namely, the number of total assets, the number of total institutions, and the number of total employees of local financial institutions, to construct a comprehensive measurement index for evaluating financial decentralization (Zheng and Lu, 2018; Lv and Liu, 2023). In addition to the above methods of adopting indicators to measure financial decentralization, some scholars have also proposed that the length of financial reform and whether it is a pilot zone for comprehensive financial reform can be used to measure financial decentralization (Wang et al., 2020); or the factors affected by the credit management system can be extracted from the changes in loan balances in each place (Fu and Li, 2017) to measure the degree of financial decentralization in each place. From the connotation of financial decentralization, the increase in local financial autonomy should be reflected in a number of aspects, such as the total amount of deposits and loans of local financial institutions, the number of people employed in the financial industry, the number of financial institutions, the number of financial products and the local regulatory index, etc., and it is difficult for a single indicator to adequately measure the degree of financial decentralization; coupled with the fact that the progress of financial reforms in each region is not the same. Therefore, the relevant indicators must be carefully selected. Under comprehensive consideration, the author believes that the indicators can be improved on the basis of the existing financial decentralization measurement standards: i.e., four indicators are chosen to measure the degree of financial decentralization comprehensively, namely, the proportion of the total amount of banking loans of each province to the total amount of banking loans of the whole country, the proportion of total amount of banking deposits to the total amount of deposits of the whole country, the proportion of the total number of financial institutions to the total number of financial institutions of the whole country, and the proportion of total number of financial employees to the total number of financial employees in the whole country[②]. Further, in order to synthesize the degree of financial decentralization of each province from these indicators in a more scientific way, the author assigns weights to each of these four indicators through the CRITIC weight evaluation method (see Table 1), and then weights them to synthesize the Financial Decentralization Index of China (FEDC) needed in this paper. All the above data can be obtained from the Financial Operation Report, EPS database and Wind database of each province in the past years.

Table1. China's Provincial Financial Decentralization Evaluation Indicator System and Weights

headline	Indicator variability	Conflicting indicators	volume of information	weights
Regional deposits as a percentage	0.027	0.554	0.015	33.61%
Area Loan Percentage	0.024	0.422	0.010	22.92%
Percentage of practitioners	0.020	0.360	0.007	16.23%
Number of institutions as a percentage	0.019	0.634	0.012	27.24%

[①] According to the National Bureau of Statistics (NBS), the number of industrial SMEs above designated size was 401,000 at the end of 2021, accounting for 98.1% of the total number of industrial enterprises above designated size, and thus representative of the study period.

[②] China's statistics on the insurance and securities industries lack a unified caliber, and there are many missing statistics on the insurance and securities industries. Based on the consideration that China's financial system is still dominated by the banking industry, the total number of institutions and employees in the banking industry will be taken as the total number of financial institutions and the total number of employees.

3.1.3 Core independent variable: definition of government attention to STI

In management science, attention is a key scarce resource in the decision-making process of the organization, and different attention will guide decision makers to pay attention to specific issues related to "attention", and then show stronger tendency and relevance in the formulation of decision-making programs. American scholar Brian Jones first introduced the concept of attention into the field of government policymaking, pointing out that government policy will follow the changes in the attention of policymakers (Wang et al., 2017). As a public organization, the allocation of the government's attention and its path of influence can reveal the degree of importance the government attaches to a specific activity or field, as well as the mechanism and logic behind the drive to invest resources to achieve the set goals (Wen , 2014). The government's attention to science and technology innovation, on the other hand, shows the government's attention to the field of science and technology innovation and the willingness and behavioral pattern of the tilted allocation of resources, reflecting the government's perception of the strategic position of science and technology innovation in economic and social development.

For the measurement of the government's attention to science and technology innovation, only a few literatures have adopted content analysis methods that can systematically analyze the textual content qualitatively and quantitatively, and in concrete terms, they have used the frequency of keywords related to science and technology innovation appearing in the studied texts and the proportion they accounted for (Zheng Ye et al., 2023; Zhang et al., 2021) to measure the corresponding tier of the government's attention to science and technology innovation Degree.

Considering that the research object of this paper is the attention to science and technology innovation of local governments at the provincial level, the author firstly needs to identify the keywords that express the attention to science and technology innovation of local governments. In view of the institutional characteristics of vertical decentralization and centralized leadership in China, firstly, the top-level design of the "Outline of the National Innovation-driven Development Strategy" issued by the State Council of the CPC Central Committee was selected as the mother text for generating keywords, and the GooSeeker Word Splitting Application V3 was used to perform word frequency statistics on the mother text, and 15 keywords related to science and technology innovation with a high word frequency were finally screened out (see Table 2), namely, innovation, technology, technology, R&D, science, talent, intellectual property rights, scientific research, high-end, and innovation. They are innovation, technology, science and technology, research and development, science, talent, intellectual property rights, scientific research, high-end, intelligence, civil-military integration, high-tech, patent, specialized, special and new, laboratory; from the people's government portals of the provinces (municipalities and autonomous regions) to obtain the government work reports issued by the 31 provinces (municipalities and autonomous regions) from 2011 to 2021, through the keywords to the provinces of the government work reports of the text of the various years to compare and crawl, to obtain the keywords of each keyword. Crawl the text of government work report of each province in each year by keywords, get the word frequency and word count of each keyword, and at the same time, count the total word count of each government work report, and utilize the ratio of the word count of keywords in the total word count of the government work report to measure the attention of the local government of a certain province to science and technology innovation in a certain year (GATS).

Table2. Frequency of key words of science and technology innovation in the Outline of National Innovation-Driven Development Strategy

Keyword	word frequency	Keyword	word frequency
blaze new trails	261	high-end	12
skill	126	smart (phone, system, bomb etc)	12
science and technology	82	civil-military integration	5
scientists	33	high and new	2
attractive looks	31	patents	1
research and development	24	labs	1
(scientific) research	22	specialized and new	1
intellectual property rights (law)	16		

3.1.4 Selection of other control variables

In addition to the core independent variables, the study needs to introduce other key control variables, according to the existing literature, the author's fiscal self-sufficiency rate (FSR), expenditure on research and experimental development (RDI), enterprise ownership structure (EOS), and per capita Gross Domestic Product (GDP) are used as control variables. Among the above variables, the fiscal self-sufficiency rate is an important indicator of local government's fiscal independence; when fiscal independence is strong, local governments can both promote innovation and development of enterprises by providing them with better productive services (Tai et al., 2018), and reduce their intervention in long-term loans to enterprises (Wu et al., 2021); and local government's R&D expenditure significantly improves enterprises' economic performance and innovation outcomes (Luan and Luo, 2016), but there may be a crowding-out effect on enterprise R&D funding input (Lin and Meng, 2018); enterprise ownership structure is a variable that has a certain impact on enterprise profits, in which for industrial enterprises above the scale, it has been found that the proportion of state-owned capital of the enterprise shows a negative correlation with the profit and growth of enterprise relationship (Shi et al., 2015); Finally, the per capita GDP of each province represents the local economic growth level, which largely affects the development environment and resource acquisition of local enterprises. The data of the above control variables can be obtained from all the years of China Financial Statistics Yearbook, China Statistical Yearbook, and the statistical yearbooks of each province in all the years, which are delivered here.

3.2 Modeling and preliminary testing

To further understand the characteristics of each variable, we performed descriptive statistics for all variables and the results are shown in Table 3.

Table 3. Descriptive statistics of variables

statistic	lnAWKM	lnAWKS	POAM	POAS	FEDC	GATS	FSR	lnGDP	EOS	lnRDI
average value	3.936	3.760	0.068	0.073	0.031	0.011	0.439	10.861	4.272	5.468
upper quartile	4.030	3.972	0.069	0.065	0.023	0.011	0.401	10.830	2.679	5.739
minimum value	-0.400	-1.022	-0.033	0.008	0.002	0.003	0.056	9.706	0.329	0.182
maximum values	6.274	6.382	0.198	0.291	0.119	0.035	0.894	12.123	24.206	8.295
(statistics) standard deviation	1.423	1.376	0.036	0.045	0.025	0.004	0.183	0.447	4.592	1.539
skewness	-0.804	-0.990	0.197	1.112	1.443	0.814	0.485	0.336	2.100	-0.813
kurtosis	3.603	4.596	3.355	4.642	4.602	4.552	2.789	2.879	7.155	3.673
sample size	341	341	341	341	341	341	341	341	341	341

Further, to avoid the pseudo-regression problem, we performed the unit root test on the series of the variables of interest to obtain the smoothness characteristics of the variable series. Table 4 shows the results of the unit root test obtained using Stata 16.0 software.

Table 4. Results of panel unit root tests for variables

test sequence	Test Methods (C,T,K)	LLC Inspection	ADF-Fisher test	PP-Fisher test	conclusion
lnAWKM	(1,0,0)	-5.85***	95.70 ***	84.48 **	smoothly
lnAWKS	(1,0,0)	-5.23 ***	168.54***	19.72	smoothly
POAM	(1,0,0)	-3.24 ***	112.98 ***	78.70 *	smoothly
POAS	(1,0,0)	-6.85***	90.51 **	161.86 ***	smoothly
FEDC	(1,1,0)	5.24	172.49 ***	5.57	smoothly
GATS	(1,1,0)	-7.17 ***	91.49 ***	206.33 ***	smoothly
FSR	(1,1,0)	-9.83 ***	108.13***	181.48 ***	smoothly
lnGDP	(1,1,0)	-3.79 ***	270.11 ***	84.10 **	smoothly
EOS	(1,0,0)	-8.77 ***	97.54 ***	178.20 ***	smoothly
RDI	(1,1,0)	-0.53	17.07	15.49	uneven
lnRDI	(1,1,0)	-9.89 ***	110.01***	112.20 ** *	smoothly

Note: C in the test denotes whether the intercept term is considered in the panel unit root test, T denotes whether the time trend term is considered, K denotes whether the difference is considered, 0 denotes not selected, and 1 denotes selected. *** indicates that the hypothesis test is statistically significant at a confidence level of 99%, ** indicates that the hypothesis test is

statistically significant at a confidence level of 95%, and * indicates that the hypothesis test is statistically significant at a confidence level of 90%.

From the results of the unit root test in Table 4, it can be seen that, except for the expenditure on research and experimental development (RDI), the sequences of other variables pass the smoothness test. In order to eliminate the negative impact of the non-stationarity of the variable series on the subsequent regression, we carry out the logarithmic transformation of RDI, and carry out the unit root test again on the transformed variable series, and the results all show significance.

Ultimately, we construct a panel econometric regression model of the following form:

$$\ln AWK_{it} = \alpha_{it} + \beta_0 FEDC_{it} + \beta_1 GATS_{it} + \sum_{k=1}^{4} \lambda_k Control_{it} + \varepsilon_{it} \quad (1)$$

$$POA_{it} = \delta_{it} + \gamma_0 FEDC_{it} + \gamma_1 GATS_{it} + \sum_{\eta=1}^{4} \pi_\eta Control_{it} + \eta_{it} \quad (2)$$

where lnAWKit and POAit represent the average number of employees and asset profitability of enterprises in province i in year t, respectively; FEDCit denotes the degree of financial decentralization in province i in year t; and GATSit denotes the index of government attention to science, technology and innovation in province i in year t.

When performing specific operations, lnAWKit and POAit in Eq. (1) and Eq. (2) will be used to classify enterprises into medium-sized and small enterprises based on size, where medium-sized enterprise growth indexes are represented by lnAWKMit and POAMit, respectively, and small enterprise growth indexes are represented by lnAWKSit and POASit, respectively Controlit denotes the set of control variables; εit and ηit are random disturbance terms and satisfy the assumption of independent homoskedasticity.

4 Empirical analysis

4.1 Baseline regression

In this paper, we first estimate the parameters of the regression models shown in Eq. (1) and Eq. (2) based on provincial panel data. We first examine the effect of financial decentralization as well as the government's attention to science, technology and innovation on the growth of SMEs under static conditions, and at the same time, we use the Hausman test to select either a fixed effect model or a random effect model for the characteristics of the static panel model. Tables 5 and 6 show the benchmark regression results obtained using Stata 16.0 software.

Table 5. Benchmark regression results

VARIABLES	lnAWKS		lnAWKM	
	(1)	(2)	(3)	(4)
FEDC	21.40***	5.06***	23.12***	5.12***
	(2.06)	(1.20)	(2.20)	(1.18)
GATS	17.34*	12.64**	27.81***	-5.20
	(9.42)	(5.00)	(10.07)	(4.89)
lnGDP	-0.95***	-0.72***	-0.60***	-0.35***
	(0.17)	(0.09)	(0.18)	(0.09)
FSR	3.40***	0.37	2.51***	-0.82***
	(0.44)	(0.25)	(0.47)	(0.25)
EOS	-0.16***	-0.10***	-0.17***	-0.10***
	(0.01)	(0.005)	(0.01)	(0.004)
lnRDI		0.74***		0.82***
		(0.03)		(0.02)
Constant	12.43***	8.11***	8.97***	4.20***
	(1.63)	(0.90)	(1.74)	(0.84)

Hausman test	72.85***	262.42***	439.54***	733.04***
model form	FE	FE	FE	FE
Observations	341	341	341	341
R-squared	0.81	0.95	0.80	0.95

Note:*** indicates that the hypothesis test is statistically significant at 99% confidence level,** indicates that the hypothesis test is statistically significant at 95% confidence level;* indicates that the hypothesis test is statistically significant at 90% confidence level, with standard errors in parentheses, FE denotes fixed effects and RE denotes random effects. FE denotes fixed effect, RE denotes random effect.

Table 6. Benchmark regression results

VARIABLES	**POAS**		**POAM**	
	(5)	(6)	(7)	(8)
FEDC	0.23**	0.21*	0.22*	0.23**
	(0.12)	(0.12)	(0.11)	(0.11)
GATS	1.00*	0.81	0.99*	1.00*
	(0.60)	(0.57)	(0.51)	(0.51)
lnGDP	-0.01	0.006		0.02**
	(0.01)	(0.01)		(0.01)
FSR		-0.03	0.0004	-0.04*
		(0.03)	(0.02)	(0.02)
EOS		-0.004***	-0.002***	-0.002***
		(0.0005)	(0.0004)	(0.0004)
Constant	0.16**	0.13***	0.0603	-0.14
	(0.07)	(0.01)	(0.0981)	(0.09)
Hausman test	9.96**	9.76*	19.60***	36.35***
model form	FE	FE	FE	FE
Observations	341	341	341	341
R-squared	0.53	0.35	0.47	0.19

From the results of parameter estimation in Tables 5 and 6, we can draw the following conclusions:

First, under the condition of not considering the size of enterprises, no matter using the personnel growth index or the efficiency growth index to measure the growth of SMEs, the relationship between financial decentralization, the government's attention to science, technology and innovation and the growth of SMEs all show a significant positive correlation. This result is basically consistent with the scatterplot, indicating that China's financial decentralization reform has promoted the growth of SMEs, while the increase in the government's attention to science, technology and innovation also positively affects the growth of SMEs to a certain extent.

Secondly, if we consider the difference in enterprise size, the degree of influence of financial decentralization and government attention to science, technology and innovation on the growth of enterprises is more obviously affected by the size of enterprises. From the perspective of small enterprises, they are more adept at promoting their own development by taking advantage of the policy advantages brought about by the government's increased attention to science, technology and innovation; for medium-sized enterprises, the performance of financial decentralization on their impact depends on the selection of different indicators, such as in expanding the size of the average number of workers in medium-sized enterprises, financial decentralization plays a significantly more positive role than the government's attention to science, technology and innovation, and in increasing the profitability of the enterprise's assets, it is relatively weaker. while it is relatively weak in terms of increasing firms' asset profitability.

In general, the above benchmark regression results can present the parameter sign and value size characteristics of each core variable in the regression model in a more comprehensive way, and initially reveal the influence mechanism and direction of financial decentralization and the government's attention to scientific and technological innovation on the growth of China's small and medium-sized enterprises (SMEs). However, due to the limitations of the model, further robustness tests need to be

implemented to ensure the reliability and stability of the research results, so we will implement further estimation of parameters by means of the instrumental variable method (IV) and the dynamic panel system generalized moment estimation (SYS-GMM) method.

4.2 Robustness tests

For the measurement of the degree of financial decentralization, the use of only one evaluation method to construct the indicator may suffer from the problem of selection bias; at the same time, the growth of SMEs is a long-term and gradual process, which needs to take into account the impact of the variable's intertemporal factors.

To address the above issues, this paper uses two methods to test the robustness of the benchmark regression results. One is to re-estimate the parameters with the help of instrumental variables and compare the re-estimation results with the benchmark regression results; the other is to implement the re-estimation by transforming the model. According to the needs of the study, we use the above two methods in combination, on the one hand, using the instrumental variable method to re-measure the provincial financial decentralization index FEDCa using the composite index method, which is used to replace the original financial decentralization index FEDC and re-regress it; on the other hand, for the intertemporal factors that may be neglected by the original model, using the dynamic panel system generalized moments estimation (SYS-GMM) method to To study whether there is an intertemporal lag effect of financial decentralization and government attention to science and technology innovation on the growth of SMEs, and to examine the reliability of the existing parameter signs. Stata 16.0 software is used to implement the above two estimations, and the results are shown in Tables 7 and 8.

Table 7. Robustness estimation results - instrumental variables approach

VARIABLES	lnAWKS		lnAWKM		POAS		POAM	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
FEDCa	55.48***	34.48***	55.53***	37.55***	0.39***	0.28**	0.44***	0.300***
	(3.96)	(3.09)	(5.86)	(3.80)	(0.15)	(0.14)	(0.12)	(0.12)
GATS	16.66	10.99	27.24*	20.94*	1.33**	-0.24	0.18	0.13
	(13.72)	(9.30)	(15.18)	(10.71)	(0.55)	(0.57)	(0.45)	(0.44)
lnGDP	-0.89***	-0.92***	-0.62***	-0.46***		-0.05***	-0.01	-0.01
	(0.20)	(0.13)	(0.22)	(0.13)		(0.01)	(0.01)	(0.01)
FSR		2.03***	-0.23	0.80*	-0.01	0.07***	0.01	0.02
		(0.45)	(0.85)	(0.44)	(0.02)	(0.02)	(0.02)	(0.02)
EOS		-0.16***		-0.18***	-0.003***	-0.003***		-0.001***
		(0.01)		(0.01)	(0.0004)	(0.0004)		(0.0004)
Constant	11.51***	12.36***	8.79***	7.92***	0.09***	0.55***	0.17**	0.16**
	(2.05)	(1.27)	(2.16)	(1.26)	(0.01)	(0.08)	(0.07)	(0.07)
Hausman test	12.19***	9.24***	0.74	258.49***	7.87**	10.68***	6.16	40.03***
model form	FE	FE	RE	FE	FE	FE	RE	FE
Observations	341	341	341	341	341	341	341	341
R-squared	0.35	0.79	0.33	0.94	0.12	0.22	0.05	0.10

Note:*** indicates that the hypothesis test is statistically significant at 99% confidence level,** indicates that the hypothesis test is statistically significant at 95% confidence level;* indicates that the hypothesis test is statistically significant at 90% confidence level, with standard errors in parentheses, FE denotes fixed effects and RE denotes random effects. FE denotes fixed effect, RE denotes random effect.

Table 8. Robustness estimation results - Dynamic panel system generalized moments estimation (SYS-GMM) method

VARIABLES	lnAWKS		lnAWKM		POAS		POAM	
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
lnAWKS(-1)	1.35***	1.18***						
	(0.16)	(0.15)						
lnAWKM(-1)			0.84***	1.70***				
			(0.08)	(0.39)				

POAS (-1)					0.62***	0.57***		
					(0.08)	(0.14)		
POAM (-1)							0.89***	1.32***
							(0.08)	(0.19)
FEDC	6.18**	8.00**	1.88*	-1.70	0.30**	0.37*	0.33*	0.20
	(2.69)	(3.84)	(1.05)	(2.03)	(0.13)	(0.21)	(0.19)	(0.15)
GATS	17.71*	8.00	8.86	8.25	0.88**	-0.27	0.29	0.63*
	(9.83)	(10.94)	(7.05)	(16.02)	(0.41)	(0.35)	(0.39)	(0.33)
lnGDP	-0.14	-0.06	-0.05	-0.37*		-0.001	0.01	0.01
	(0.09)	(0.07)	(0.09)	(0.21)		(0.01)	(0.01)	(0.33)
FSR		-0.34	0.55	0.91*	-0.004	-0.01	-0.05**	-0.05*
		(0.24)	(0.39)	(0.55)	(0.01)	(0.02)	(0.02)	(0.03)
EOS		-0.02***	-0.03	0.02	-0.001*	-0.001*		-0.0002
		(0.01)	(0.02)	(0.03)	(0.0004)	(0.001)		(0.001)
lnRDI		-0.01		0.23*		-0.001		0.0003
		(0.06)		(0.13)		(0.003)		(0.09)
Constant	1.51	0.91	2.37*	3.69*	0.03**	0.04	-0.07	-0.06
	(1.01)	(0.06)	(1.26)	(2.04)	(0.01)	(0.07)	(0.06)	(0.09)
AR (1)	-2.79***	-2.64***	-2.25**	-2.20**	-2.61***	-1.88*	-2.59***	-2.04**
AR (2)	0.27	0.11	-0.50	1.47	-2.068**	-1.83*	-0.93	0.67
Hansen test	0.58	0.92	0.28	0.54	0.06	0.06	0.47	0.36

Note: The value of Hansen's test indicates the value of the probability of significance of the chi-square test i.e., p-value; lnAWKS (-1) denotes lagged first-order variable of lnAWKS, lnAWKM (-1) denotes lagged first-order variable of lnAWKM, POAS (-1) denotes lagged first-order variable of POAS, and POAM (-1) denotes lagged first-order variable of POAM.

In the instrumental variables method, we still use the Hausman test to select fixed effects or random effects, and at the same time judge the validity of the selected instrumental variables with the help of the Cragg-Donald Wald F-statistic and the Shea spartial R2 test, and the results of the tests show that the instrumental variables do not have a weak correlation problem, and at the same time the Hansen J test shows that the instrumental variables satisfy the criterion of exogeneity. variables satisfy the exogeneity criterion; in the system generalized moments estimation, we utilize the AR order to represent the dynamic lagged effects and use the Hansen test to verify the exogeneity of the instrumental variables to ensure that there is no endogeneity problem in the model. Observing the regression results of each model, we can find the following points.

First, from the estimation results of the instrumental variables method, after reconstructing the financial decentralization index using the composite index method, it still shows a significant contribution to the growth of SMEs; at the same time, the conclusion that the increase in government attention to science, technology and innovation will promote the growth of SMEs is robust and reliable.

Second, according to the empirical results of the dynamic panel model, both types of variables representing SME growth are characterized by significant path dependence, i.e., the impact of financial decentralization and the government's attention to science, technology and innovation on the growth of SMEs has a significant lag effect. At the same time, both financial decentralization and government attention to science and technology innovation are statistically proven to play a positive role in promoting SME growth, which is generally consistent with the estimation results of the static panel model.

Combining the results of the robustness tests in Tables 7 and 8, we basically confirm the validity of the core parameters to be estimated, and their main conclusions are to a large extent consistent with the expectations of our earlier hypothesis tests. However, there are still very few variables that fail the consistency test, which may be related to the limitations of the theoretical framework, the timeliness of policy changes, and other factors, which provide an important direction for our future research.

4.3 Endogenous treatment

Theoretically, the relationship between financial decentralization, government attention to STI, and SME growth is not fixed, and in addition to some of the correlations we mentioned earlier, there may be important links between financial

decentralization and government attention to STI, a situation that can make it difficult to determine the causality of the problem, and at the same time there may be a problem with omitted variables, resulting in the accuracy of parameter estimation being Impact.

In order to verify the existence of the endogeneity problem and to eliminate its effects, this paper will use the latest Extended Regression Model (ERM) method for parameter estimation. The advantage of this method is that it not only accurately identifies the endogeneity problem and has a more flexible model form, but also overcomes the limitations of traditional instrumental variable methods in addressing endogeneity and parameter calibration, thus minimizing the disturbance caused by sample selection bias and better adapting to panel data.

The results of the parameters obtained through Stata 16.0 software are shown in Table 9.

Table 9. Panel ERM estimation results

VARIABLES	lnAWKM	lnAWKS	POAM	POAS
	(25)	(26)	(27)	(28)
FEDC	42.60***	24.08***	0.55***	1.11***
	(3.38)	(4.76)	(0.15)	(0.18)
GATS	30.45**	34.88**	0.30	0.06**
	(14.06)	(14.62)	(0.49)	(0.60)
Constant	-0.02***	2.62***	0.17***	-0.02***
	(0.16)	(0.17)	(0.07)	(0.002)
corr(e.FEDC,e.lnAWKM)	-0.30***			
	(0.07)			
corr(e.FEDC,e.lnAWKS)		0.24**		
		(0.10)		
corr(e.FEDC,e.POAM)			-0.15*	
			(0.09)	
corr(e.FEDC,e.POAS)				-0.33***
				(0.08)
control variable	Yes	Yes	Yes	No
Observations	341	341	341	341

Note:*** indicates that the hypothesis test is statistically significant at 99% confidence level,** indicates that the hypothesis test is statistically significant at 95% confidence level,* indicates that the hypothesis test is statistically significant at 90% confidence level, and the standard error is shown in parentheses.

In Table 9, whether the endogeneity problem is handled properly depends on the size and significance of the covariance correlation coefficient, if the covariance correlation coefficient is small and passes the significance test, it indicates th at the endogeneity is handled more cleanly, and the author can get the following conclusions based on the results in Table 8:

First, after the endogeneity treatment, financial decentralization and increased government attention to science and technology innovation still significantly promote the growth of SMEs, and the marginal impact coefficients are further expanded. This result is consistent with the results of parameter estimation using static panel models, indicating the robustness of the results of the previous empirical tests.

Second, comparing the benchmark regression results with the changes in parameter sizes of ERMs, it can be found that at the level of medium-sized enterprises, the positive impact of financial decentralization on their development is slightly larger than the government's attention to science, technology and innovation; when oriented towards small-sized enterprises, the effect of deepening the degree of financial decentralization on the improvement of their asset margins is larger than the positive impact of the government's attention to science, technology and innovation on the development of the enterprise, and the support effect of the expansion of the size of their employees is smaller than the government's attention to science, technology and innovation. support effect is smaller than the government's STI attention. This suggests that financial decentralization is more important for SMEs to improve their profitability in a short period of time.

4.4 Mediation effects test

Based on the results of the previous empirical tests, we have verified the direct effect of financial decentralization and government's attention to science and technology innovation affecting the growth of SMEs. However, according to the theoretical analysis, financial decentralization may indirectly affect the growth of SMEs through the government's attention to science and technology innovation, in addition to being able to directly affect the growth of SMEs. Therefore, it is necessary to test this mediating transmission mechanism. In view of the current discussion on the mediation mechanism research, in order to avoid the causal push defects of the three-stage mediation effect test (Jiang, 2022), this paper adopts the practice of Niu et al. (2023) as well as Zeng et al. (2023) by adding mediating variables to test the four-stage mediation mechanism of the explanatory variables regression separately, in order to assess whether government attention to science, technology and innovation plays a mediating role in the relationship between financial decentralization and SMEs' growth between financial decentralization and SME growth, and the results are further judged according to the Sobel test to enhance the robustness and credibility of the research results. The model form of the constructed regression equation is set as follows:

$$\begin{cases} \ln AWK_{it} = \theta_{it} + \beta_0 FEDC_{it} + \sum_{i=1}^{4} \beta_i Control_{it} + \pi_{it} & (3) \\ GATS_{it} = \alpha_{it} + c_0 FEDC_{it} + \sum_{i=1}^{4} c_i Control_{it} + \varepsilon_{it} & (4) \\ \ln AWK_{it} = \lambda_{it} + \alpha_0 GATS_{it} + \sum_{i=1}^{4} \alpha_i Control_{it} + \eta_{it} & (5) \\ \ln AWK_{it} = \upsilon_{it} + \omega_0 FEDC_{it} + \omega_1 GATS_{it} + \sum_{i=1}^{4} \omega_i Control_{it} + \mu_{it} & (6) \end{cases}$$

$$\begin{cases} POA_{it} = \theta_{it} + \beta_0 FEDC_{it} + \sum_{i=1}^{4} \beta_i Control_{it} + \pi_{it} & (7) \\ GATS_{it} = \alpha_{it} + c_0 FEDC_{it} + \sum_{i=1}^{4} c_i Control_{it} + \varepsilon_{it} & (8) \\ POA_{it} = \lambda_{it} + \alpha_0 GATS_{it} + \sum_{i=1}^{4} \alpha_i Control_{it} + \eta_{it} & (9) \\ POA_{it} = \upsilon_{it} + \omega_0 FEDC_{it} + \omega_1 GATS_{it} + \sum_{i=1}^{4} \omega_i Control_{it} + \mu_{it} & (10) \end{cases}$$

The estimation was carried out using Stata 16.0 software and the results of the parameters obtained are shown in Tables 10 and 11.

Table 10. Results of the mediation effect test

VARIABLES	lnAWKS				lnAWKM			
	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
	lnAWKS	GATS	lnAWKS	lnAWKS	lnAWKM	GATS	lnAWKM	lnAWKM
FEDC	37.40***	0.03***		36.28***	24.00***	0.03**		23.08***
	(2.68)	(0.01)		(2.71)	(2.17)	(0.01)		(2.16)
GATS			69.30***	34.88**			42.46***	29.23***
			(17.90)	(14.70)			(10.60)	(9.24)
Constant	5.26***	-0.03***	-3.34*	6.37***	7.03***	-0.03***	8.01***	7.95***
	(1.61)	(0.01)	(1.86)	(1.67)	(1.18)	(0.01)	(1.38)	(1.20)
control variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sobel Z	1.92*				1.95*			
Observations	341	341	341	341	341	341	341	341
R-squared	0.42	0.26	0.13	0.43	0.79	0.27	0.72	0.80

Note:*** indicates that the hypothesis test is statistically significant at 99% confidence level,** indicates that the hypothesis test is statistically significant at 95% confidence level,* indicates that the hypothesis test is statistically significant at 90% confidence level, and the standard error is shown in parentheses. Standard errors in parentheses.

Table 11. Results of the mediation effect test

VARIABLES	POAS				POAM			
	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)
	POAS	GATS	POAS	POAS	POAM	GATS	POAM	POAM
FEDC	0.24*	0.02*		0.20	0.24**	0.07***		0.31***
	(0.14)	(0.01)		(0.13)	(0.12)	(0.01)		(0.08)
GATS			1.03*	0.94			1.75***	0.13
			(0.61)	(0.61)			(0.46)	(0.47)
Constant	0.08***	0.008	0.20*	0.19*	0.16**	0.01***	0.06***	0.06***
	(0.01)	(0.009)	(0.10)	(0.10)	(0.06)	(0.0003)	(0.008)	(0.005)
control variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sobel Z	1.198				2.14**			
Observations	341	341	341	341	341	341	341	341
R-squared	0.11	0.37	0.22	0.23	0.06	0.16	0.11	0.05

Observing the empirical results in Tables 10 and 11, we can see that:

First, the government's attention to science and technology innovation is an important mediating variable in the impact of financial decentralization on the growth of SMEs, and its enhancement not only directly promotes the development of SMEs, but also indirectly strengthens the boosting effect of financial decentralization on the growth of SMEs. As a key component of the central government's authority, the effective implementation of financial decentralization has given local governments greater autonomy and flexibility in financial market intervention, formed a financial and policy system that meets the characteristics and development needs of the local economy, and guided the flow of financial resources to SMEs with innovation potential in the form of increased attention to science and technology innovation from the local government to provide a strong guarantee for their growth.

Second, from the parameter signs of the core variables, overall financial decentralization and government attention to science and technology innovation still show a positive correlation with the growth of SMEs, indicating that further deepening the reform of financial decentralization and enhancing the government's attention to science and technology innovation in the future will play an important role in promoting the development of SMEs.

4.5 Heterogeneity analysis

4.5.1 Considering regional heterogeneity

Given the unbalanced and insufficient level of development of China's regions, coupled with significant differences in the unequal distribution of resources and vastly different geographic locations, the level and degree of economic development among provinces and cities show large differences. Therefore, we must consider more deeply the impact of regional heterogeneity on the relationship between key variables. Therefore, we adopt the method of dividing China's three major policy zones, namely, East, Central and West, to further explore the specific impacts of financial decentralization and government's attention to science and technology innovation on the growth of SMEs under different regional conditions.

We applied Stata 16.0 software to regress the data from the three major regions of East, Central and West respectively, and the final regression estimates are shown in Tables 12 and 13.

Table 12. Heterogeneity analysis: regional differences (medium-sized enterprises)

VARIABLES	the east		central section		western part	
	lnAWKM	POAM	lnAWKM	POAM	lnAWKM	POAM
	(45)	(46)	(47)	(48)	(49)	(50)
FEDC	23.65***	0.11	13.41***	1.31***	75.08***	1.74***
	(2.23)	(0.08)	(4.13)	(0.42)	(6.47)	(0.27)

GATS	17.13	-1.24**	24.77**	2.43***	16.35	0.08
	(16.94)	(0.54)	(11.92)	(1.34)	(17.12)	(0.73)
Constant	-0.19	0.08***	-9.52***	0.04**	3.63	0.05***
	(2.03)	(0.01)	(2.50)	(0.02)	(2.52)	(0.01)
control variable	Yes	Yes	Yes	Yes	Yes	Yes
Hausman test	65.55***	0.97	181.65***	131.31***	8.27***	7.49**
model form	FE	RE	FE	FE	FE	FE
Observations	121	121	88	88	132	132
R-squared	0.82	0.05	0.84	0.27	0.75	0.37

Note:*** indicates that the hypothesis test is statistically significant at 99% confidence level,** indicates that the hypothesis test is statistically significant at 95% confidence level;* indicates that the hypothesis test is statistically significant at 90% confidence level, with standard errors in parentheses, FE denotes fixed effects and RE denotes random effects. FE denotes fixed effect, RE denotes random effect.

Table 13. Heterogeneity analysis: regional differences (small enterprises)

VARIABLES	**the east**		**central section**		**western part**	
	lnAWKS	POAS	lnAWKS	POAS	lnAWKS	POAS
	(51)	(52)	(53)	(54)	(55)	(56)
FEDC	27.31***	0.24**	29.65***	1.69***	75.65***	1.48***
	(3.70)	(0.12)	(5.98)	(0.48)	(6.48)	(0.20)
GATS	22.38	-2.35**	17.09	2.24*	10.93	0.02
	(28.21)	(0.91)	(17.04)	(1.53)	(16.41)	(0.55)
Constant	8.35**	0.46***	9.97***	-0.35**	7.69	-0.31***
	(3.32)	(0.11)	(2.72)	(0.33)	(2.01)	(0.08)
control variable	Yes	Yes	Yes	Yes	Yes	Yes
Hausman test	198.31***	2.53	0.91	16.26***	2.33	14.40***
Model form	FE	RE	RE	FE	RE	FE
Observations	121	121	88	88	132	132
R-squared	0.39	0.21	0.43	0.43	0.53	0.55

In the analysis, we first implement the parameter estimation of the effects of financial decentralization and government attention to science and technology innovation on the average number of employees in SMEs, and conduct group regressions for the three regions of the east, central and west. At the same time, this paper carries out the test of inter-group variability between the eastern region and the central region, the eastern region and the western region, and the central region and the western region, respectively①. The results of Bootstrap 1000 times sampling test show that, in terms of financial decentralization, for the small-sized enterprises, the empirical P-values of the three are 0.077, 0.011, and 0.076, respectively, which indicate that there are significant differences between the different groups; For medium-sized enterprises, the empirical p-values of the three are 0.126, 0.091, and 0.080, respectively, indicating that there is a significant difference between both the eastern and central regions and the western region.

Observing the empirical results in Table 10, the following conclusions can be drawn.

First, whether in the eastern, central or western regions, financial decentralization significantly contributes to the increase in the average number of workers employed by SMEs, thus expanding the size of enterprises, and from the specific estimation results of the parameters, the systematic contribution of financial decentralization is generally significantly larger than that of government attention to science, technology and innovation. This suggests that financial decentralization can act more quickly on the financing process of SMEs than the government's STI attention, thus directly promoting the growth of SMEs.

Second, for all SMEs, the positive impact of financial decentralization on their growth is consistent with the law that it is strongest in the West, while it differs in its performance in the East and the Centre. In the case of medium-sized enterprises, financial decentralization has a weaker impact on enterprise development in the central region than in the eastern region, but

① The test of between-group variability used in this paper is the Fisher's Combined Test. Same as below.

at this time, the increased attention of the government to science and technology innovation in the central region has an enhanced positive effect on enterprise growth, and its contribution is significantly greater than that of financial decentralization; in the case of small-sized enterprises, the positive effect of financial decentralization on enterprise growth in the central region is stronger than that in the eastern region. This suggests that the degree of financial decentralization in the western region still needs to be improved, while the central region, due to limitations such as the degree of marketization, is more obviously affected by policy orientation.

Third, in terms of the extent to which advances in the degree of financial decentralization can improve SME growth, the eastern, central and western regions all provide a stronger boost to the growth of small firms, with marginal coefficients of contribution that are significantly larger than those of the medium-sized firm sample. This suggests that financial decentralization has a more pronounced role in supporting the growth of small firms in all regions.

Next we conducted parameter reestimation of the impact of financial decentralization and government attention to science, technology and innovation on SMEs' asset margins, again grouping regressions for the East, Central and West, and tests of inter-group variability between the Eastern region and the Central region, the Eastern region and the Western region, and the Central region and the Western region, respectively. The test results show that in terms of financial decentralization, for small-sized enterprises, the empirical P-values of the three regions are 0.022, 0.152, and 0.077, respectively, indicating that there is a significant difference between the central region and the remaining two in terms of the impact of financial decentralization on SMEs' growth; and for medium-sized enterprises, the empirical P-value of the eastern region and the central region is 0.082, which suggests that financial decentralization can be further compared between the eastern and central regions in terms of their differential impact on SME growth. As for government STI attention, for small-sized enterprises, the empirical P-values of the three are 0.032, 0.029, and 0.426, indicating that there is a significant difference between the eastern region and the remaining two in terms of the impact of government STI attention on SMEs' growth; for medium-sized enterprises, the empirical P-values of the three are 0.047, 0.030, and 0.533, and the between-groups variability is consistent with that of small-sized enterprises.

Observing the empirical results in Table 11, the following points can be observed.

First, for all SMEs in Central and Western China, the overall advancement of financial decentralization and the increased attention of the government to science, technology and innovation can increase the profitability of firms' assets and provide an important incentive for SMEs to grow.

Second, for enterprises of the same size, the strength of financial decentralization varies across regions. For small-sized enterprises, financial decentralization is significantly stronger in the central region than in the eastern and western regions; for medium-sized enterprises, financial decentralization is also more effective in the central region than in the eastern region. This suggests that as financial decentralization advances, the match between the financial needs of SMEs and financial support in the central region is more clearly improved, thus contributing to a significant increase in local enterprise efficiency.

4.5.2 Considering local government size heterogeneity

In addition to the different levels of economic development in different regions of China, the size of local governments in China also varies. And government size is one of the key factors affecting the government's role positioning, and its size is related to the degree of government intervention in market development and economic development. Meanwhile, existing studies have found that the expansion of government size has a significant impact on the resource allocation efficiency of enterprises (Zhu and Zhang, 2016). Therefore, with reference to the existing literature, we use the share of local government's fiscal expenditure in GDP as a measure of the size of the government and divide the overall sample into three groups of small, medium, and large size based on the three tertiles of the size of the government, to study the impact of financial decentralization and the government's attention to science, technology, and innovation on the growth of SMEs in each of the subgroups. The final estimation results are shown in Tables 14 and 15.

Table 14. Heterogeneity analysis: differences in government size (medium-sized enterprises)

VARIABLES	small government		central government		big government	
	lnAWKM	POAM	lnAWKM	POAM	lnAWKM	POAM

	(57)	(58)	(59)	(60)	(61)	(62)
FEDC	18.07***	0.02	10.21***	0.56*	93.97***	0.85**
	(2.02)	(0.10)	(2.95)	(0.32)	(13.11)	(0.36)
GATS	-6.85	-0.41	24.10*	1.42	12.45	-1.87**
	(12.81)	(0.57)	(13.70)	(1.07)	(31.12)	(0.80)
Constant	8.34***	-0.16	13.47***	-0.07	1.44	-0.12
	(1.52)	(0.16)	(1.61)	(0.17)	(3.12)	(0.08)
control variable	Yes	Yes	Yes	Yes	Yes	Yes
Hausman test	4.62	15.54***	4.19*	5.38*	0.88	3.82
model form	RE	FE	FE	FE	RE	RE
Observations	118	118	116	116	107	107
R-squared	0.50	0.38	0.31	0.15	0.39	0.25

Table 15. Heterogeneity analysis: differences in government size (small businesses)

VARIABLES	**small government**		**central government**		**big government**	
	lnAWKS	POAS	lnAWKS	POAS	lnAWKS	POAS
	(63)	(64)	(65)	(66)	(67)	(68)
FEDC	18.96***	0.44**	17.49***	0.65*	40.16***	0.59*
	(1.42)	(0.18)	(2.17)	(0.38)	(9.46)	(0.29)
GATS	-15.10	-2.73***	0.05	0.56	4.25	-1.46**
	(9.44)	(0.85)	(7.21)	(0.92)	(20.34)	(0.70)
Constant	7.19***	0.36***	13.04***	0.20***	18.02***	0.04
	(1.32)	(0.04)	(1.14)	(0.033)	(3.34)	(0.11)
control variable	Yes	Yes	Yes	Yes	Yes	Yes
Hausman test	2.91	18.32	18.48***	6.27	29.09***	3.82*
model form	RE	RE	FE	RE	FE	FE
Observations	118	118	116	116	107	107
R-squared	0.78	0.42	0.76	0.22	0.82	0.32

Parameter re-estimation of the effect of implementing financial decentralization and government attention to science, technology and innovation on the average number of employees in SMEs, as well as between-groups difference tests for small vs. medium government, small vs. large government, and medium vs. large government, respectively. The results of Bootstrap's 1,000-times sampling test show that, in the case of financial decentralization, for small firms, the empirical p-values of the three are 0.010, 0.016, and 0.100, indicating a significant difference between groups, 0.016, and 0.100, indicating that there is a significant difference between different groups; for medium-sized enterprises, the empirical p-values of the three are 0.029, 0.008, and 0.256, indicating that there is a significant difference between both medium and large governments and small governments. Observing the estimation results, we can get the following conclusions.

First, for all SMEs, the overall positive impact of financial decentralization on their growth is consistent with the pattern that large-sized governments are the strongest, small-sized the next strongest, and medium-sized the weakest. This suggests that there is still room for medium-sized local governments to improve their efficiency in allocating financial resources or the effectiveness of related policy implementation.

Second, whether for small, medium or large governments, financial decentralization is effective in promoting SMEs' expansion in terms of staff size, and the systemic contribution of financial decentralization is generally significantly larger than that of government STI attention. This reflects the fact that financial decentralization can act more quickly and directly on SMEs' financing and other aspects than government STI attention, which in turn strongly promotes SMEs' growth.

Third, for both small and medium-sized government locations, financial decentralization performs better in promoting the growth of small firms than it does for medium-sized firms. Only for large-sized governments does the performance differ, with deeper financial decentralization being more beneficial to medium-sized firms. This implies that governments of different sizes may have different emphases and strategies in the implementation of financial decentralization policies. Small and medium-sized local governments may focus more on supporting small enterprises in order to stimulate market dynamics and promote

employment growth, while large-sized governments place more emphasis on the development of medium-sized enterprises in order to capitalize on their scale advantage and innovation capacity to promote the overall upgrading of the regional economy.

The next parameter reestimation of the impact of financial decentralization and government attention to science, technology and innovation on SMEs' asset margins is carried out, and the same between-groups variability tests are conducted for small vs. medium-sized government, small vs. large government, and medium vs. large government, respectively. The test results show that in terms of financial decentralization, for medium-sized firms, the empirical p-values of the three are 0.077, 0.124, and 0.093, respectively, indicating that the effect of financial decentralization on SMEs' growth in the medium-sized government affiliation is significantly different from that of the small government and the large government . In terms of government STI attention, for small firms, the empirical p-values of the three are 0.080, 0.220, and 0.078, respectively, indicating that the effect of government STI attention on SMEs in the places belonging to the medium-sized government is likewise significantly different from the rest of the two. Observing the estimation results, we can get the following conclusions.

First, for all SMEs, the positive impact of increased attention to STI in medium-sized government-owned local governments on their efficiency gains is more pronounced.

Second, for enterprises of different sizes, the strength of the role of financial decentralization varies with the size of government. For medium-sized enterprises, the positive impact of financial decentralization on their growth is consistent with the pattern that large-sized governments are the strongest, small-sized the second strongest and medium-sized the weakest; while for small enterprises, the growth-enhancing effect of financial decentralization is slightly better in medium-sized local governments than in large governments.

5 Conclusions and policy implications

At the present stage, financial decentralization reform has more and more practical significance to support the development of China's real economy, especially the growth of small and medium-sized enterprises (SMEs), and financial decentralization, as an important initiative of China's in-depth promotion of the reform of the financial system, can give full play to the advantages of the local government in grasping the local information, resource deployment, policy adjustment and other aspects. At the same time, small and medium-sized enterprises as the main force of scientific and technological innovation, the government's attention to scientific and technological innovation will also provide a positive policy effect. Therefore, we should focus on the rationalization of financial decentralization combined with the policy guidance role of the government's attention to science and technology innovation to effectively and solidly promote the development of SMEs. Based on the detailed examination of the correlation between financial decentralization, the government's attention to science and technology innovation and the growth of SMEs, this paper summarizes the results of the previous research and draws the following conclusions.

First, both financial decentralization and government attention to science, technology and innovation have been effective in promoting SME growth, which has been reflected in a significant increase in firm size on the one hand and in the profitability of firms' assets on the other.

Second, based on the perspective of the government's attention to science and technology innovation, we find that the impact of financial decentralization on the growth of SMEs can have a mediating effect on the growth of SMEs through the government's attention to science and technology innovation, in addition to the existence of a direct effect. The promotion of financial decentralization can motivate local governments to increase their attention to science and technology innovation, thus contributing to the development of SMEs in their territories.

Third, the impact of financial decentralization and government attention to science and technology innovation on SME growth is characterized by significant heterogeneity. In terms of regional heterogeneity, the deepening degree of financial decentralization has the strongest incentive effect on SME growth in the western region relative to the east-central region. From the perspective of government size, we find that the pulling capacity of financial decentralization on the development of local SMEs is weak when the size of local governments is small or medium, while the promotion of financial decentralization on the

growth of SMEs is significantly stronger when the size of local governments is large.

Based on the above conclusions, we put forward the following policy recommendations for the reference of governments at all levels.

First, the establishment of a unified system for assessing the degree of financial decentralization should be accelerated, so that the actual degree of financial decentralization can be measured in a scientific and objective manner by taking into full consideration the division of financial powers and responsibilities between the central authorities and local authorities, the degree of competition in the financial market, and other aspects. This will help to identify irrationalities in the allocation of financial resources, thereby promoting the adjustment of relevant policies and the rationalization of the degree of financial decentralization, and providing SMEs with a better financial service environment.

Secondly, it is necessary to gradually deepen the reform of financial decentralization between the central and local governments with Chinese characteristics, while paying great attention to the indispensable role of local governments in scientific and technological innovation, and further relaxing the autonomy of local governments in the allocation of financial resources, so as to give full play to the advantages of local governments in the mastery of local information and the coordination of resources, and to form an innovation ecosystem in which the government, industry, academia, research and application of science and technology are closely integrated. This can, on the one hand, solve the problems of difficult and expensive financing for SMEs and promote the flow of more funds to SMEs with innovative potential and market prospects; on the other hand, local governments can promote the transformation and application of scientific and technological innovation achievements through policy guidance, financial support and project cooperation, providing SMEs with more innovative resources and market opportunities.

Thirdly, the reform of financial decentralization in China should be promoted in accordance with local conditions. Each region should adjust some of its policy arrangements in a timely manner according to its own stage of development and level of economic development, such as focusing on strengthening the degree of financial decentralization in the western region in order to incentivize the growth of small and medium-sized enterprises, and strengthening the integration and balance of financial decentralization in the eastern and central regions and the degree of importance attached by the Government to scientific and technological innovation. For local governments of different sizes, the financial decentralization strategy should be flexibly adjusted, with larger local governments requiring greater financial decentralization and smaller and medium-sized governments requiring stronger financial regulation.

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