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Article

The impact of policies controlling government hospital development on the number and scale of government and private hospitals: A DID analysis

Weizhen Chen[1,*], Juan Mai[2]

[1] Department of Doctor-Patient Coordination, Beijing Tongren Hospital, Capital Medical University, Beijing 100730, China
[2] Jingdong Zhongmei Hospital, Langfang 065200, China
*** Corresponding author:** Weizhen Chen, davy-chen7@hotmail.com

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Abstract: Since 2013, the state has introduced a number of policies to strictly control the number and scale of public hospitals and to control the rapid expansion of public hospitals. After the introduction of this series of policies, the number of public hospitals in China did not continue to grow, but the number of beds in public hospitals continued to grow. This paper uses difference-in-difference (DID) method to analyze the number of public hospitals with the corresponding data of the development of private hospitals after the introduction of the policy, and the results proves that the introduction of relevant policies has an impact on the number of public hospitals, but has a limited impact on the expansion of the scale of public hospitals. At the end of the article, positive policy suggestions are given to the development of hospitals in China, such as controlling the expansion of public hospitals, strictly controlling the number of beds in public hospitals, and vigorously developing private hospitals. Promoting the development of private hospitals is an important economic supplement to China's health care.

Keywords: public hospital; private hospital; the hospital scale; DID method

1. Introduction

Since 2013, particularly following the Outline of the 13th Five-Year Plan for National Economic and Social Development of the People's Republic of China, multiple policies have been introduced in China to strictly control the quantity and scale of public hospitals (Basu et al, 2017; Fidler et al, 2007). Various national medical reform documents explicitly stipulate that public hospitals must not expand blindly (Griffin et al., 2021). In October 2013, the General Office of the State Council of China issued the document titled "Several Opinions of the State Council on Promoting the Development of the Health Service Industry," commonly referred to as Document No. 40. This document clearly encourages enterprises, charitable organizations, foundations, and commercial insurance institutions to invest in the healthcare service industry through various means, including funding new constructions, participating in restructuring, and public-private partnerships (Shi et al., 2025). In June 2014, the former National Health and Family Planning Commission issued an "Emergency Notice on Controlling the Rapid Expansion of Public Hospitals." This notice introduced the "Four Stricts" policy: strict control over the approval of public hospital beds, strict control over construction standards for public hospitals, strict control over the allocation of large medical equipment in public hospitals, and a complete prohibition on public hospitals incurring debt for construction (Health Commission Development, 2019). On 8 August 2016, the former National Health and Family Planning Commission launched the "Guiding Principles for the Planning of Medical

Institutions (2016–2020)," which emphasized strict regulation of the overall and individual scales of public hospitals (Jiang, 2024). The document aimed to guide social forces in establishing medical institutions, enhance information technology infrastructure, and gradually build an integrated healthcare service system that aligns with national economic and social development levels and meets health needs. This system would be led by national and regional medical centers, supported by provincial medical centers, with municipal and county hospitals as the backbone, and grassroots medical and health institutions as the foundation. Public hospitals would serve as the main component, supplemented by privately funded healthcare. The guidelines provided a range of favorable factors to promote the development of private healthcare, advocating for the rapid growth and elevation of privately funded medical services. In July 2017, the General Office of the State Council issued the "Guiding Opinions on Establishing a Modern Hospital Management System," which mandated strict control over the scale of public hospital beds, construction standards, and the allocation of large medical equipment, while prohibiting debt-driven construction and luxury renovations. It also stated that the proportion of specialized services provided by public hospitals should not exceed 10% (Liao, 2014). On 12 June 2019, the National Health Commission, in collaboration with nine other ministries, issued a notice to promote the sustained, healthy, and standardized development of privately funded medical services, further tightening control over the quantity and scale of public hospitals to create space for the growth of private healthcare (Liu and Zhao, 2015).

These policies collectively indicate that the government has implemented multiple measures to strictly control the number and scale of public hospitals, regulate their expansion, and ensure the efficient use of public funds during a transitional period.

2. The quantity and scale of public hospitals

Public hospitals typically refer to those funded by the government, with ownership belonging to local and regional authorities. These hospitals are integrated into the fiscal budget management of the government. In contrast, private hospitals are those not operated by the government; their ownership lies with social investors, meaning they are established with non-governmental funds. The scale of a hospital is generally measured by factors such as the number of hospital beds and the capacity of medical services it offers. In June 2014, the former National Health and Family Planning Commission issued an "Emergency Notice on Controlling the Rapid Expansion of Public Hospitals," which emphasized strict controls over the approval of hospital beds, construction standards, and the allocation of large medical equipment. Considering national policies and hospital development, the scale of hospitals should encompass the number of beds, construction standards, and the configuration of major medical equipment. Generally, a higher number of hospital beds indicates a larger scale, while fewer beds signify a smaller scale. For the purposes of this article, the number of beds will serve as a key indicator of hospital size, excluding other factors such as patient admissions.

Since the reform and opening-up period in China, the capacity of health services

has gradually increased. Within the existing healthcare system, public hospitals have continuously expanded. This expansion is evident not only in the increasing number of hospitals but also in the rising number of beds relative to the volume of patients treated. For instance, the First Affiliated Hospital of Zhengzhou University has over 10,000 beds. Many hospital administrators assess the performance of hospitals and their leaders based on the number of beds, and this trend of expansion continues.

This article primarily discusses two key indicators: the number of public hospitals and the scale of public hospitals measured by the number of beds. By understanding these dynamics, we can gain insights into how the public healthcare sector is evolving in response to demand and policy frameworks, and the implications this has for the overall healthcare system in China.

3. Difference-in-difference method

The Difference-in-Differences method, also known as the double difference method, is a widely used approach for evaluating economic policies (Li et al, 2024). This method requires at least two time periods of data and divides samples into two groups: the experimental group and the control group. In the first period, the experimental group is not affected by the policy, but the policy is implemented afterward, leading to results in the second period that reflect the policy's impact. The control group, on the other hand, remains unaffected by the policy throughout both periods, serving as a benchmark for comparison. The calculation of the DID effect is straightforward: it involves taking the differences between the two time periods for both groups and then finding the difference between these two differences, effectively isolating the policy effect (Richardson et al, 2023; Rothbard et al, 2024).

The DID method was introduced into economic research in the West as early as the late 1970s (Callaway and Sant'Anna, 2021). In China, the first authoritative literature to apply the DID method for public policy evaluation was the study by Zhou and Chen (2005), which examined the impact of tax reform on farmers' income growth (CDM, 2016; Song, 2022). The adoption and popularization of new methodologies often experience a delay; between 2006 and 2007, there were virtually no studies employing the DID method to evaluate policy effects. However, following 2008, the number of journal articles and theses utilizing the DID approach has shown a general upward trend, indicating that the method is increasingly being used for policy evaluation in China.

This growth can be attributed to several factors, including the method's ability to control for unobserved variables that could bias results and its relevance in various fields, such as healthcare, education, and social policies. As researchers become more familiar with the DID technique, it is likely to become a standard tool in the toolkit for evaluating policy impacts, enhancing the rigor and reliability of empirical studies in the social sciences (Wang, 2014).

4. Analyzing the impact of policies restricting the development of public hospitals on the number and scale of public hospitals using the DID method

Based on the DID method, the sample is divided into two groups: the experimental group and the control group. This study primarily examines the number and scale of public hospitals, with public hospital data serving as the experimental group (Treatment Group). Despite the strong advocacy for social capital in healthcare in China, the development of private hospitals has faced significant challenges. The policy environment for private healthcare has not fundamentally changed, and issues regarding equitable treatment for social capital in healthcare remain unresolved. Furthermore, the promotion of private healthcare has been a consistent policy stance that has not wavered over time. Therefore, the development of private hospitals is relatively less influenced by policies, making the number and scale of private hospitals suitable for use as the control group (Control Group).

For the analysis, 2010 serves as the first period, representing the pre-policy implementation phase. Although policies restricting the expansion of public hospitals began to emerge in 2013, there is typically a delay of 1–2 years before these policies are fully enacted and their effects observed. The second phase of the analysis begins in 2015, marking the period when public hospitals began to experience the effects of newly implemented policy interventions. Before 2015, there were no significant restrictions on the expansion of public hospitals, allowing them to grow without substantial regulatory limitations. However, starting in 2015, various policies were introduced to control the scale and growth of public hospitals, aiming to address issues such as resource allocation, healthcare equity, and the balance between public and private healthcare sectors. These interventions represented a shift in government priorities, emphasizing the need to regulate public hospital development while fostering the growth of private hospitals. This policy-driven shift created a critical turning point in the healthcare system, providing a unique opportunity to assess its impact through a structured analysis, such as the difference-in-difference (DID) method. Understanding these dynamics is essential for evaluating the broader implications of such reforms on the healthcare landscape.

Let d^j represent the grouping dummy variable, where $d^1 = 1$ indicates that the experimental group is affected by the policy, and $d^0 = 0$ signifies that the control group is not influenced by the policy. The time dummy variable for all samples is represented by d_t, with $d_t = 0$ before the policy intervention and $d_t = 1$ afterward, indicating that the policy impact has occurred. The product of the time dummy variable d_t and the group dummy variable d^j gives the DID estimator d_t^j (Difference-in-Differences Estimator), where $d_t^j = d_t \cdot d^j$. This d_t^j serves as the basis for assessing whether the experimental treatment (policy implementation) significantly influences the dependent variable (Basu et al., 2017).

The DID econometric model can be expressed as follows:

$$y_{it}^j = \alpha_0 + \alpha_1 d_t + \alpha_2 d^j + \beta d_t^j + \alpha_3 x_{it}^j + \varepsilon_{it}^j \quad (1)$$

In this equation, y_{it}^j represents the dependent variable for individual i, x_{it}^j denotes control variables that account for individual differences, and ε_{it}^j is the random

disturbance term. The coefficients α and β are regression coefficients, with β representing the effect of the treatment variable (DID estimator) on the dependent variable, referred to as the policy effect. The policy effect β is defined as:

$$B = (\grave{y}_1^1 - \grave{y}_0^1) - (\grave{y}_1^0 - \grave{y}_0^0) = E[y|d_t^j = 1] - E[y|d_t^j = 0] \quad (2)$$

Note $d^1 = 1$, that is, public hospitals in the experimental group were affected by the policy, and $d^0 = 0$, that is, private hospitals in the control group were not affected by the policy.

β in the above equation is the treatment effect, that is, the difference in the size growth of the two types of hospitals before and after the implementation of the policy, that is, the impact on the size of public hospitals after the implementation of the policy.

Beta is the experimental effect of experimental variables on the experimental group. Since the policy in this paper is a development-restricting policy, if $\beta = E[y|d_t^j] < 0$, it indicates that the policy has a positive impact on the number and scale of public hospitals, and it is used for production. If $\beta = E[y|d_t^j] > 0$, it indicates that the policy has a negative impact on the number and scale of public hospitals, with no effect or limited effect.

So what is the effect of a series of policies to limit the number and scale of public hospitals in China?

Based on the data, it is evident that the number of public hospitals has decreased steadily since the implementation of the policy, while the number of private hospitals has significantly increased. This trend raises questions about whether the decline in public hospitals is due to closures, transitions to private ownership, or other factors. A closer analysis reveals that many of the disappearing public hospitals were not entirely shut down but rather transitioned into private hospitals through mergers, acquisitions, or restructuring. These transitions were driven by the policy's aim to curb the rapid growth of public hospitals while encouraging the development of the private healthcare sector. By promoting the reallocation of resources, the policy enabled certain public hospitals to adapt to changing market dynamics and continue operations under private ownership, contributing to the observed increase in private hospital numbers (**Table 1**).

Table 1. Growth of hospital numbers from 2010 to 2020 (unit: number of hospitals).

Hospital Type	**2010 (d_t = 0)**	**2015 (d_t = 1)**	**2017 (d_t = 2)**	**2018 (d_t = 3)**	**2019 (d_t = 4)**	**2020 (d_t = 5)**
Public Hospitals (d^1)	13,850	13,069	12,297	12,032	11,930	11,870
Private Hospitals (d^0)	7068	14,518	18,759	20,977	22,424	23,524

From 2010 to 2020, the number of hospital beds in both public and private hospitals in China showed notable growth. According to **Table 2**, public hospital beds increased from 3.014 million in 2010 to 5.091 million in 2020. Despite policies implemented to control the growth of public hospitals, the number of beds continued to rise steadily, particularly from 2015 to 2020. For instance, between 2015 and 2020, the number of public hospital beds grew from 4.296 million to 5.091 million, reflecting an annual increase of approximately 160,000 beds. This trend suggests that while the expansion of public hospitals is restricted, the demand for healthcare services remains high. In contrast, private hospitals saw a much faster growth in bed numbers. As shown

in **Table 2**, private hospital beds grew from 374,000 in 2010 to 2.041 million in 2020. Between 2015 and 2020, the number of private hospital beds increased from 1.034 million to 2.041 million, with an average annual growth of around 200,000 beds. This sharp increase reflects the rapid expansion of private hospitals, driven by both policy incentives and the growing demand for private healthcare services. When comparing the growth of public and private hospital beds, it is clear that while the number of beds in public hospitals remains significantly higher, private hospitals are expanding at a much faster pace. In 2010, public hospital beds were about 8 times greater than private hospital beds, as shown in **Table 2**. By 2020, however, this ratio had reduced to approximately 2.5 times, indicating that private hospitals are gradually capturing a larger share of the healthcare market. In conclusion, **Table 2** highlights that, while the number of public hospital beds continues to grow due to persistent demand, the rapid expansion of private hospitals underscores their increasing importance in China's healthcare system. The growth of private hospitals, aided by favorable policies, is likely to play a more prominent role in meeting the healthcare needs of the population in the future.

Table 2. Growth of hospital beds from 2010 to 2020 (unit: ten thousand beds).

Institution Name	**2010 (d_t = 0)**	**2015 (d_t = 1)**	**2017 (d_t = 2)**	**2018 (d_t = 3)**	**2019 (d_t = 4)**	**2020 (d_t = 5)**
Public Hospitals (d^1)	301.40	429.6	463.1	480.2	497.6	509.1
Private Hospitals (d^0)	37.40	103.4	148.9	171.8	189.1	204.1

Note: The above data is sourced from the "2021 Report on the Development of Private Hospitals in China" (Wang et al., 2024).

Figure 1 illustrates the trends in the number of public and private hospitals in China from 2010 to 2020, highlighting the divergent trajectories of the two sectors under the influence of healthcare policies. The number of public hospitals steadily declined from approximately 13,850 in 2010 to 11,870 in 2020, reflecting the impact of government policies implemented since 2013 to control the expansion of public hospitals. These policies, such as stricter approval processes and limits on resources like hospital beds and medical equipment, aimed to curb the proliferation of public hospitals and redirect healthcare development toward the private sector. In contrast, the number of private hospitals experienced a significant and rapid increase, rising from 7068 in 2010 to 23,524 in 2020. This growth was driven by favorable policies encouraging private investment in healthcare, including support for new hospital construction, public-private partnerships, and regulatory incentives. The contrasting trends underscore a strategic shift in China's healthcare system, where private hospitals have become an increasingly important supplement to public healthcare. By taking on routine and lower-acuity care, private hospitals allow public hospitals to focus on specialized and critical services, contributing to a more balanced and efficient allocation of healthcare resources. The trends depicted in **Figure 1** highlight the success of these policy interventions in reshaping China's healthcare landscape over the past decade.

Figure 2 demonstrates the growth trends in hospital beds in public and private hospitals in China from 2010 to 2020, providing critical insights into the scale expansion of these two sectors amidst evolving healthcare policies. Over this period,

public hospitals consistently maintained a higher number of beds compared to private hospitals, increasing from 3.014 million in 2010 to 5.091 million in 2020. This steady growth highlights the persistent demand for public healthcare services despite the government's policies to control the scale and expansion of public hospitals. Notably, the growth in public hospital beds was most pronounced between 2010 and 2015, corresponding to a pre-policy implementation phase, after which the growth rate slowed but remained positive, reflecting ongoing demand-driven adjustments within the sector. In contrast, private hospitals experienced a much faster relative growth in bed numbers, rising from 374,000 beds in 2010 to 2.041 million in 2020, representing a more than fivefold increase. This rapid expansion aligns with the government's policy emphasis on promoting private healthcare, as outlined in initiatives such as Document No. 40 and subsequent reforms. These policies encouraged private investment and the establishment of private hospitals to supplement public healthcare and meet the growing and diverse medical needs of the population. While private hospitals started with a significantly lower baseline in terms of bed numbers, their exponential growth underscores the sector's increasing role in China's healthcare system. The trends in **Figure 2** reveal a complementary dynamic between the two sectors. Although public hospitals continue to dominate in terms of total bed capacity, the accelerated growth of private hospital beds reflects a deliberate policy-driven shift to balance the public-private healthcare landscape. This dual development approach has allowed private hospitals to play a growing role in addressing healthcare demands while enabling public hospitals to focus on specialized and critical care. The observed trends highlight the evolving structure of China's healthcare system, emphasizing both policy effectiveness and the importance of continued efforts to optimize healthcare resource allocation.

Upon introducing the DID analysis, the following table is presented (**Table 3**):

Table 3. Analysis of hospital scale changes using the DID method.

DID Treatment Effect	2015 (d_t = 1)	2017 (d_t = 2)	2018 (d_t = 3)	2019 (d_t = 4)	2020 (d_t = 5)
B (Number)	8231	13,244	15,727	17,276	17,436
B (Scale/Beds)	62.2	50.8	44.4	44.5	43.0

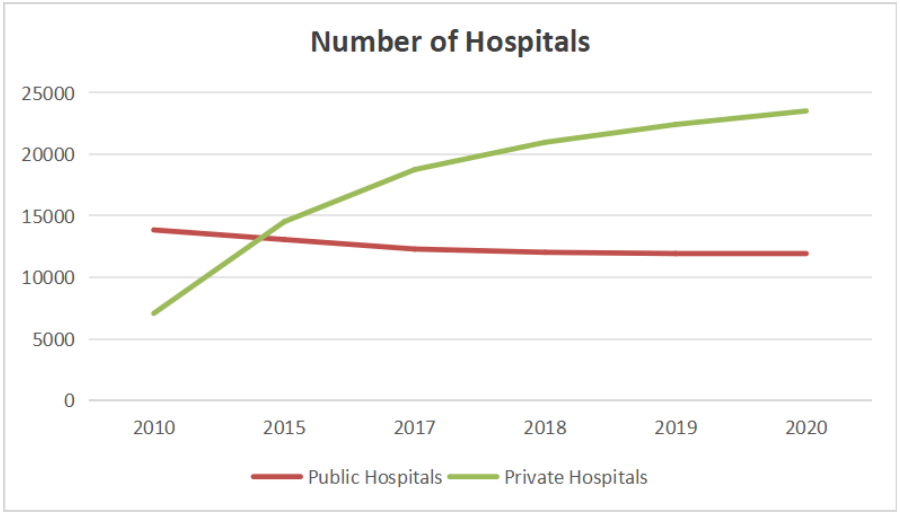

Figure 1. Line graph of changes in the number of hospitals from 2010 to 2020.

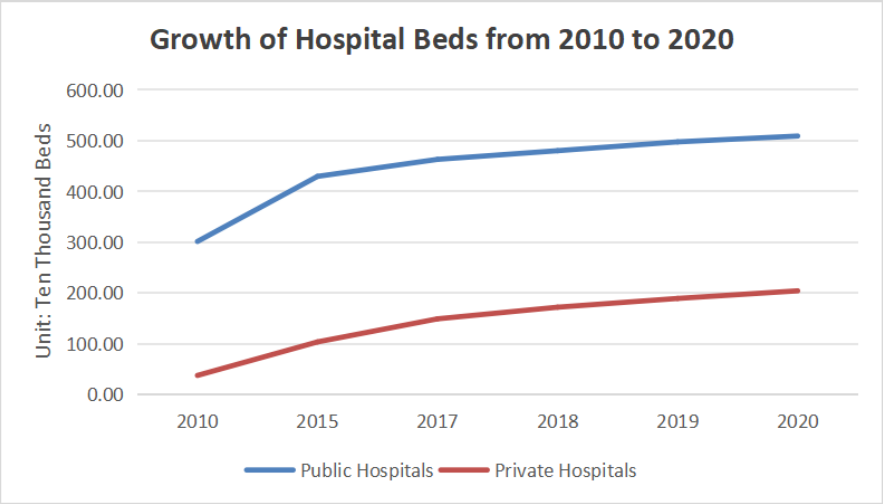

Figure 2. Growth of hospital bed numbers from 2010 to 2020.

Table 3 presents the analysis of hospital scale changes using the DID method, highlighting the distinct effects of policies on the number and scale of public hospitals. The treatment effect β on the number of public hospitals shows a consistently negative trend, deepening from −8231 in 2015 to −17,436 in 2020, which demonstrates that the policies have been highly effective in reducing the number of public hospitals over time. This decline reflects the success of government measures such as stricter approval processes for new public hospitals, prohibitions on debt-financed expansions, and the transition of smaller public hospitals to private ownership or mergers. These interventions align with the broader goal of controlling the overexpansion of public hospitals and reallocating resources to balance the healthcare system. In contrast, the treatment effect on the scale of public hospitals, measured by bed numbers, remains positive but shows a declining trend, decreasing from 62.2 in 2015 to 43.0 in 2020. This indicates that while the policies have curbed the rapid expansion of public hospitals, their overall bed capacity has continued to grow, albeit at a slower rate. The initial higher values in 2015 and 2017 likely result from the completion of previously approved projects or the need to meet increasing healthcare demands by expanding existing infrastructure. However, the declining trend in β over time suggests that the policies have started to effectively slow the growth of bed numbers. These contrasting trends reveal the complexity of the policy impacts: while the reduction in public hospital numbers is evident, the remaining hospitals are becoming larger to meet rising demand, potentially leading to resource concentration and overburdening. This underscores the importance of fostering the development of private hospitals to absorb healthcare demand and reduce pressure on public facilities. Overall, the findings highlight that while the policies have achieved notable success in limiting the number of public hospitals, addressing the continued expansion of their scale remains a challenge, requiring more comprehensive measures to ensure a balanced and efficient healthcare system.

5. Conclusion

Through the application of the DID method, this analysis reveals that after the implementation of national policies aimed at restricting the quantity and expansion of

public hospitals, there has been a significant impact on the overall number of public hospitals, which has been effectively limited (Ye et al, 2024). However, the influence on the scale of public hospitals remains relatively constrained, though it is gradually becoming more pronounced. The introduction of a series of policies designed to curtail the expansion of public hospitals has led to stricter oversight during the approval stages for new public hospitals (Zhang et al, 2018). As a result, the number of new hospitals has been clearly controlled, with a consistent decline observed year by year. This regulatory approach indicates a commitment to managing public hospital growth and ensuring that it aligns with national healthcare objectives. Nevertheless, despite these limitations, individual public hospitals continue to expand in scale, with an increase in bed numbers. This suggests that while the overall number of public hospitals is decreasing, existing facilities are not only maintaining but often enhancing their capacity (Barber et al, 2013; Zhou, 2021).

The phenomenon of individual public hospitals expanding their scale can be attributed to several factors. First, as existing hospitals seek to improve their services and patient care, they may increase their bed capacity and medical facilities to meet growing demand. This rapid expansion of individual hospitals, however, is beginning to show signs of a slowdown due to the ongoing policy implementation. The short-term effects of rapid growth are now giving way to a more measured approach, as regulations continue to evolve and adapt to the needs of the healthcare system.

Policies limiting the development of public hospitals began to take shape around 2013, with ongoing legislation and guidelines still being introduced as of 2019. This trend underscores the Chinese government's strong determination to manage the number and scale of public hospitals. Such control is seen as an essential requirement for the reform of the healthcare sector and the development of the medical market in China. The approach reflects a broader strategy to ensure that public healthcare facilities operate efficiently and effectively, avoiding the pitfalls of overexpansion which can lead to resource strain and diminished service quality.

Moreover, the control of public hospital expansion is not just about limiting quantity; it also addresses the internal governance challenges that hospitals face. There is a growing concern regarding the phenomenon of "internal control" within hospitals, where decision-making may be influenced by entrenched interests rather than by the needs of the patient population. Therefore, it is crucial for local governments to implement stringent measures to oversee the growth of public hospital bed capacities while promoting transparency and accountability within these institutions.

In parallel to limiting the expansion of public hospitals, there is a pressing need to bolster the development of private healthcare. Encouraging the growth of private hospitals offers a significant opportunity to enhance the overall healthcare landscape in China. By fostering a vibrant private healthcare sector, the government can provide citizens with a broader array of choices in medical services, leading to improved health outcomes and higher patient satisfaction. This dual approach of managing public hospital growth while promoting private healthcare development can create a more balanced and comprehensive healthcare system.

Furthermore, as private hospitals grow, they can alleviate some of the pressures faced by public hospitals, enabling the latter to focus on complex cases that require specialized care. This division of labor can enhance the efficiency of the healthcare

system, ensuring that resources are allocated where they are most needed. Additionally, a robust private healthcare sector can stimulate competition, driving improvements in service quality and innovation across the board.

Ultimately, the policies aimed at restricting the number and scale of public hospitals are part of a broader strategy to reform the healthcare system in China. By carefully managing public hospital expansion and promoting private healthcare development, the government aims to create a sustainable, efficient, and accessible healthcare system for all citizens. The ongoing evolution of these policies will be crucial as China navigates the complexities of healthcare delivery in a rapidly changing environment, ensuring that the needs of the population are met both now and in the future.

In conclusion, the effective management of public hospital growth, paired with a concerted effort to expand private healthcare options, will be vital to the future success of China's healthcare reforms, ultimately benefiting the health and well-being of its citizens.

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