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Official rotation and corporate innovation: Evidence from the governor rotation



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ABSTRACT

Rotation is a practice whereby officials are regularly moved between equally ranked positions. Focusing on governor rotation, this paper examines the effect of official rotation on corporate innovation in China. First, we find that official rotation significantly promotes corporate innovation, including enterprises' innovation investment, quantity, and quality. Second, we find that the effect of official rotation on corporate innovation varies because of official and regional heterogeneity. Officials rotating from other provinces significantly stimulate corporate innovation, but officials rotating from the central government have an insignificant influence on corporate innovation. In addition, officials rotating to non-eastern regions significantly enhance corporate innovation, while officials rotating to eastern regions have a negligible impact on corporate innovation. We further examine the driving mechanism behind the effect of official rotation on corporate innovation and find that officials rotating from eastern regions to non-eastern regions can significantly promote corporate innovation, but officials rotating from non-eastern regions to eastern regions do not boost corporate innovation. These findings imply that the different effects of official rotation on corporate innovation are due to the official experience effect. We also find that official rotation can promote corporate innovation through reducing corporate charitable donations and increasing corporate innovation subsidies. In a supplementary analysis, we find that GDP-oriented performance appraisal pressure weakens the effect of official rotation on corporate innovation. The lower the pressure on officials regarding their performance, the more significant the effect of official rotation on corporate innovation. In addition, official rotation can significantly promote the development of the regional economy and improve the GDP growth rate via corporate innovation, which is a micro-level economic growth effect of official rotation. Overall, our findings further verify the economic effect of official rotation and extend our understanding of the influencing factors of corporate innovation.

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vation from the perspective of the official governance system. Our findings also have clear policy implications for how the government can improve the official governance model to promote corporate innovation during the transition period of the national innovation system.

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1. Introduction

After 40 years of reform and opening-up, China has achieved sustained and rapid economic development and has considerably improved its national strength. From 1978 to 2016, China's average annual GDP growth rate was 9.7%, far higher than that of other major economies during the same period. China's GDP surpassed that of Japan in 2010 and is now second in the world. From 2010 to 2016, China's average contribution to world economic growth has been as high as 27.6%, ranking first in the world and surpassing the combined contributions of the United States, the Eurozone, and Japan. Economists have sought to explain China's rapid economic growth using two theories. The theory of fiscal decentralization explains China's economic growth from a government system perspective using the famous theory of "Federalism, Chinese Style" (Qian and Weingast, 1997; Qian and Roland, 1998). Political promotion tournament theory interprets the economic growth from an official governance system perspective and suggests that Chinese officials' political promotion incentives related to GDP growth are the key to China's economic growth (Zhou, 2007). However, China's high-growth economy is largely a low-efficiency, high-cost extensive economy. However, the fiscal decentralization system and political promotion tournaments have not only promoted rapid economic growth but have also produced some adverse effects. In the context of the fiscal decentralization system, the local government and officials control huge amounts of fiscal and economic resources, make relatively independent economic decisions, and have a variety of administrative powers to intervene in resource allocation in the market. Thus, the economy is government-dominated. Under centralized political governance, local officials are mainly supervised by central authorities. The central government assesses, appoints, and removes local officials based on economic indicators, which motivates local officials to compete fiercely in terms of GDP and to focus exclusively on short-term economic performance. Local officials can affect the investment behaviors of various market participants through the local government's "visible hand", and have led local governments, enterprises, and even society to invest more in production than in innovation, resulting in extensive economic growth (Wu, 2017).

However, the central government attaches great importance to the economic growth pattern and emphasizes the key role of technological innovation in achieving growth model transformation. Since the 18th National Congress of the Party, the central government has unswervingly implemented innovation-driven development strategies and constantly emphasized the transformation of the economic growth pattern. China continues to pursue innovative development through technological innovation and improvement of the quality and efficiency of development. Relying on resources, capital, labor, and other production factors to support economic growth and scale expansion is an unsustainable development model. However, regional economic growth increasingly faces a number of practical challenges, including momentum conversion, economic growth style transition, and industrial transformation and upgrading. It is time to give scientific and technological innovation a leading role in the great leap of Chinese economic development. Scientific and technological innovation is the driving force behind the continued growth of the national economy, and the vigorous implementation of innovation-driven development strategies will more closely link science and technology with economic growth and improve and shift the growth model. Furthermore, corporate innovation is the micro-foundation for sustained economic growth and the core driving force for improving independent innovation at the national level. During this crucial period of innovation-driven transformation, it is necessary to fully understand the current development status, laws, problems, and trends of Chinese enterprises' innovation. Research on the influential factors of corporate innovation suggest that corporate innovation is affected by the internal governance environment and the external political and economic environment.

The internal governance environment mainly includes the equity structure, equity pledge, director network, salary gap, equity incentives, and executive background (Li and Yu, 2015; Li et al., 2018; Wang and Zhang, 2018; Kong et al., 2017; Liu and Wang, 2018; Yu et al., 2018). The external political and economic environment mainly includes the impact of government subsidies, government officials, and industrial policies on corporate innovation (Guo, 2018; Wang et al., 2018; Chen et al., 2016; Gu and Shen, 2012; Dang et al., 2015; Yu et al., 2016; Li and Zheng, 2016). Innovation-driven development is key to succeeding in the international economy. As the economy enters a new normal and growth slows, China's economy will rely increasingly on innovation to drive its growth and must therefore quickly be put on the path of endogenous growth driven by innovation. Therefore, during the transformation of the national innovation system, it is necessary to systematically solve the problems of how the local government improves the official governance model to promote corporate innovation and plays a lead role in this effort.

Compared with enterprises in a mature market economy, Chinese enterprises tend to maintain closer ties with the government. As an important institutional force, the Chinese government has greater influence over enterprises' operational activities than governments in mature economies. In the innovation-driven wave, the local government has served as a commander-in-chief, improving regional economic development capability through guiding production factors to flow into R&D departments and encouraging enterprises to carry out technological innovation. The efficiency and quality of official governance are regarded as fundamental factors affecting economic development, and local officials also play an important role in China's economic and social development (Li, 1998). Local officials have received incentives to promote economic growth through fiscal decentralization and political promotion tournaments, but such incentives for economic growth are ultimately determined by specific official governance systems. Without proper monitoring and control mechanisms, the incentive effects of fiscal decentralization and political promotion tournaments on local officials may not be effective. Official rotation is an implicit control mechanism and an important way for the central government to coordinate regional coordinated development and achieve balanced regional development. The current "Regulations on the Rotation of Party and Government Leaders," which was formulated in accordance with the civil servant law of the PRC, the regulations on the selection and appointment of leading party and government cadres, and other relevant laws and administrative rules, was promulgated to further promote the work of official rotation, optimize the leadership structure, improve the quality and ability of leading cadres, strengthen the Party culture, promote a corruption-free Party, and boost economic and social development. The literature has found that official rotation positively affects regional economic growth, suggesting that it has an economic growth effect (Zhang and Gao, 2007; Xu et al., 2007; Wang and Xu, 2008). From a micro-level perspective, long-term economic growth may be mainly achieved through the optimal allocation of R&D investments, innovation activities, and input factors between enterprises.

If official rotation promotes economic growth, does it also influence corporate innovation? On the one hand, official rotation can result in the replication or transplant of successful economic growth experiences in developed regions when officials in developed regions are rotated into the less-developed regions. In addition, central officials transferred to local government can improve communication between central and local governments, monitor and restrict inappropriate local government actions, and more effectively ensure the implementation of central policy at the local level. On the other hand, official rotation can limit officials' terms in the same area or department and break officials' local personal and relationship networks, indicating that rotation can restrain factionalism and prevent corruption (Pu, 1999; Chen and Li, 2012). As a result, rotation increases the relative cost of creating political connections and improves incentives for companies to innovate (Yang, 2011; Dang et al., 2015). Therefore, this paper studies the impact of official rotation on corporate innovation in the current Chinese political system.

This paper makes several contributions to the literature. First, the literature has confirmed that official rotation matters for regional economic growth, which we call the effect of official rotation. However, the specific way in which the official rotation affects regional economic growth has not been systematically explored. Our findings provide micro-level evidence on the effect of official rotation on regional economic growth by analyzing the impact of official rotation on corporate innovation. Second, our paper not only clarifies how official rotation affects corporate innovation but also distinguishes the different effects of official rotation on corporate innovation due to the heterogeneity of officials and regions, examines the mechanism behind the effect of official rotation, helps to optimize official governance, and provides a theoretical basis for enhancing regional

coordinated development. Third, different from the numerous studies that examine either R&D expenses or patent applications, our paper comprehensively and systematically examines the impact of official rotation on the status of R&D investments, total patent applications, and invention patent applications. Moreover, our paper has implications for policy makers, especially now that China's economic model has shifted from the high-speed development stage to the high-quality development stage, and from being factor-driven and investment driven to being innovation driven. As our paper finds that official rotation can effectively increase innovation investment, quantity, and quality, it is a practical problem of how to design a reasonable official governance system and give full play to the role of local government as an engine of innovation-driven strategies in the transitional economy.

2. Literature review and hypothesis development

2.1. Literature review

China's market-oriented economy is characterized by government dominance, and it has been repeatedly observed that local officials play an active role in China's economic development process. Many studies have directly examined the influence of officials on the economic behavior and performance of the country.

First, the literature directly examines the economic growth effect of official rotation. [Xu et al. \(2007\)](#) systematically explore the direct effect of governor rotation on provincial economic growth and verify that governor rotation has improved provincial economic growth. [Zhang and Gao \(2007\)](#) find that both vertical and horizontal official rotation have positive effects on economic growth, and that term limits and economic growth exhibit a weak inverse-U relationship. They also show that the effect of governor rotation varies by region, as the positive impact on local growth is more obvious in eastern provinces. [Wang and Xu \(2008\)](#) examine the influence of the official governance system on regional economic growth from the perspective of official source and destination, and find that governors and party secretaries who come from the central government have insignificant effects on local economic growth, and governors and provincial party secretaries rotating to the central government also achieve negligible effects on economic growth. [Yang et al. \(2010\)](#) study the influence of officials on regional economic growth from the resource endowment effect perspective and find that horizontal official rotation contributes to economic growth but that vertical official rotation hinders local economic growth. They also observe regional variation: officials rotating to developed regions have a positive impact on economic growth, while officials rotating to underdeveloped regions have a negative effect on economic growth. [Wang and Xu \(2017\)](#) empirically examine how local officials affect foreign investment behavior and find that official rotation has significantly different effects on foreign investment between coastal areas and non-coastal areas, as officials rotating to coastal areas significantly reduce foreign investment and officials rotating to non-coastal provinces significantly increase foreign investment. They find that this difference is embedded in the official experience effect. Officials rotating from coastal areas to non-coastal areas can improve regional economic openness, foster a market-oriented economic system, bring more economic development experience, and promote the flow of information across regions, thus significantly promoting foreign investment in non-coastal regions. However, in coastal areas, official rotation may disturb the stability of the local economic development strategy, and it is difficult to bring more useful information and experience, and thus to promote foreign investment. These findings send the important signal that official rotation matters for economic growth, but that this effect will vary across officials and regions.

Second, the literature directly explores the social management effect of official rotation. Rotation can curb factionalism by requiring rotated officials to work with new officials. [Chen and Zhao \(1996\)](#) confirm that to a certain extent, official rotation can prevent factionalism, enable local officials to better implement central policies, and curb corruption. Officials rotated to different positions and areas can gain a new working environment, escape the shackles of conservatism and interpersonal relationships, update working ideas and methods, and foster their working ability. Thus, the official rotation system is generally considered to help break down the personal and relationship networks formed by local officials due to geographical relations, and to address corruption ([Pu, 1999](#)). [Chen and Li \(2012\)](#) evaluate the anti-corruption effects of official rotation and find it can significantly reduce corruption. They also find that both vertical official rotation and horizontal official rotation have a significant anti-corruption effect, and that there is a U-shaped relationship between term limits

and the anti-corruption effect. [Bu and Di \(2018\)](#) analyze the relationship between corporate investment and government subsidies and test whether official rotation can play a regulatory role. They find that official rotation can restrain the local government's rent-seeking behavior to some extent, and that both vertical and horizontal official rotation have significant effects. The Chinese government can be divided into central and local levels. The central level consists of the State Council and ministries, and the local level consists of provincial and sub-provincial governments. There are two types of bureaucrats in the Chinese political system: those who perform multiple tasks that have complex relationships, and those who perform single, relatively homogenous tasks ([Huang, 2002](#)). This division between multi-task bureaucrats and single-task bureaucrats roughly corresponds to the division between local officials and central officials. Central officials, classified as single-task bureaucrats, usually specialize in a certain field, have a well-defined sphere of responsibilities, and accumulate relevant management experience, whereas local officials, classified as multi-task bureaucrats, must comprehensively manage all the problems related to regional economic and social development and accumulate comprehensive economic and social management experience. Thus, local officials have more experience advantages than central officials. However, central officials have a closer relationship with the central government and are better able to effectively transmit and implement central policies, weakening the information asymmetry between local and central governments and strengthening the supervision and control of local governments. Therefore, both vertical and horizontal official rotation have significant effects on regional corruption and the local government's rent-seeking behavior.

Third, the literature empirically examines the economic consequences of official turnover. [Wang et al. \(2009\)](#) find that policy uncertainty caused by local official turnover has a significant negative impact on regional economic growth, but official turnover mainly affects short-term economic growth fluctuations rather than long-term economic growth trends. When enterprises face policy uncertainty, they will significantly reduce the scale of investment expenditure to avoid potential policy risks. [Cao \(2013\)](#) finds that the turnover of the provincial secretary will significantly reduce the investments of state-owned enterprises, and [Xu et al. \(2013\)](#) find that official turnover will also affect the investments of private enterprises. [Chen et al. \(2016\)](#) find that the policy uncertainty caused by a change of the municipal party secretary increases the uncertainty of the financing environment and reduces government subsidies and bank borrowing, leading to reductions in patent applications and innovation efficiency. [Wang et al. \(2018\)](#) find that the incentives created by the impending promotion of local politicians reduce firms' innovation quantity and quality. The findings of [Cao \(2013\)](#) and [Xu et al. \(2013\)](#) are consistent with those of [Wang et al. \(2009\)](#): official turnover has a significantly negative impact on economic growth from the perspective of corporate investment expenditure. [Chen et al. \(2016\)](#) and [Wang et al. \(2018\)](#) verify the negative impact of official turnover on the economy from the perspective of corporate innovation. The above studies are consistent with transnational research. Numerous economic studies have examined the influence of official turnover on economic growth and other economic development from the perspective of political power arrangements. [Jones and Olken \(2005\)](#) find that a change in national leaders can significantly affect policy choices and economic growth performance. [Julio and Yook \(2012\)](#) find that companies significantly reduce investment expenditure in political election years due to economic policy uncertainty during elections. [Julio and Yook \(2016\)](#) empirically test the impact of political uncertainty on FDI and find that FDI inflows in the upcoming quarter that includes a leader election decrease significantly, and that this relative decline only occurs in the election quarter, suggesting that the impact of political uncertainty on FDI is short term.

The above literature shows that under the current cadre personnel system and fiscal system, local officials have complex effects on economic and social development. It is crucial to set up an effective official incentive system and a well-designed official governance system. Most current papers are focused on identification effects, and the literature has not paid enough attention to heterogeneity effects or to explaining the driving mechanism behind these effects. From the perspective of policy uncertainty, a large body of literature has examined the impact of official turnover on macroeconomic growth and microenterprises' behavior. However, as stated, these effects of official turnover are short term. In terms of official rotation, the current literature mainly focuses on the long-term impact on the economy and society of a change in political rights. In general, the transfer of political rights at the level of regional leaders not only brings short-term uncertainty and affects short-term economic operation, but also has medium- and long-term effects on economic growth, such as through changes in economic policies, development models, and economic environments. Furthermore, the

influence of these longer-term effects is more important and far-reaching. Therefore, following the seminal work of Zhang and Gao (2007) and Xu et al. (2007), our paper examines the long-term effect of official rotation. Specifically, our paper analyzes the positive effect of official rotation on economic growth from the perspective of corporate innovation, studies the differences in the effect of official rotation from the perspective of official and regional heterogeneity, and reveals the driving mechanism behind these effects to provide empirical evidence for the current innovation-driven development.

2.2. Hypotheses

2.2.1. Official rotation and corporate innovation

Official rotation has made tremendous contributions to the development of regional economic growth, the micro-foundation of which may depend on corporate innovation. The effect of official rotation on corporate innovation stems from the following logic.

First, foreign officials and native officials have different career experience, especially economic development experience. Rotation across different provinces and positions can replicate and transplant successful economic and social management experience across regions (or departments), especially rotation from developed to undeveloped regions, which is conducive to introducing successful experiences to and promoting the economic development of undeveloped regions. Official rotation may also strengthen economic cooperation between undeveloped and developed areas, break market segmentation, and promote the economic development of undeveloped areas (Zong and Yue, 2013). Rotation has become an important method for the central government to coordinate and implement regional development strategies (Xu et al., 2007). The current “Regulations on the Rotation of Party and Government Leaders” clearly states that the purpose of official rotation is to promote economic and social development. Officials rotating from developed regions can bring superior economic development experience and information, and improve regional economic and political environment, and will thus be more effective in cultivating market mechanisms. Thus, official rotation can promote corporate innovation through sharing the advanced economic development experience of booming regions.

Second, official rotation can improve the business environment. In the context of regional economic decentralization, local governments and officials control huge amounts of fiscal and economic resources and resource disposal rights. Local officials can obtain more rent-seeking benefits by setting up cumbersome approval links, which make the decision-making and development of enterprises increasingly subject to the local government (Shleifer and Vishny, 1994). Under the GDP-oriented official performance evaluation model, economic growth, tax revenue, and infrastructure are the most important rigid targets for political promotion, which made officials show self-interested investment preferences and resulted in an emphasis on production and the neglect of innovation. Gu and Shen (2012) find that the GDP-oriented political promotion standard has significantly reduced government R&D subsidies to enterprises, which has affected enterprises’ R&D investment expenditure. Li and Zheng (2016) find a contradiction between the goal of short-term political promotion and the long-term nature of substantive innovation, and that firms tend to strategic innovate to seek support, pursuing “innovation by quantity” instead of quality to obtain more subsidies and tax incentives and to cater to the political needs of officials. Wang et al. (2018) find that officials’ expectations of political promotion significantly reduce the quantity and quality of corporate innovation, and that companies seek to establish political connections with the local government through charitable donations, which results in reduced innovation investment expenditure. Yang (2011) believes that enterprises not only seek to build their own internal capacity but also to obtain government assistance and, thus, competitive advantages. However, they are constrained by limited resources and must balance capacity-building and political connections. If the government controls a large amount of economic resources and is granted great discretion, and it is very difficult for enterprises to upgrade and maintain product quality advantages, and they will pursue political association rather than capacity-building. In other words, seeking political connections and strengthening innovation are two ways for enterprises to develop themselves. Correspondingly, in an environment where corruption costs are relatively low, enterprises tend to develop themselves by establishing political connections, which will further squeeze R&D investment expenditure and hinder corporate innovation. Officials rotating from other provinces can help to eliminate the interest-based relationship networks formed by officials who have been worked in the same areas (or departments) for a long time, resulting in reduced corrup-

tion, increased cost to establish political connections, and improved business environments. China's official governance system is an important part of the central government's anti-corruption strategy, and rotation not only promotes economic and social development, but also strengthens Party conduct and integrity. As anti-corruption efforts increase, the relative costs of seeking political connections also increase, which in turn increases corporate innovation incentives. Therefore, anti-corruption effort has a positive effect on corporate innovation (Dang et al., 2015), and the anti-corruption effect of official rotation can thus promote corporate innovation.

Third, official rotation can decrease the information asymmetry between the central and local governments. There may be differences and conflicts between the interests and goals of the central and local governments, and in many cases, the local government and officials may conceal regional bad news from the central government, such as regarding economic development, social governance, and environmental pollution, to protect their own interests and avoid accountability. However, rotating officials have no motive to conceal bad news and will pass it to the central government, thus building an information exchange bridge that can effectively communicate news and reduce the information asymmetry between the central and local governments (Huang, 2002). If officials expect to be rotated to different positions, their incentives to abide by the policies of the central government are strengthened because they gain little by over-aggressively pursuing the interests associated with their current position, which they will soon leave. They may be motivated to cooperate with other agencies because they may head these agencies in the future. The central government can thus gradually obtain accurate information about local economic and social development, and understand problems concerning economic patterns, environmental pollution, embezzlement, and corruption, and will be better able to use targeted measures and policies to overcome these problems. Rotating officials also effectively delivers central policy indicators to make the local government serve the national strategy (Bu and Di, 2018). Thus, official rotation can promote corporate innovation through information exchange and central policy transmission.

Based on the above analysis, we propose the following hypothesis:

H1: Official rotation effectively promotes corporate innovation, improving innovation investment, quantity, and quality.

2.2.2. Official heterogeneity and corporate innovation

The effect of official rotation on corporate innovation may vary due to the heterogeneity of officials. The differences in officials' educational background, career history, and economic development ideas may result in heterogeneities in their economic behavior and policy decisions. Officials rotating from different positions (departments) have different initial endowments, which represent their differences in backgrounds, abilities, and qualifications. Accordingly, there are two types of official rotation: horizontal official rotation, where officials come from other provinces, and vertical official rotation, where officials come from the central government. Yang et al. (2010) show that officials rotating from the central or local government have different economic performance, and find that horizontal official rotation improves economic growth but vertical official rotation hinders local economic growth, suggesting that the effects of official rotation are heterogeneous. As documented, central ministries perform single, relatively homogenous tasks, and the knowledge acquired from governing one ministry is not necessarily readily transferable to governing another ministry. However, provincial secretaries and governors are involved in multi-dimensional tasks: they must deal with many kinds of problems and accumulate comprehensive economic and social management experience, which can be readily transferable between provinces. Thus, officials rotating from other provinces have the experience of previous local economic affairs management, which can be transferred or popularized between provinces, suggesting that the horizontally rotating officials have an advantage in economic development experience. Vertically rotating officials have a closer relationship with the central government, are more familiar with its intentions, and can more effectively deliver its strategic policies. Thus, compared with horizontally rotating officials, vertically rotating officials may be more efficient in information dissemination and policy coordination between the central and local governments and can more effectively guarantee the implementation of central policy intentions. Vertically rotating officials may also help local governments obtain more central fiscal and economic resources. Therefore, the differences between horizontally rotating officials and vertically rotating officials—the communication of information between the central and local governments and the replication and promo-

tion of successful economic development experience—may create distinct differences in the corporate innovation effects of official rotation.

Based on the above analysis, we propose the following hypothesis:

H2: The effect of official rotation on corporate innovation varies due to official heterogeneity.

2.2.3. Regional heterogeneity and corporate innovation

Although China's system reform and marketization have accelerated significantly, non-eastern regions' economic and social development is lagging behind that of the eastern regions for natural, historical, and other reasons. These regions have significant differences in terms of resource endowment, economic policy, regional governance, and economic development, indicating substantial regional heterogeneity in terms of marketization (Fan et al., 2011). Yang et al. (2010) find that the economic growth effect of official rotation shows regional variation, as officials rotating to good resource endowment areas have positive roles in promoting economic growth. Wang and Xu (2017) find that the foreign investment effect of official rotation has obvious regional heterogeneity. Officials rotating to coastal areas significantly reduce foreign investment, while officials rotating to non-coastal provinces significantly increase foreign investment. According to the findings of the above literature, regional heterogeneity may also influence the effect of official rotation on corporate innovation. Official rotation can affect corporate innovation, but the effect of official rotation depends not only on the heterogeneous characteristics of the rotating officials but also on those of the areas. First, the market environment has a significant impact on transaction costs. Reducing government intervention, improving government services, and strengthening legal protection are conducive to reducing non-productive expenditure on rent-seeking (Wan and Chen, 2010). Local officials control abundant economic and administrative resources and can engage in rent-seeking through setting up cumbersome approval processes. Enterprises can also seek establish political connections to obtain more economic resources, such as government subsidies, bank loans, and tax incentives. If the degree of regional marketization is relatively low, there will be a large rent-seeking space, such that enterprises notably increase non-productive expenditure and local governments frequently interfere in business operations. Therefore, compared with eastern regions, officials rotating to a non-eastern region will significantly change the regional political and ecological environment. Second, eastern regions have a higher degree of marketization, better economic development, and higher government efficiency, resulting in inherently superior conditions and more mature development experience in promoting economic development and corporate innovation. Correspondingly, in eastern regions, native officials are more familiar with local superior conditions and have advanced experience, but foreign officials do not have these unique experiences and information. However, in non-eastern regions, the market environment and economic system are not mature enough, and the development of non-eastern regions requires the experience, information, and resources of developed areas. Therefore, officials rotating from an eastern region to a non-eastern region can introduce the economic development experience of developed regions and foster more efficient and transparent economic and political systems, and thus promote corporate innovation.

Based on the above analysis, we propose the following hypothesis:

H3: The effect of official rotation on corporate innovation may vary due to regional heterogeneity.

3. Research design

3.1. Data and sample selection

The innovation investment data in this paper are mainly obtained from the Wind database, which provides the R&D expense data of Chinese listed firms from 2007. The innovation quantity and quality data are obtained from the patent database of CSMAR, which provides information about the patent applications and authorization of listed firms, subsidiaries, sub-subsidiaries, and their associated joint venture companies from 1990. Because the actual innovation time is better reflected by the patent application year than the patent grant year, this paper uses patent application to proxy for corporate innovation. Because listed companies not only carry out R&D activities by themselves but also rely on subsidiaries, associated companies, and joint ven-

tures for R&D, this paper uses the patent applications of listed companies and their subsidiaries, associated companies, and joint ventures to comprehensively measure the level of corporate innovation. Because the new accounting standards have required listed companies to disclose the expended and capitalized parts of their R&D expenditure separately since 2007, the innovation data effectively starts from 2007.

The data for the provincial officials in this paper are obtained from the CSMAR database, and the basic information for governors (those responsible for autonomous regions and municipalities directly under the central government) are manually collected from the Baidu encyclopedia. We abstract the effective samples from 2007 to 2015, covering 31 provinces, cities, and autonomous regions. Firms' financial and corporate governance data are obtained from the CSMAR database. The provincial data are all obtained from the National Bureau of Statistics. To eliminate the influence of outliers, all the continuous variables are winsorized at the 1% and 99% levels. We first delete observations for financial institutions, firms' listing year, special treatment firms, and firms whose debt-to-assets ratio is greater than 1. We also delete observations with missing data. The sample has 12,034 firm-year observations from 2007 to 2015.

3.2. Model

$$\text{Innovation}_{i,t+1} = \beta_0 + \beta_1 * \text{Rotation}_t + \text{Controls} + \varepsilon \dots \quad (1)$$

3.2.1. Explained variable: corporate innovation (innovation)

Innovation_{i,t+1}, the dependent variable of the model, represents the corporate innovation of firm *i* in year *t* + 1. This paper measures corporate innovation from three aspects: innovation investment, innovation quantity, and innovation quality. R&D expense (LnRD) is the proxy for innovation investment. According to Chinese Patent Law, national patents include three categories—invention patents, utility model patents, and appearance design patents—of which invention patents are the most original. We thus use invention patent applications (Patenti) as a proxy for innovation quality and total patent applications (Patent) as a proxy for innovation quantity. To solve the problem of sample skewness, natural logarithmic treatments was carried out for LnRD, Patent, and Patenti after adding 1 to them.

3.2.2. Explanatory variables: official rotation (rotation)

Rotation is an explanatory variable in the model. We primarily investigate the effect of governor rotation on corporate innovation. The setting for rotation is based on the method of Zhang and Gao (2007): if new governors are rotated from the central government or other provinces, the value of Rotation equals 1 during their term of office; if they are promoted from native provinces, then the value of Rotation is 0.

There are three main sources of governors: promotion from native provinces, rotation from other provinces, and rotation from the central government. Correspondingly, our paper introduces two variables, Central and Province, to indicate the origin of a governor. If governors are rotated from the central government, the value of Central is 1, and 0 otherwise; if governors are rotated from other provinces, the value Province equals 1, and 0 otherwise. We also compare the difference in the effect of official rotation on corporate innovation between east and non-east regions. The east regions include the following provinces and municipalities: Liaoning, Beijing, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Hainan. Other provinces are classified as non-eastern.

In addition, we further divide rotating officials into Central, those rotating from the central government, EastProvinces, those rotating from eastern regions, and NonEastProvinces, those rotating from non-eastern regions, to further identify the driving mechanism behind the effect of official rotation on corporate innovation.

3.2.3. Control variables

The other explanatory variables in Eq. (1) are control variables. Size, the natural logarithm of the firm's total assets at the end of year *t*, captures the effects of size. Lev captures the financial leverage of the firm and is measured as the ratio of total debt to total assets. Growth is the percentage change in sales and indicates the firm's future development capabilities. Roa proxies for financial performance and is calculated as net

income divided by total assets. CFO is the cash flow from operations divided by total assets. PPE is the current-year level of property, plant, and equipment scaled by total assets. Age captures the maturity level of the firm, and we use the number of years the firm has been publicly traded. The two control variables of corporate governance in Eq. (1) are Board, defined as the number of directors on the board, and Indep, defined as the proportion of independent directors on the board. We also add three provincial control variables: Fin represents the local fiscal revenue and is measured as the natural logarithm of the annual general budget revenue of each province, Dgdp is the percentage change in GDP, and Pgdpc is the natural logarithm of GDP per capita for each province. We also include the industry and year fixed effects to remove the influences of industry and year on the estimation of the coefficients of the official rotation variable.

4. Empirical evidence

4.1. Descriptive analysis

Table 1, Panel A reports the descriptive statistics of the main variables. Official rotation (Rotation) has a mean of 0.395, and horizontal official rotation (Province) and vertical official rotation (Central) account for 17.6% and 21.9%, respectively. The means (standard deviations) of R&D expenses (LnRD), total patent applications (Patent), and invention patent applications (Patenti) are 14.918 (6.086), 2.561 (1.557), and 1.758 (1.408), respectively, suggesting that companies' innovation investment, quantity, and quality have different characteristics.

Table 1, Panel B provides information about official rotation and corporate innovation from 2007 to 2015. There are 114 rotating governors from 2007 to 2015: 51 horizontally rotating governors and 63 vertically rotating governors. Of these, 34 rotated to eastern regions and 80 rotated to non-eastern regions. In eastern regions, 24 governors rotated from the central government, 2 rotated from eastern regions, and 8 rotated from non-eastern regions, which indicates that governors rotating to eastern regions mainly came from the central government. In non-eastern regions, 27 governors rotated from the central government, 28 rotated from eastern regions, and 25 rotated from non-eastern regions. Thus, the number of governors rotating from eastern to non-eastern regions is higher than that from non-eastern to eastern regions. Potential reasons are that the marketization degree is relatively low and the market economy is underdeveloped in non-eastern areas; however, governor rotation from eastern to non-eastern regions may bring superior economic development experience, which is conducive to improving the market environment. In addition, from 2007 to 2015, the figures for official rotation and corporate innovation show increasing trends year by year, as do the numbers of governors rotating in eastern and non-eastern regions. These findings suggest that there is a linear relationship between the governor rotation and corporate innovation data.

4.2. Empirical results

To identify the effect of official rotation on corporate innovation, we conduct a regression analysis of three proxy indicators that measure corporate innovation according to Eq. (1). Because official rotation has a lag effect on R&D investment and patent applications, our paper constructs a proxy variable of corporate innovation with a lag of one year.

4.2.1. Official rotation and corporate innovation

Table 2 reports the estimation results for Eq. (1). The official rotation variable (Rotation) is significantly positively associated with the three corporate innovation variables. In column (1), the coefficient on Rotation is 0.272 with a t-statistic of 2.013, which is significantly positive at the 5% level. In columns (2) and (3), the coefficients on Rotation are positive and significant, 0.079 (t-statistic = 1.762) and 0.101 (t-statistic = 2.459), respectively, suggesting that the quantities of total patent applications and invention applications significantly increase during the term of the rotating official. These findings are consistent with our hypothesis H1 and support the notion that official rotation promotes corporate innovation, including innovation investment, quantity, and quality.

Table 1

Descriptive Statistics. Panel A reports the summary statistics for our main variables. Panel B reports the descriptive statistics for official rotation and corporate innovation by year.

Panel A: Summary statistics for the main variables

Variables	Obs	Mean	SD	Min	Median	Max
LnRD	12,034	14.918	6.086	0.000	17.053	21.280
Patent	12,034	2.561	1.557	0.000	2.565	6.682
Patenti	12,034	1.758	1.408	0.000	1.609	5.805
Rotation	12,034	0.395	0.489	0.000	0.000	1.000
Central	12,034	0.219	0.414	0.000	0.000	1.000
Province	12,034	0.176	0.381	0.000	0.000	1.000
Size	12,034	21.932	1.248	19.755	21.730	25.961
Lev	12,034	0.432	0.205	0.047	0.431	0.867
Growth	12,034	0.086	0.235	-0.840	0.106	0.707
Roa	12,034	0.042	0.049	-0.114	0.037	0.197
CFO	12,034	0.045	0.068	-0.149	0.043	0.237
PPE	12,034	0.237	0.151	0.008	0.207	0.677
Age	12,034	8.524	5.873	1.000	7.000	22.000
Board	12,034	8.877	1.757	5.000	9.000	15.000
Indep	12,034	0.371	0.053	0.308	0.333	0.571
Fin	12,034	7.893	0.768	5.588	8.008	9.145
Dgdp	12,034	0.103	0.043	0.003	0.092	0.196
Pgdp	12,034	10.802	0.481	9.493	10.875	11.576

Panel B: Descriptive statistics for official rotation and corporate innovation from 2007 to 2015

year	Corporate Innovation			Eastern Region				Non-Eastern Region				Official Rotation
	LnRD	Patent	Patenti	Central	EastProvinces	NonEastProvinces	Total	Central	EastProvinces	NonEastProvinces	Total	
2007	7.621	2.143	1.325	1	1	0	2	3	1	1	5	7
2008	8.290	2.271	1.433	1	0	1	2	3	4	1	8	10
2009	10.12	2.414	1.586	1	0	1	2	3	4	1	8	10
2010	13.63	2.320	1.533	0	0	2	2	2	4	2	8	10
2011	14.50	2.569	1.703	2	0	2	4	1	4	3	8	12
2012	16.61	2.559	1.760	4	0	1	5	2	3	4	9	14
2013	16.86	2.618	1.838	5	0	0	5	4	3	4	11	16
2014	16.93	2.697	1.925	5	1	0	6	4	3	4	11	17
2015	17.07	2.776	1.979	5	0	1	6	5	2	5	12	18
Total	-	-	-	24	2	8	34	27	28	25	80	114

Table 2

Effects of Official Rotation on Corporate Innovation. This table reports the effects of official rotation on corporate innovation, including innovation investment, innovation quantity, and innovation quality (H1). Column (1) reports the results on the effect of official rotation on innovation investment (LnRD), column (2) reports the results on the effect of official rotation on innovation quantity (Patent), and column (3) reports the results on the effect of official rotation on innovation quality (Patenti). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

	(1) LnRD _{t+1}	(2) Patent _{t+1}	(3) Patenti _{t+1}
Rotation_t	0.272** (2.013)	0.079* (1.762)	0.101** (2.459)
Size _t	0.437*** (4.389)	0.561*** (18.094)	0.527*** (18.173)
Lev _t	-0.118 (-0.235)	0.157 (0.996)	0.048 (0.336)
Growth _t	0.841*** (3.957)	0.165** (2.419)	0.175*** (2.821)
Roa _t	3.750*** (2.590)	2.525*** (5.046)	2.106*** (4.555)
CFO _t	1.191 (1.272)	0.175 (0.663)	0.350 (1.443)
PPE _t	-1.450** (-2.475)	-1.506*** (-7.409)	-1.191*** (-6.481)
Age _t	-0.096*** (-6.593)	-0.016*** (-3.247)	-0.011** (-2.519)
Board _t	0.105** (2.109)	-0.018 (-1.005)	0.009 (0.544)
Indep _t	0.921 (0.663)	0.466 (0.939)	0.785* (1.673)
Fin _t	0.157 (1.068)	0.355*** (6.794)	0.286*** (5.990)
Dgdp _t	-1.451 (-0.549)	2.504*** (2.660)	3.095*** (3.673)
Pgdp _t	-0.052 (-0.207)	-0.017 (-0.197)	0.118 (1.415)
Intercept	-4.825* (-1.653)	-13.060*** (-12.762)	-14.298*** (-14.669)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	12,034	12,034	12,034
Adj.R ²	0.302	0.274	0.266

4.2.2. Official heterogeneity and corporate innovation

The findings in Table 2 suggest that official rotation promotes corporate innovation. Does the effect of official rotation on corporate innovation vary with different types of official rotation due to official heterogeneity? To examine whether the effect of official rotation on corporate innovation is affected by official heterogeneity (hypothesis H2), we examine the effect of horizontal official rotation (Province) and vertical official rotation (Central) on corporate innovation. Table 3 reports the regression results for official heterogeneity and the effect of official rotation on corporate innovation. The regression coefficients on Province are all significantly positive and within the range of 0.128–0.516, while the regression coefficients on Central are positive but insignificant. These findings are consistent with hypothesis 2 that the effect of official rotation on corporate innovation varies due to official heterogeneity, and that officials rotating from other provinces have a greater effect on corporate innovation. An explanation points to the differences in individuals' initial endowments. Officials rotating from other provinces perform multiple tasks, have more experience in economic and social

Table 3

Effects of Official Rotation on Corporate Innovation, Province vs. Central. This table reports the results for hypothesis H2, that the effect of official rotation on corporate innovation varies with the source of officials due to the heterogeneity of sources. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

	(1) LnRD _{t+1}	(2) Patent _{t+1}	(3) Patenti _{t+1}
Province_t	0.516** (2.572)	0.128** (2.116)	0.173*** (3.130)
Central_t	0.089 (0.650)	0.043 (0.822)	0.047 (0.985)
Size _t	0.432*** (4.345)	0.560*** (18.098)	0.525*** (18.186)
Lev _t	-0.088 (-0.175)	0.163 (1.036)	0.057 (0.401)
Growth _t	0.826*** (3.888)	0.162** (2.377)	0.170*** (2.756)
Roa _t	3.772*** (2.605)	2.529*** (5.057)	2.112*** (4.576)
CFO _t	1.196 (1.277)	0.177 (0.668)	0.351 (1.452)
PPE _t	-1.423** (-2.427)	-1.500*** (-7.378)	-1.183*** (-6.441)
Age _t	-0.096*** (-6.616)	-0.016*** (-3.262)	-0.011** (-2.545)
Board _t	0.102** (2.050)	-0.019 (-1.039)	0.008 (0.491)
Indep _t	0.838 (0.603)	0.449 (0.908)	0.760 (1.626)
Fin _t	0.200 (1.330)	0.364*** (6.938)	0.299*** (6.252)
Dgdp _t	-1.563 (-0.591)	2.482*** (2.641)	3.062*** (3.641)
Pgdp _t	-0.054 (-0.215)	-0.018 (-0.202)	0.118 (1.412)
Intercept	-4.936* (-1.687)	-13.083*** (-12.789)	-14.331*** (-14.729)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	12,034	12,034	12,034
Adj.R ²	0.303	0.275	0.266

management, and can take effective measures to encourage firms to increase R&D investment. However, officials rotating from the central government perform single tasks and need more time to adapt to managing more comprehensive local affairs. Such officials may also be rotated to solve specific problems or to increase professional experience rather than improve economic factors, so vertical official rotation has a smaller impact on corporate innovation.

4.2.3. Regional heterogeneity and corporate innovation

The development of regional economies in China is radically uneven. Does the effect of official rotation on corporate innovation vary between eastern and non-eastern regions? Samples from eastern and non-eastern regions are used to examine the role of regional heterogeneity in the effect of official rotation on corporate innovation (hypothesis H3). In Table 4, we run Eq. (1) to test innovation performance for firms in eastern and non-eastern regions separately, and find a significant difference between the two samples. For the non-eastern region sample, official rotation improves corporate innovation, as the coefficients for Rotation are

Table 4

Effects of Official Rotation on Corporate Innovation, Eastern Region vs. Non-Eastern Region. This table reports the results for hypothesis H3, that the effect of official rotation on corporate innovation varies between eastern and non-eastern region due to heterogeneity across regions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
	Non-Eastern Region			Eastern Region		
	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}
Rotation_t	0.831*** (3.412)	0.232*** (2.831)	0.160** (2.164)	-0.070 (-0.450)	-0.029 (-0.541)	0.052 (1.056)
Size _t	0.695*** (4.428)	0.519*** (9.749)	0.459*** (9.698)	0.327*** (2.634)	0.575*** (15.383)	0.555*** (15.726)
Lev _t	-0.553 (-0.566)	0.151 (0.541)	0.089 (0.389)	0.020 (0.036)	0.227 (1.207)	0.063 (0.362)
Growth _t	0.648* (1.724)	0.160 (1.379)	0.237** (2.311)	0.872*** (3.461)	0.165** (1.985)	0.145* (1.896)
Roa _t	0.887 (0.356)	2.229*** (2.693)	0.631 (0.895)	5.111*** (2.915)	2.812*** (4.586)	3.004*** (5.248)
CFO _t	2.579* (1.747)	-0.772* (-1.776)	-0.275 (-0.770)	0.372 (0.319)	0.571* (1.765)	0.566* (1.838)
PPE _t	-3.009*** (-3.376)	-1.652*** (-5.298)	-1.417*** (-5.218)	-0.325 (-0.435)	-1.395*** (-5.326)	-1.026*** (-4.216)
Age _t	-0.100*** (-4.205)	-0.026*** (-2.971)	-0.021*** (-2.770)	-0.087*** (-4.804)	-0.012** (-2.041)	-0.008 (-1.363)
Board _t	0.142** (2.138)	0.009 (0.296)	0.030 (1.173)	0.087 (1.252)	-0.031 (-1.366)	-0.002 (-0.069)
Indep _t	0.083 (0.040)	0.513 (0.603)	0.733 (0.925)	1.242 (0.678)	0.390 (0.634)	0.778 (1.334)
Fin _t	0.588** (2.207)	0.431*** (4.432)	0.326*** (3.821)	-0.105 (-0.529)	0.304*** (4.554)	0.288*** (4.623)
Dgdp _t	-2.312 (-0.520)	4.844*** (2.983)	5.495*** (3.778)	-2.553 (-0.544)	1.184 (0.823)	1.918 (1.461)
Pgdp _t	-0.847 (-1.285)	-0.600*** (-2.823)	-0.448** (-2.322)	0.535 (1.310)	0.147 (1.098)	0.359*** (2.845)
Intercept	-3.473 (-0.513)	-7.739*** (-3.376)	-8.244*** (-3.914)	-7.729 (-1.579)	-14.362*** (-8.970)	-17.150*** (-11.372)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	3856	3856	3856	8178	8178	8178
Adj.R ²	0.282	0.256	0.245	0.321	0.290	0.282

all positive and significant; however, for the eastern region sample, there is no evidence that official rotation promotes corporate innovation. This significant difference is consistent with hypothesis 3 that the effect of official rotation on corporate innovation varies between eastern and non-eastern regions, and that official rotation contributes to corporate innovation in non-eastern regions. These findings reflect the regional differences in match of officials and districts. Eastern regions tend to have superior natural conditions and more mature economic development. Accordingly, native officials are more familiar with these conditions and have more experience, which makes it relatively easier for them to promote corporate innovation. However, rotating officials do not have unique experience and information, and may even exert negative effects when they restart local integrated affairs management or implement new economic development strategies. Thus, for eastern regions, official rotation does not necessarily lead to more corporate innovation. For non-eastern regions that have imperfect market economic systems and are relatively underdeveloped economically, official rotation can promote corporate innovation through the exchange of experience, information, and resources between eastern and non-eastern regions.

4.2.4. Robustness test

Our paper assumes that the rotation of governors is exogenous, or that we ignore the endogeneity problems in the rotation. Governor rotation depends on the central government's decision-making; provinces and individuals do not make these decisions. The central government makes rotation decisions after comprehensively considering various factors, not just economic one. We carry out a series of robustness tests to corroborate our empirical results.

- (1) Officials with a tenure of less than 3 years or who violated the rules are excluded from this study. It is difficult for officials who have served less than 3 years to significantly affect their region's economic and social development. In addition, if officials violate rules or regulations and have been removed by the central government, official rotation may be an endogenous variable. The results are similar to our primary results, as the coefficients on Rotation are still significantly positive in Table 5, Panel A.
- (2) This paper mainly investigates the effect of the rotation of governors. However, provincial secretaries are also responsible for local political, economic, and social affairs. Therefore, we further investigate the impact of official rotation on corporate innovation from the perspective of provincial secretaries, and obtain similar results.
- (3) Technological innovation entails long development cycles, large amounts of capital demand, and high risk, and enterprises' innovation activities require huge long-term R&D investments to achieve results. Therefore, the corporate innovation variables are delayed for 2 periods to further study the long-term effect of official rotation on corporate innovation. As shown in Table 5, Panel A, there is little variation within the sample.
- (4) The above findings show that official rotation can improve corporate innovation at the firm level. Consistent with prior research, we further adopt innovation-related indicators at the provincial level and for enterprises above a designated size as dependent variables to examine the effect of official rotation. The provincial results are also similar to our primary results, except that in column (3) of Table 5, Panel B, the coefficient on Rotation is not significant.

5. Analysis of the driving mechanism

5.1. Official experience effect

The results in Tables 3 and 4 show that the effect of official rotation on corporate innovation varies due to official and regional heterogeneity. We suspect that the driving mechanism behind these heterogeneities may be primarily official experience. As discussed, central officials perform single and relatively homogenous tasks, often within a well-defined sphere of responsibilities, and have information communication advantages that can promote and guarantee information transmission and policy coordination between the central and local governments. However, provincial secretaries and governors perform multiple and more comprehensive tasks that involve all aspects of economic and social life. They must comprehensively manage all of the region's economic and social development problems, and they thus accumulate comprehensive economic and social management experience. Thus, local officials can more quickly adapt to new working environments and positions, discharging their duties in an effective and efficient manner. The effect of horizontally rotating officials is therefore stronger than that of vertically rotating officials.

The essence of official rotation is the re-match between regions and officials. The cross-regional rotation of officials includes rotation within eastern regions, within non-eastern regions, and between eastern and non-eastern regions. Compared with non-eastern regional officials, officials rotating from eastern regions have better economic development experience and are more effective in economic management. If the effect of official experience plays a leading role, then officials rotating from an eastern region to a non-eastern region can promote corporate innovation in the non-eastern region, while officials rotating from non-eastern region to eastern region might have an insignificant impact on corporate innovation in the eastern region. We further examine the effect of different types of cross-regional official rotation to confirm whether the official experience effect leads to official rotation promoting corporate innovation. Table 6, Panel A provides the results for the

Table 5

Robustness Test. Panel A reports the results of the robustness test for the firm level, which includes the solution to the endogeneity problem, the definition of official rotation with provincial secretaries, and innovation variables lagged two periods. Panel B reports the results of the robustness test for the provincial level and enterprises above the designated size. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

Panel A: Robustness Test, Firm Level									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Endogeneity			Redefinition			Lag		
	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}	LnRD _{t+2}	Patent _{t+2}	Patenti _{t+2}
Rotation _t	0.277** (1.965)	0.081* (1.744)	0.130*** (3.057)	0.185* (1.803)	0.088*** (2.882)	0.088*** (3.147)	0.256* (1.904)	0.102** (2.069)	0.123*** (2.685)
Size _t	0.430*** (4.211)	0.561*** (17.578)	0.527*** (17.701)	0.436*** (7.779)	0.560*** (37.628)	0.526*** (38.663)	0.468*** (4.718)	0.567*** (16.931)	0.535*** (17.000)
Lev _t	0.059 (0.112)	0.207 (1.267)	0.093 (0.635)	-0.119 (-0.390)	0.158* (1.835)	0.048 (0.629)	-0.181 (-0.350)	0.168 (0.951)	0.068 (0.417)
Growth _t	0.777*** (3.537)	0.166** (2.319)	0.164** (2.517)	0.848*** (4.340)	0.168*** (2.725)	0.178*** (3.285)	1.184*** (4.535)	0.245*** (3.146)	0.289*** (4.005)
Roa _t	4.362*** (2.882)	2.688*** (5.180)	2.128*** (4.474)	3.700*** (3.038)	2.506*** (7.356)	2.085*** (6.829)	4.301*** (2.784)	2.545*** (4.356)	2.138*** (3.909)
CFO _t	0.918 (0.954)	0.190 (0.695)	0.367 (1.478)	1.194 (1.553)	0.179 (0.833)	0.352* (1.821)	0.618 (0.674)	0.214 (0.726)	0.359 (1.340)
PPE _t	-1.513** (-2.464)	-1.596*** (-7.631)	-1.259*** (-6.659)	-1.427*** (-3.940)	-1.499*** (-14.381)	-1.182*** (-12.656)	-0.811 (-1.350)	-1.559*** (-7.023)	-1.286*** (-6.312)
Age _t	-0.101*** (-6.849)	-0.016*** (-3.178)	-0.012** (-2.547)	-0.096*** (-11.670)	-0.016*** (-6.379)	-0.012*** (-5.107)	-0.077*** (-5.133)	-0.017*** (-3.226)	-0.013** (-2.519)
Board _t	0.105** (2.057)	-0.012 (-0.665)	0.012 (0.713)	0.104*** (3.302)	-0.019** (-2.089)	0.009 (1.077)	0.098** (2.011)	-0.022 (-1.127)	0.003 (0.137)
Indep _t	1.425 (1.045)	0.530 (1.030)	0.846* (1.745)	0.844 (0.925)	0.433 (1.582)	0.750*** (2.962)	1.389 (1.002)	0.585 (1.075)	0.778 (1.501)
Fin _t	0.163 (1.023)	0.372*** (6.806)	0.284*** (5.703)	0.124 (1.459)	0.345*** (13.467)	0.273*** (11.788)	0.076 (0.504)	0.363*** (6.310)	0.310*** (5.801)
Dgdp _t	-1.122 (-0.410)	1.742* (1.799)	2.766*** (3.178)	-0.468 (-0.223)	2.895*** (4.323)	3.521*** (5.896)	-1.783 (-0.620)	1.897* (1.651)	2.935*** (2.802)
Pgdp _t	-0.087 (-0.312)	-0.061 (-0.650)	0.124 (1.406)	-0.037 (-0.244)	-0.002 (-0.051)	0.130*** (3.230)	0.013 (0.051)	-0.027 (-0.279)	0.097 (1.057)
Intercept	-4.703 (-1.526)	-12.671*** (-11.747)	-14.299*** (-13.967)	-4.961*** (-2.660)	-13.237*** (-25.252)	-14.427*** (-29.729)	-3.329 (-1.116)	-12.793*** (-11.228)	-14.104*** (-13.036)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,163	11,163	11,163	12,034	12,034	12,034	9694	9694	9694
Adj.R ²	0.304	0.281	0.271	0.302	0.274	0.265	0.234	0.262	0.254

Panel B: Robustness Test, Provincial Level and Enterprises above the Designated Size					
	(1)	(2)	(3)	(4)	(5)
	Provincial Level		Enterprises Above the Designated Size		
	R&D Expenditure	R&D Expenses	Total Patent	Invention Patent	Full-time Equivalent of R&D Personnel
Rotation _t	0.245** (2.481)	0.263* (1.842)	0.213 (1.329)	0.253* (1.756)	0.337** (2.200)
Dgdp _t	0.565 (0.402)	0.856 (0.582)	2.373 (1.488)	2.337 (1.493)	0.767 (0.521)
Pgdp _t	0.373* (2.003)	0.147 (0.460)	0.033 (0.107)	0.177 (0.699)	-0.101 (-0.312)
Fin _t	1.370*** (17.953)	1.559*** (10.192)	1.662*** (12.743)	1.561*** (13.109)	1.639*** (9.548)
Intercept	1.069 (0.656)	1.566 (0.579)	-3.655 (-1.394)	-5.534** (-2.581)	0.325 (0.118)
Year	Yes	Yes	Yes	Yes	Yes
N	279	279	279	279	279
Adj.R ²	0.934	0.907	0.890	0.901	0.888

test of the official experience effect. Consistent with our expectations, the regression coefficients on EastProvince are all significantly positive in non-eastern regions but are not significant and may even have a negative effect in eastern regions, whereas the coefficients on NonEastProvince are not significant in eastern or non-eastern regions. Thus, official rotation from an eastern region to a non-eastern region has a positive impact on corporate innovation, suggesting that the effect of official rotation on corporate innovation may be driven by official experience.

Table 6, Panel A also provides evidence that the regression coefficients on Central are significantly positive in non-eastern regions, which shows that vertically rotating officials can effectively promote corporate innovation in non-eastern areas. A possible reason is that compared with eastern regions, the political and economic environment in non-eastern regions is relatively poor and government efficiency is low. Officials rotating from the central government to a local government can strengthen communication between the central government and the local government, and can supervise and restrain local government actions, thus improving the business environment and government quality in non-eastern regions. In addition, vertically rotating officials have a close relationship with the central government and can obtain more resources for the local government. Thus, given official and regional heterogeneity, central rotating officials can promote corporate innovation in non-eastern regions.

5.2. Charitable donations and innovation subsidies

In China, the relationship between the government and businesses plays an important role in the allocation of government resources. Seeking political connections and improving innovation ability are key factors for obtaining a competitive advantage (Yang, 2011). Constrained by limited resources, firms must balance building capacity and political connections. That is, building political connections and strengthening innovation ability are the two substitutive ways for enterprises to develop themselves. Charitable donations can generate advertising, reputation, and tax deduction effects and assist the local government in achieving political goals, and can thus be a quick and effective way to establish political connections. Corporate charitable donations are generally regarded as “political contributions” paid by companies to establish political relationships, rather than as the fulfillment of social responsibilities (Dai et al., 2014). Considering that official rotation can significantly curb corruption (Chen and Li, 2012) and improve the business environment, we think that official rotation might enhance the innovation incentive by increasing the relative cost of establishing political connections. Therefore, our paper further explores the relationship between official rotation and corporate charitable donations, and examines the mechanism by which official rotation influences corporate innovation. The results shown in columns (1) and (2) of Table 6, Panel B suggest that horizontal official rotation can reduce corporate charitable donations and restrict the establishment of political connections, leading to the promotion of corporate innovation.

The local government plays a critical role in China’s science and technology investment system. Vast and long-term R&D spending increase a corporation’s financial risk. Companies engaged in R&D activities may lack capital due to the exclusive characteristics of R&D information and the external characteristics of technological innovation, and may be confronted with market failures during the process of scientific and technological innovation. Market failures of technological innovation provide the theoretical base of government’s intervention and support to enterprises’ innovation activities. The local government can affect corporate R&D investment behaviors through a “visible hand” by establishing a series of science and technology projects supported by financial expenditure on science and technology. In addition, government funds can be used to support R&D activities in particular innovation areas. The local government can also help firms overcome the problem of insufficient R&D investment through innovation subsidies, which can significantly promote R&D investment and substantive innovation output (Guo, 2018). We therefore further examine whether official rotation can increase innovation subsidies to identify the effect of official rotation on corporate innovation from the perspective of resource allocation. The results shown in columns (3) and (4) of Table 6, Panel B suggest that vertical official rotation can increase corporate innovation subsidies that directly supplement enterprises’ R&D investment.

Table 6

Channels through Which Official Rotation Promotes Corporate Innovation. Panel A reports the results for the test of the driving mechanism, which examines the relationship between the effect of official rotation on corporate innovation and the effect of official experience. Panel B, columns (1) and (2) report the results for charitable donations, which indicate the relationship between official rotation and charitable donations. Panel B, columns (3) and (4) report the results for innovation subsidies, which indicate the relationship between official rotation and innovation subsidies. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

Panel A: Effects of Official Rotation on Corporate Innovation, Official Experience Effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Non-Eastern Region			Eastern Region		
	LnRD _{t+1}	Patent _{t+1}	Patent _{t+1}	LnRD _{t+1}	Patent _{t+1}	Patent _{t+1}
EastProvince _t	0.874*** (2.693)	0.253** (2.352)	0.191* (1.916)	0.163 (0.238)	-0.429*** (-2.604)	-0.168 (-1.109)
NonEastProvince _t	0.859*** (3.187)	0.147 (1.321)	0.087 (0.891)	0.387 (1.094)	0.026 (0.258)	0.175* (1.802)
Central _t	0.759*** (2.750)	0.274*** (2.893)	0.181** (2.129)	-0.234 (-1.498)	-0.027 (-0.434)	0.022 (0.385)
Size _t	0.696*** (4.411)	0.517*** (9.730)	0.458*** (9.672)	0.315** (2.541)	0.574*** (15.398)	0.553*** (15.696)
Lev _t	-0.548 (-0.559)	0.150 (0.539)	0.089 (0.393)	0.051 (0.089)	0.230 (1.227)	0.071 (0.408)
Growth _t	0.644* (1.707)	0.158 (1.357)	0.234** (2.285)	0.856*** (3.399)	0.160* (1.924)	0.138* (1.815)
Roa _t	0.865 (0.348)	2.223*** (2.683)	0.620 (0.878)	5.197*** (2.970)	2.825*** (4.595)	3.029*** (5.292)
CFO _t	2.592* (1.747)	-0.768* (-1.757)	-0.267 (-0.746)	0.363 (0.312)	0.556* (1.719)	0.554* (1.801)
PPE _t	-3.009*** (-3.372)	-1.659*** (-5.324)	-1.423*** (-5.233)	-0.290 (-0.386)	-1.394*** (-5.310)	-1.019*** (-4.180)
Age _t	-0.100*** (-4.199)	-0.026*** (-2.981)	-0.021*** (-2.796)	-0.086*** (-4.748)	-0.012** (-2.028)	-0.007 (-1.300)
Board _t	0.142** (2.134)	0.009 (0.320)	0.031 (1.197)	0.081 (1.180)	-0.031 (-1.376)	-0.003 (-0.118)
Indep _t	0.086 (0.041)	0.511 (0.599)	0.732 (0.921)	1.098 (0.601)	0.386 (0.631)	0.748 (1.289)
Fin _t	0.592** (2.176)	0.417*** (4.274)	0.313*** (3.641)	-0.058 (-0.286)	0.303*** (4.515)	0.297*** (4.718)
Dgdp _t	-2.633 (-0.616)	4.877*** (3.123)	5.442*** (3.931)	-0.907 (-0.190)	1.174 (0.815)	2.223* (1.689)
Pgdp _t	-0.845 (-1.279)	-0.611*** (-2.875)	-0.457** (-2.367)	0.365 (0.890)	0.147 (1.082)	0.326** (2.558)
Intercept	-3.470 (-0.508)	-7.505*** (-3.289)	-8.024*** (-3.797)	-6.224 (-1.286)	-14.282*** (-8.978)	-16.813*** (-11.226)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	3856	3856	3856	8178	8178	8178
Adj.R ²	0.282	0.257	0.245	0.322	0.291	0.282

Panel A: Official Rotation, Charitable Donations, and Innovation Subsidies

	(1)	(2)	(3)	(4)
	Donation _{t+1}	Donation _{t+1}	RD&Subsidy _{t+1}	RD&Subsidy _{t+1}
Rotation _t	-0.256*** (-3.500)		0.280* (1.738)	
Province _t		-0.409*** (-4.067)		0.186 (0.825)
Central _t		-0.115 (-1.425)		0.362** (2.056)

(continued on next page)

Table 6 (continued)

	(1) Donation _{t+1}	(2) Donation _{t+1}	(3) RD&Subsidy _{t+1}	(4) RD&Subsidy _{t+1}
Size _t	0.941*** (23.050)	0.943*** (23.039)	0.151 (1.422)	0.152 (1.438)
Lev _t	0.205 (0.838)	0.193 (0.790)	-0.162 (-0.293)	-0.171 (-0.310)
Growth _t	0.109 (1.090)	0.111 (1.119)	1.085*** (5.490)	1.087*** (5.505)
Roa _t	8.461*** (11.449)	8.480*** (11.494)	3.329** (2.034)	3.334** (2.038)
CFO _t	1.324*** (3.372)	1.326*** (3.383)	-2.486*** (-2.706)	-2.483*** (-2.704)
PPE _t	-0.205 (-0.775)	-0.208 (-0.786)	-0.659 (-1.078)	-0.665 (-1.088)
Age _t	-0.052*** (-7.370)	-0.052*** (-7.316)	-0.092*** (-5.230)	-0.091*** (-5.218)
Board _t	-0.008 (-0.342)	-0.006 (-0.257)	-0.008 (-0.127)	-0.007 (-0.107)
Indep _t	-0.615 (-0.887)	-0.576 (-0.831)	-1.682 (-0.996)	-1.658 (-0.982)
Fin _t	0.085 (1.224)	0.063 (0.906)	0.452*** (2.721)	0.439*** (2.632)
Dgdp _t	3.732*** (2.405)	3.727** (2.400)	0.047 (0.014)	0.066 (0.020)
Pgdp _t	-0.033 (-0.273)	-0.028 (-0.231)	-0.397 (-1.354)	-0.395 (-1.350)
Intercept	-6.927*** (-5.209)	-6.904*** (-5.187)	6.230* (1.829)	6.252* (1.833)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	13,421	13,421	15,830	15,830
Adj.R ²	0.202	0.203	0.243	0.243

6. Supplementary analysis: performance appraisal pressure and economic growth

6.1. Performance appraisal pressure

Since the third plenary session of the 11th Central Committee of the Communist Party of China (CPC) put forward the concept of “economic development as the central task” in 1978, the National People’s Congress (NPC) has made the GDP growth rate the primary indicator of China’s economic development. In China, officials’ measure for promotion has changed from political performance to economic performance. However, under centralized political governance, local officials are mainly supervised by central authorities. Given the incentive of promotion, local officials engage in a “promotion tournament” based on GDP growth (Zhou, 2007). The promotion likelihood of Chinese provincial officials has a significant positive correlation with the growth rate of provincial GDP (Li and Zhou, 2005). In addition, the central government appraises the performance of local officials using relative performance evaluation methods to reduce appraisal error. This strengthens the political tournament and incentivizes local government officials to focus on short-term goals that highlight achievements made during their term. Local officials are assumed to face two investment choices: production investment, which is characterized by short-term cycles, quick effects, and low risk, and innovation investment, which is characterized by long-term cycles, slow effects, and high risk. To maximize their economic and political interests during their time in office, local officials tend to encourage productive investment and ignore innovative investment—that is, they show a self-interested investment preference of “emphasizing production and neglecting innovation” (Wu, 2017). Therefore, if the GDP growth rate is a deci-

sive factor for political promotion, economic development should directly affect the behavioral preferences of local officials. To gain an advantage in the political promotion tournament, local officials will actively attract investment and promote infrastructure construction to promote rapid economic growth within their jurisdiction (Bu et al., 2018). Especially in regions with low GDP growth rates, officials experience greater pressure regarding their political performance evaluation. To pursue economic growth, officials' self-interested investment preference—to invest more in production than in innovation—will be more severe. Thus, we examine the effect of official rotation under different levels of assessment pressure to test whether the effect of official rotation on corporate innovation varies with different levels of performance appraisal pressure.

We divide the sample into four groups according to the GDP growth rate of each province. Regions with the lowest GDP growth rate are designated as the High Pressure group, and regions with the highest GDP growth rate are classified as the Low Pressure group. Table 7, Panel A shows how the different levels of performance appraisal pressure affect the relationship between official rotation and corporate innovation. The coefficient on Rotation is significantly positive in the Low Pressure group but fails the significance test for the High Pressure group, suggesting that appraisal pressure does affect the relationship between official rotation and corporate innovation. Only when rotating officials are faced with low appraisal pressure do they have positive effects on corporate innovation. This is consistent with the reality that local officials rely heavily on investment in fixed assets rather than intangible assets.

6.2. Official rotation, corporate innovation, and economic growth

Development is the key to solving economic problems, and long-term economic growth is the core of development. The central government attaches great importance to the quality of economic growth and to sustainable development. In five-year plans and important conferences, the central government has continuously emphasized the transformation of the economic growth mode and the key roles of science, technology, and innovation in economic development and transformation. Science, technology, and innovation are the primary productive forces and engines of economic growth. Through the development of high-tech industries, China can seek an “opportunity window” to leap ahead technologically and accelerate its economic development (Liu et al., 2017). China is in a critical period of economic transition that requires more active recognition of the crucial roles of knowledge and technological innovation in the modern economy to lay the foundation for innovation-driven development. However, during the process of economic transformation, can official rotation promote regional economic development by improving corporate innovation?

To answer this question, our paper further examines the relationship between official rotation, corporate innovation, and economic growth to verify the positive effect of corporate innovation resulting from official rotation on regional economic development. Table 7, Panel B presents the results for economic growth. Consistent with our speculation, using the next period of GDP and the GDP growth rate as explained variables, the coefficients on Rotation*LnRD and Rotation*Patent are both significantly positive, indicating that R&D expenditure and patent applications caused by official rotation can increase regional GDP and the GDP growth rate. In other words, official rotation can promote economic growth by increasing corporate innovation, which supports the economic growth effect of official rotation at the micro level (Zhang and Gao, 2007; Xu et al., 2007).

7. Conclusion

As China's economy has entered a “new normal” period with slower economic growth, major changes are taking place in terms of the growth rate and development model, implying that economic growth is in a critical period of transition from being factor and investment driven to being innovation driven. From 2006 to 2020, China's science and technology development goal is to build an innovation-oriented country and to make scientific and technological innovation the backbone of economic development. Therefore, it is of great practical significance to foster and stimulate innovation, which is a challenge for both the government and firms.

By considering governor rotation, this paper empirically examines the effect of official rotation on corporate innovation and explores the driving mechanism of this effect. Using a sample of Chinese A-share listed companies from 2007 to 2015, we find that official rotation has a positive effect on corporate innovation. Offi-

Table 7

Supplementary Analysis: Performance Appraisal Pressure and Economic Growth. Panel A reports the results for the test of performance appraisal pressure, which examines the relationship between the effect of official rotation on corporate innovation and performance appraisal pressure. Panel B reports the results for economic growth, which indicates the relationship between the effect of official rotation on corporate innovation and economic growth. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

Panel A: Effects of Official Rotation on Corporate Innovation, High Pressure vs. Low Pressure

	(1) High Pressure	(2)	(3)	(4) Low Pressure	(5)	(6)
	LnRD _{t+1}	Patent _{t+1}	Patent _{t+1}	LnRD _{t+1}	Patent _{t+1}	Patent _{t+1}
Rotation _t	0.076 (0.469)	-0.050 (-0.679)	0.017 (0.264)	0.576** (2.172)	0.171** (2.481)	0.169*** (2.682)
Size _t	0.612*** (4.993)	0.530*** (13.579)	0.506*** (14.303)	-0.010 (-0.056)	0.515*** (11.884)	0.476*** (12.157)
Lev _t	-0.146 (-0.257)	0.385* (1.915)	0.182 (1.009)	0.631 (0.628)	0.035 (0.153)	-0.073 (-0.354)
Growth _t	1.025*** (3.525)	0.131 (1.175)	0.180* (1.842)	1.392** (2.048)	0.162 (1.033)	0.135 (1.023)
Roa _t	0.757 (0.438)	2.926*** (4.008)	2.426*** (3.718)	4.871 (1.375)	1.799** (2.316)	1.246* (1.739)
CFO _t	1.284 (0.939)	0.460 (1.039)	0.451 (1.135)	2.706 (1.298)	-0.089 (-0.203)	0.322 (0.800)
PPE _t	-0.366 (-0.544)	-1.216*** (-4.602)	-0.927*** (-3.929)	-2.130** (-1.969)	-1.738*** (-6.457)	-1.276*** (-5.303)
Age _t	-0.053*** (-3.300)	-0.013** (-2.217)	-0.008 (-1.486)	-0.227*** (-6.722)	-0.013* (-1.681)	-0.013* (-1.939)
Board _t	0.099 (1.545)	-0.013 (-0.489)	0.019 (0.811)	0.157* (1.832)	-0.040 (-1.639)	-0.001 (-0.048)
Indep _t	1.232 (0.883)	-0.048 (-0.072)	0.512 (0.821)	0.354 (0.115)	0.910 (1.244)	1.004 (1.410)
Fin _t	0.205 (0.854)	0.314*** (4.099)	0.286*** (4.273)	0.224 (0.675)	0.346*** (4.672)	0.315*** (4.667)
Dgdp _t	2.536 (0.408)	5.074** (2.339)	5.595*** (2.908)	-6.973 (-0.874)	-0.005 (-0.003)	2.104 (1.265)
Pgdp _t	0.033 (0.093)	-0.193 (-1.592)	-0.203* (-1.796)	-0.732 (-1.610)	-0.091 (-0.767)	0.040 (0.360)
Intercept	-3.948 (-0.996)	-10.300*** (-7.472)	-10.490*** (-8.238)	10.900* (1.957)	-10.541*** (-7.630)	-12.042*** (-9.255)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	3196	3196	3196	2942	2942	2942
Adj.R ²	0.197	0.272	0.261	0.297	0.227	0.215

Panel B: Official Rotation, Corporate Innovation, and Economic Growth

	(1) GDP _{t+1}	(2) Dgdp _{t+1}
Rotation _t	0.014 (0.502)	-0.002** (-2.104)
Rotation*LnRD _t	0.006*** (3.836)	
Rotation*Patent _t		0.001** (2.239)
LnRD _t	-0.002** (-2.432)	
Patent _t		0.000** (1.992)

(continued on next page)

Table 7 (continued)

	(1) GDP _{t+1}	(2) Dgdp _{t+1}
Size _t	−0.013** (−2.005)	−0.001** (−2.044)
Lev _t	0.124*** (3.569)	0.000 (0.032)
Growth _t	−0.031* (−1.868)	0.005*** (4.818)
Roa _t	0.316*** (3.017)	−0.003 (−0.433)
CFO _t	0.031 (0.506)	0.001 (0.300)
PPE _t	0.146*** (3.893)	−0.002 (−0.813)
Age _t	−0.005*** (−4.279)	−0.000*** (−2.582)
Board _t	−0.006 (−1.340)	−0.000 (−0.725)
Indept _t	−0.278*** (−2.735)	0.013** (2.323)
Fin _t	1.060*** (61.742)	−0.000 (−0.024)
Dgdp _t	0.115 (0.557)	
Pgdp _t	−0.398*** (−13.984)	−0.014*** (−12.889)
Intercept	6.575*** (27.518)	0.297*** (28.037)
Industry	Yes	Yes
Year	Yes	Yes
N	12,034	12,034
Adj.R ²	0.864	0.721

cial rotation significantly improves R&D investment and increase the quantities of total patent applications and innovation patent applications. We also find that the effect of official rotation on corporate innovation varies due to official and region heterogeneity. Officials rotating from other provinces significantly promote corporate innovation, but officials rotating from the central government have a negligible effect on corporate innovation. Officials rotating to non-eastern regions significantly improve corporate innovation, while officials rotating to eastern regions do not. These results reflect the need to further improve the role of technological innovation in non-eastern regions for economic development. Compared with eastern regions, in non-eastern regions, the market environment is relatively poor, and the economy develops slowly. Officials rotating from eastern regions to non-eastern regions provide superior economic development experience and improve the economic and political environment, thus promoting corporate innovation and coordinating regional economic development. In other words, if eastern region officials are rotated to non-eastern regions, the market environment of non-eastern region will become more transparent, standardized, convenient, and vigorous due to the effect of officials' experience, which is conducive to corporate innovation and quickly improves corporate innovation. In addition, we find that central officials and local officials have different channels through which to influence corporate innovation. Officials rotating from the central government promote corporate innovation in non-eastern regions through increasing innovation subsidies, while officials rotating from local governments mainly improve corporate innovation through the experience effect and by decreasing corporate charitable donations. We also find that performance appraisal pressure significantly inhibits the effect of official rotation on corporate innovation. Only when officials have less pressure to increase their achievements do they have a positive impact on corporate innovation. We also confirm that official rotation promotes the regional growth of GDP through promoting corporate innovation.

This paper has policy implications for government administrators. First, in the context of fiscal decentralization and political centralization, China has accomplished great achievements in economic development. To maximize economic and political interests during their terms, local officials have incentives to pay more attention to production investment than to innovation investment. However, an economic growth model that relies heavily on extensive investment in fixed assets cannot be sustainable. Our paper finds that official rotation does have significant and positive effects on innovation-production investment, thus laying theoretical foundation for transforming economic growth from an extensive to an innovation-driven form. Second, our paper finds that the effect of official rotation on corporate innovation varies due to official and regional heterogeneity, which has important reference significance for properly modifying the official governance system to promote economic development. Third, our paper finds that GDP-oriented pressure to perform weakens the corporate innovation effect of official rotation. Therefore, we should gradually reduce the weight of economic assessment in official performance evaluations and increase the weight of assessment of public services and social management.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Variable definitions

Variables	Definitions
LnRD	Innovation investment, the natural logarithm of R&D expense after adding 1. $\text{LnRD} = \text{Ln}(1 + \text{R\&D expense})$
Patent	Innovation quantity, the natural logarithm of total patent applications after adding 1. $\text{Patent} = \text{Ln}(1 + \text{total patent applications})$
Patenti	Innovation quality, the natural logarithm of invention patent applications after adding 1. $\text{Patenti} = \text{Ln}(1 + \text{invention patent applications})$
Rotation	Dummy variable, which is equal to 1 if the new governors are selected from cross-regional rotation and 0 otherwise (Zhang and Gao, 2007)
Central	Dummy variable, which is equal to 1 if the cross-regional rotation governors are selected from the central government and 0 otherwise
Province	Dummy variable, which is equal to 1 if the cross-regional rotation governors are selected from other foreign provinces and 0 otherwise
Eastern Region	Eastern regions include Liaoning, Beijing, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Hainan. The other provinces are classified as non-eastern regions
EastProvinces	Dummy variable, which is equal to 1 for cross-regional rotation governors coming from eastern regions and 0 otherwise

NonEastProvinces	Dummy variable, which is equal to 1 for cross-regional rotation governors coming from non-eastern regions and 0 otherwise
Size	Natural logarithm of end-of-year total assets
Lev	End-of-year total liabilities divided by end-of-year total assets
Growth	Percentage change in sales
Roa	Net income divided by end-of-year total assets
CFO	Annual net cash flow from operating activities divided by end-of-year total assets
PPE	Current year level of property, plant, and equipment, scaled by end-of-year total assets
Age	Number of years the firm has been listed on the stock exchange
Board	Number of directors on the board
Indep	Proportion of independent directors on the board
Fin	Natural logarithm of the annual general budget revenue of each province
GDP	Natural logarithm of the GDP of each province
Dgdp	Percentage change in GDP
Pgdp	Natural logarithm of GDP per capita
Donation	Charitable donations, the natural logarithm of charitable donations after adding 1. Donation = $\text{Ln}(1 + \text{charitable donations})$
RD&Subsidy	Innovation Subsidies, the natural logarithm of innovation subsidies after adding 1. RD&Subsidy = $\text{Ln}(1 + \text{innovation subsidies})$

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