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Unlocking Private Healthcare in China: Large Language Model–Based Policy Analysis and Empirical Evidence on Patient Choice

Kai Liu[1] | Jinbao Zhang[2] | Liyuan Shang[3] | Tianyu Wang[1]

[1]School of Labor and Human Resources, Renmin University of China, Beijing, China | [2]Care and Outcomes Research Centre, University of Kent, Canterbury, UK | [3]School of Economics, Fudan University, Shanghai, China

Correspondence: Jinbao Zhang (j.zhang@kent.ac.uk)

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ABSTRACT

Promoting private healthcare is widely recognized as a means to alleviate pressures on public systems and improve healthcare access. Yet in China, despite the rapid growth of private providers, patient uptake remains limited. This study investigates how different types of private-sector promotion policies—market entry, government procurement, and insurance designation coverage—affect patients' choices of private healthcare providers in China. We constructed a large-scale health policy database comprising over 500,000 official documents issued by Chinese central and local governments. Using a BERT-based large-language-model approach, we identified more than 15,000 policy statements promoting private providers. These were matched with four waves of nationally representative survey data from the China Health and Retirement Longitudinal Study, spanning 2011 to 2018. High-dimensional fixed-effect models were used to estimate the effects of policy exposure at the prefecture level on patients' use of private primary care facilities (PCFs) and hospitals for outpatient and inpatient services. Findings reveal that local governments disproportionately emphasized market entry over postentry policies such as government procurement and insurance designation. However, only government procurement and insurance designation policies significantly increased patients' use of private PCFs for outpatient care. Market entry promotion policies had no significant impact on patient choices. Mediation analysis suggests that the presence of private providers alone does not fully explain patient choice, implying that service quality, affordability, and patient trust are likely critical. Our findings suggest that promoting private healthcare requires more than facilitating provider entry. Targeted postentry policies that improve financial access and quality may be more effective in improving patient uptake—particularly for primary care. This study also demonstrates the potential of large language models to support policy analysis at scale, offering new tools for health system research globally.

1 | Introduction

The private sector plays an increasingly vital role in health systems globally. In many countries, private healthcare providers are seen as essential to achieving universal health coverage by improving access to care, particularly in regions where public health services are insufficient [1]. It is estimated that private providers contribute approximately 40%–60% of healthcare services across WHO regions [2]. By leveraging private investment, technology, and managerial expertise, policymakers frequently look to the private sector to supplement strained public health systems, particularly in rural and peripheral areas [1]. However, despite this increasing availability, the actual utilization of

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private health services often falls short of expectations, potentially contributing to prolonged waiting times and overcrowding in public facilities [3–5]. This phenomenon reflects a critical disconnect: Although private providers are available, many patients still prefer public healthcare options due to concerns about the acceptability, quality, and accessibility of private services. This underutilization represents not only a waste of healthcare resources but also a significant policy challenge. How to improve the uptake of private healthcare services, thus balancing the healthcare burden between public and private providers, is a key issue facing policymakers.

Previous studies have indicated that policies promoting the private sector in healthcare tend to focus heavily on market entry, such as simplifying the licensing process or increasing investment opportunities, particularly in countries where the public sector dominates healthcare provision [6–8]. However, focusing solely on increasing the number of private providers without addressing patient concerns about quality and affordability may not be sufficient. For example, in East and Southern Africa, health policy agendas typically prioritize market entry through registration and licensing, rather than regulating postentry behaviors such as cream skimming. This allows private providers to select patients based on profitability rather than medical needs, leading to distortions in the quality and pricing of health services and undermining efforts to achieve equitable, efficient, and sustainable health systems [6]. Similarly, in Thailand, the policy emphasis on the public sector restricts the use of private hospitals mainly to affluent residents and foreigners [3]. Many countries have focused on identifying optimal interventions to engage the private sector and improve both the quality and coverage of its services [9]. However, empirical evidence on the effectiveness of these policy interventions remains limited, especially concerning how they affect patients' care-seeking behaviors.

China represents a valuable context for addressing this research gap due to the recent proliferation of initiatives aimed at developing private providers, alongside considerable policy variations among prefecture-level cities. This combination of strong central reform signals and local policy heterogeneity creates a meaningful empirical context for examining how proprivate policies influence patients' care-seeking behaviors. Historically, however, China's health system has been dominated by state-owned public providers, which continue to deliver the majority of healthcare services nationwide. The private sector long remained underdeveloped and institutionally peripheral. Unlike many OECD countries where hospital reforms have primarily emphasized cost containment and efficiency enhancement, China's public hospital reform has focused on reasserting the social welfare orientation of public providers [10]. This reform trajectory implies that private sector expansion in China does not unfold within a market-substitution framework. Rather, it takes place within a state-dominated service architecture in which public hospitals remain institutionally central. In such a health system, policies promoting private providers may not simply expand supply but may interact with financing arrangements and reimbursement rules, thereby shaping patient choice in complex ways. Since 2009, healthcare reforms have been implemented to strengthen the role of private providers, including simplifying administrative procedures for market entry, increasing service volumes through government procurement, and incorporating private providers into the social health insurance reimbursement network. However, empirical studies on the effects of these policies on patients' choices between private and public providers remain scarce.

This study examines the effects of private-sector promotion policies on patients' choices of private healthcare in China. Specifically, we focus on three key policy interventions designed to (1) facilitate market entry to expand service availability, (2) use government procurement to improve service quality, and (3) extend insurance designation coverage to increase the affordability of private healthcare. We created a Chinese health policy database covering health policy documents that were published by the prefectural government. Additionally, we adopted large language models (LLMs) to identify policy texts that recorded the details of the three policy interventions. Combining the policy data with individual-level data from the China Health and Retirement Longitudinal Study (CHARLS), we conducted high-dimensional fixed-effect analyses among adults aged 45 and above to explore the policy effects on patient choices of private providers for outpatient and inpatient services at the primary care facility (PCF) and hospital levels.

This paper makes three contributions. First, it offers an application of LLMs for classifying policy texts in the health policy research field. Second, it advances the understanding of how market entry and postentry policies distinctly affect patient choice of private healthcare. Third, it provides valuable policy implications for implementing strategies that maximize the effectiveness and sustainability of the private sector and stimulate competition among care providers. These insights may also inform other countries seeking to strengthen the role of the private sector alongside the public health system in achieving universal health coverage and addressing growing healthcare demands.

2 | Literature Review

2.1 | Factors Associated With Patient Choice of Private Healthcare

The private health sector refers to nonstate providers of healthcare services, including individual practitioners, clinics, and both for-profit and not-for-profit organizations. Patient choice between private and public providers varies substantially across countries and contexts, influenced by demand-side, supply-side, and policy factors. Given the institutional differences between China and other countries, we review the evidence separately.

On the demand side, the choice of private services shows a socioeconomic gradient. In many countries, including India, Italy, and the United Kingdom, patients with higher socioeconomic status—characterized by higher income, occupational status, education levels, and possession of health insurance—were more likely to select private healthcare [11, 12]. Private providers are perceived to provide better services over public options, such as shorter waiting times and increased patient choice, while access to private providers depends on individuals' financial capacity, which disproportionally favors patients with high socioeconomic status.

Conversely, a different pattern is observed in China, where the health system is dominated by social insurance and public

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provision, and resources such as government funding, medical equipment, and the number of physicians, are concentrated in public providers, particularly public hospitals (see Appendix Table A1 for an international comparison of healthcare system types and the role of private providers) [5, 13]. Accordingly, patients often prefer public providers to private ones. Given that patients in China are free to choose their healthcare providers, some studies found that lower socioeconomic groups, including those without insurance and lower levels of education, were more inclined to choose private-sector services due to their lower price compared to public options [4, 14]. In such markets dominated by public providers, private providers often adopt low pricing strategies to compete, appealing to price-sensitive individuals from lower socioeconomic groups. These different patterns across countries show that demand-side factors alone cannot fully account for the choice of private providers, underscoring the crucial role of supply-side determinants.

On the supply side, the characteristics and quality of healthcare services provided by private providers may influence patient choice. In low- and middle-income countries, such as India and Ghana, patients are more likely to seek care in the private sector where services and equipment were accessible, staff were well-trained, waiting times were short, service quality was high, and facilities were in close proximity to patients and offered extended hours [12, 15, 16]. Similarly, in China, patients prefer health providers that have available medications and diagnostic examinations, as well as higher medical professional expertise and more advanced equipment [17, 18]. However, these features are largely concentrated in public providers, particularly, public hospitals [13]. This suggests that private providers in China tend to have less capacity to compete with public counterparts in attracting patients.

2.2 | Health Policies and Patient Choice of Private Healthcare

In addition to the demand-side and supply-side factors, policy factors also influence the patient choice of private healthcare by shaping the market environment in which private providers operate. Well-designed health policies provide the private sector with the resources and capacity to expand services and improve quality. These policies may improve the availability, quality, affordability, and acceptability of private healthcare, encouraging patients to choose private services [19]. In India, private providers have expanded due to supportive policies like tax exemptions and subsidized land [20]. As a result, patients choose private providers to receive accessible and higher-quality healthcare [21].

Health policies can improve patient access to healthcare by affecting both demand-side and supply-side factors. Levesque et al. conceptualized healthcare access through five dimensions: approachability, acceptability, availability, appropriateness, and affordability [19]. The dimensions of approachability and acceptability focus on patient characteristics—approachability refers to patients' awareness of available services and their needs, while acceptability pertains to their perceptions of providers. In contrast, availability and appropriateness emphasize provider attributes, which are more directly influenced by provider promotion policies. Moreover, affordability is related to both patient characteristics and provider attributes. In this study, we examined the intersection between policy and provider attributes by concentrating on the dimensions of availability, appropriateness, and affordability, which serve as the foundation for categorizing private-sector promotion policies (see Figure 1 for the conceptual framework).

First, availability means the existence of healthcare resources. Patients' access to private healthcare is only possible when providers are available in the market. Unlike a typical commercial market, entry into the healthcare sector is often regulated because providers are required to obtain government licenses to operate. Market entry policies therefore directly shape the availability of private providers by determining whether, and how easily, these providers can establish services. When these policies are stringent, private providers are less likely to enter the market, which limits patient access to private healthcare. Government interventions like streamlined licensing processes increase the availability of private services, making them a viable option for more patients [6–8].

Second, appropriateness refers to the fit between services and patients' needs. This dimension closely relates to service quality because services delivered to an appropriate standard are more likely to meet patients' needs [19]. To ensure service quality, policymakers could promote the financial sustainability and enhance regulatory oversight of private providers through strategies such as government procurement. Through contractual agreements, the government can stipulate service packages, establish standards, and enforce performance evaluations, incentivizing private providers to meet these benchmarks and enhance service quality to secure financial compensation [5, 22, 23]. Improved service quality increases patients' preference for private-sector care.

Third, affordability reflects patients' economic capacity to access healthcare but also the pricing and service charges set by providers [19]. To provide affordable healthcare, many countries have introduced state-supported schemes, such as Medicare in the United States [24] and the Rajiv Aarogyasri Scheme in India [25]. Although the names and structures of these programs differ across countries, they generally influence patients' ability to pay through reimbursement mechanisms and affect providers' pricing and patient volume. In Beveridge health systems, such as the United Kingdom, where the National Health Service is tax-financed and most healthcare is free at the point of delivery, private healthcare is less attractive because patients need to pay out-of-pocket [26]. Under Bismarck systems, such as Germany, statutory health insurance provides universal coverage with low out-of-pocket costs for covered services. Reimbursement rates for these services are the same for public and private providers contracted with statutory insurance, allowing patients to choose providers freely [27]. Similarly, in China, existing studies suggest that one of the most important policy barriers to accessing affordable private healthcare is the exclusion of private providers from social health insurance reimbursement networks [4, 14]. China has two main social health insurance schemes: Urban Employee Basic Medical Insurance (UEBMI) and Urban and Rural Resident Basic Medical Insurance (URRBMI). UEBMI covers urban employees in formal sectors, while URRBMI covers urban residents not employed in formal sectors and rural residents [28]. Under these schemes, patients are reimbursed when seeking healthcare at designated providers but must pay the full

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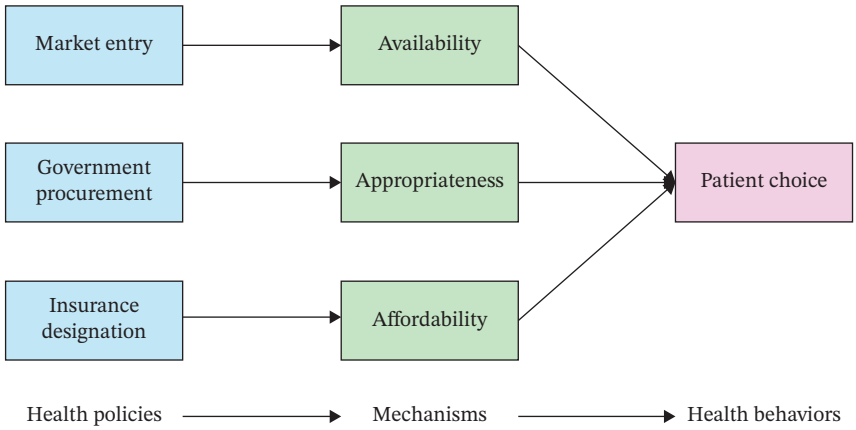


FIGURE 1 | Conceptual framework.

cost out-of-pocket at nondesignated providers, which are mostly private facilities. Including private providers in health insurance networks can reduce patients' out-of-pocket expenses, thereby encouraging them to choose private healthcare.

2.3 | The Private Health Sector in China

Healthcare in China has predominately been provided by public sector facilities, particularly public hospitals. In 2005, the private sector delivered less than 5% of the total healthcare services [4]. Even by 2011, private hospitals accounted for only 9.1% of all outpatient visits and 9.7% of all inpatient visits at the hospital level [5]. In response to increasing healthcare demand, long waiting time at public hospitals, and other challenges, the Chinese government launched a nationwide systemic healthcare reform in 2009 [29]. As part of this reform, the private sector is regarded as a vital supplement of the public sector, alleviating pressures on public facilities. Developing private providers is expected to expand healthcare supply, increase patient choice, foster competition among providers, enhance healthcare quality and efficiency, and meet patients' diverse needs.

Consequently, the government formulated an array of policies to encourage the growth of private providers. First, given the low proportion of private providers, policies have focused on facilitating market entry for new private actors and eliminating constraints on healthcare investment [7, 8]. To achieve these objectives, the government has streamlined administrative approval procedures, permitted private investment in all healthcare areas not explicitly restricted by law, and eliminated entry requirements pertaining to equipment, medical technique, and the scope and types of healthcare. These measures have expanded opportunities and mitigated administrative barriers for private actors to enter the healthcare market. Second, as a purchasing agent, the government has contracted with eligible private providers, especially those that meet the quality standards specified by the government. Services from clinics and family physicians are also procured through public funding to expand healthcare access in rural and remote areas [7]. By creating a stable source of demand and revenue through these contractual arrangements, government procurement policies provide financial incentives for private providers to deliver high-quality care. Third, to encourage patients to use private-sector services, the government has revised social health insurance reimbursement rules to include private providers in the network. Private providers can apply for insurance designation, enabling their services to be reimbursed at rates comparable to those of public facilities. This reform reduces financial barriers for patients seeking care from private providers, addressing a concern highlighted in prior research [4, 7, 14]. Our study focuses on private-sector promotion policies related to market entry, government procurement, and insurance designation, as these policy instruments have been emphasized by policymakers and highlighted in prior studies [4, 7, 8, 14]. Other policy measures aimed at promoting the private sector are presented in Appendix Table A2.

The responsibility for implementing these policies lies with local governments, particularly prefectural authorities. First, they approve the entry of private providers and oversee their operations. Second, guided by the goals and directives set by the central government, local governments have the flexibility to develop and implement policies based on local conditions. Accordingly, policies regarding the encouragement of private providers vary across the nation. For example, many local governments prohibit nonprofit hospitals from generating profit, while others, such as those in Zhejiang, allow them to receive dividends and returns on investment [30]. Since the implementation of these policies, the private sector has expanded.

While the number of private facilities has surged, their take-up rates have remained relatively low, failing to keep pace with facility growth. This has resulted in underuse of healthcare infrastructure and inefficiencies in resource allocation. Between 2009 and 2021, the number of private hospitals nearly tripled, reaching 26,746 and accounting for 73.14% of all hospitals; private PCFs increased by 72,997, constituting 87.50% of all PCFs [31]. Moreover, the number of private hospital beds increased approximately fourfold, from 0.7 million to 2.5 million, and private PCF beds grew nearly 20%, an increase of 14,446 [31]. Despite this expansion, the growth of private-sector healthcare provision has been relatively slow. From 2009 to 2021, the share of outpatient and inpatient visits to private hospitals increased only slightly, from 17.29% to 19.27%, while the share for private PCFs even declined, from 61.31% to 55.19% [31]. Overall, the private-sector's role in healthcare provision remains limited compared to the public sector. This disconnect between provider growth and service uptake raises an important question: can private-sector promotion policies effectively shift patient choice?

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In summary, previous studies mainly examine demand-side (e.g., education and income) and supply-side (e.g., waiting time and staff qualification) factors in explaining the patient choice of private providers. However, it remains unknown whether, and which types of, health policies influence patient choice. In China, despite the proliferation of policies promoting the private sector, few studies have investigated whether these policies have encouraged patients to use private healthcare, and which types of private healthcare, including primary care, hospital care, as well as outpatient and inpatient services, are affected. Understanding the role of health policy is important for explaining the underuse of private healthcare and for informing the design of efficient health systems.

3 | Method

3.1 | Data

3.1.1 | Macro Level Data

We employed a two-step process to analyze private healthcare promotion policies in China: first, constructing a health policy database; and second, identifying relevant policy statements. Using the "text-as-data" method [32, 33], we constructed a comprehensive Chinese health policy database by systematically collecting policy documents from multiple official sources. In the initial phase, we compiled the URLs of over 20,000 official websites, including those of the central government, 31 provincial governments, 333 prefectural governments, and key health-related departments such as the Health Commission, Healthcare Security Administration, Department of Human Resources and Social Security, Department of Finance, Department of Development and Reform, and Department of Civil Affairs. To streamline policy extraction, we used Python (Version 3.8) for automated retrieval of publicly available policy documents from government portals. Specifically, we employed the Scrapy framework [34] and Selenium library [35] for automated web crawling, and the Requests library for HTTP-based document retrieval. Each document was categorized using a named-entity recognition algorithm based on the *jieba* Chinese text segmentation library [36], which extracted the title, issuance date, and issuing department. Documents were identified as health policies based on the presence of specific keywords in their titles, such as health, healthcare, disease, hospitals, clinics, drugs, health insurance, and health centers. This approach enabled the compilation of over 500,000 health policy documents.

Using this systematic collection, we applied LLMs to identify policy statements promoting private-sector involvement. The use of LLMs has become increasingly prevalent, particularly with models like bidirectional encoder representations from transformers (BERT) and ChatGPT, for tasks such as text classification, sentiment analysis, and generative dialogue [37, 38]. Their generative capabilities enable them to predict subsequent words in an autoregressive manner, generating coherent and contextually appropriate text. For this study, we used the Mengzi-BERT–based model [39], implemented using the PyTorch deep learning framework [40] and the Hugging Face Transformers library [41], to identify relevant policy statements. Mengzi-BERT has proven effective and efficient for text classification in Chinese. Data processing and variable construction were performed using the Pandas [42] and NumPy [43] libraries.

We identified and classified private-sector promotion policy statements in three steps, treating the identification of policy statements as a text classification task. First, we created a subset of sample policy statements. Specifically, we randomly selected 500 documents from the policy database and manually annotated policy statements related to market entry, government procurement, and insurance designation inclusion. Additionally, we manually annotated a subset of data with subcategory labels for PCFs and hospitals within the three domains (see, e.g., Table 1). The annotation was guided by a predefined coding framework that mapped each policy domain to specific semantic patterns and indicator keywords (see Appendix Table A3 for detailed keyword lists and coding rules). Annotators were instructed to evaluate the semantic context of each sentence holistically, rather than relying solely on keyword matching, to ensure that only statements genuinely promoting private-sector involvement were coded as positive cases.

Second, we trained and tested a deep learning language model capable of automatically labeling relevant policy statements. We randomly selected 80% of the manually annotated data as the training set, while the remaining 20% served as the test set. During training, we developed three binary models to classify policy statements across the three domains and six submodels to identify the subcategory policy statements. In the testing phase, we validated model accuracy using the test dataset. The models achieved over 92% accuracy in identifying policy statements across the three domains, ensuring accurate identification of the most relevant statements. The training and testing results are reported in Appendix Table A4.

Third, we applied the trained model to label all policy statements in the health policy database. Sentences with a predicted probability greater than 70% were defined as indicating the promotion of private providers. For this study, we focused on private provider promotion policies published between 2009, the start of China's national healthcare reform, and 2022. This process yielded 15,660 relevant policy statements. The correlation between proportions of policy statements in the three domains is presented in Appendix Table A5.

3.1.2 | Micro Level Data

To investigate patients' choices of private healthcare, this study used individual-level data from CHARLS, a longitudinal panel study that began in 2011. Similar to the Health and Retirement Study in the United States, CHARLS is a nationally representative survey of middle-aged and older adults (aged 45 and older) in Mainland China. It collects a rich set of data on individual health status, healthcare, pensions, and employment. CHARLS is conducted every two to 3 years, using a mutistage probability proportionate to size sampling strategy. The 2011 baseline survey included 17,500 individuals from 108 prefectures in 28 provinces. This study used data from waves 1 through 4 (2011, 2013, 2015, and 2018), where the ownership of healthcare providers variable was available. We focused on patients who were aged 45 and over and had sought outpatient care in the past month or inpatient care in the past year prior to the survey, yielding a sample of 16,261 observations.

Notably, the policy data span 2009–2022 to capture trends in private-sector promotion policies, while the empirical analysis uses CHARLS Waves 1–4 (2011–2018), which contain the

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TABLE 1 | Example statements (annotated texts) of the three policy domains promoting the private sector.

	PCF	Hospital
Market entry	Encouraging the establishment of private clinics without additional local criteria	Restricting the number and size of public hospitals to leave sufficient quota for private hospitals
Government procurement	Increasing government procurement to support private clinics in providing healthcare	Encouraging the government to purchase services provided by private hospitals
Insurance designation	Including private clinics in social health insurance reimbursement network, thereby enabling patients' reimbursements	Equal criteria for including private hospitals in health insurance reimbursement network

healthcare provider ownership variable. The 2020 CHARLS wave is not used because it lacks ownership information. Thus, although there is a temporal mismatch, the policy data serve primarily for descriptive context, while the empirical analysis relies on survey waves with relevant ownership information.

A flowchart illustrating the complete data processing pipeline—from document collection and text preprocessing to LLM-based classification, variable construction, and data merging—is provided in Appendix Figure A1.

3.2 | Measurement

3.2.1 | Dependent Variables

The dependent variable was whether individuals who had medical visits in the past month or year chose private providers. In the CHARLS design, healthcare services were divided into two types: outpatient care (whether the respondent visited a health worker for outpatient care in the last month) and inpatient care (whether the respondent received inpatient care in the past year). For each service type, providers were further classified into PCFs and hospitals. PCFs contained clinics, township health centers, healthcare posts, and community health centers, while hospital providers comprised general hospitals, specialized hospitals, and Chinese medicine hospitals. In China, both PCFs and hospitals deliver outpatient and inpatient services. To capture patient choice, we constructed four variables: outpatient care at private PCFs, outpatient services at private hospitals, inpatient care at private PCFs, and inpatient services at private hospitals. For each variable, respondents indicated whether they chose private providers (0 = public, 1 = private).

3.2.2 | Independent Variables

A common approach to extracting structured variables from unstructured text involves counting the frequency of specific sentences or keywords. For instance, researchers have used the frequency of targeted keywords or news articles containing those keywords to approximate indicators such as economic policy uncertainty [44], geopolitical risk [45], and market sentiment [46, 47]. In a similar vein, measures of prospective healthcare payment methods—based on the frequency of policy sentences related to payment mechanisms—have been used to predict individual healthcare costs [48].

In this study, policy interventions aimed at promoting private providers—such as those related to market entry, government procurement, and insurance designation—were assessed by the proportion of policy statements promoting private providers at the PCF or hospital level, compared to the total frequency of policy statements promoting private providers. Proportion-based metrics help compare emphasis across policy types while controlling for variation in total policy volume. For example, the extent to which policies encouraging private PCFs to enter the market was calculated by dividing the yearly cumulative sentence frequency related to such policy by the total frequency of market entry policies for private providers. Similarly, the relative importance of facilitating private hospitals' market entry was measured by dividing the market entry frequency for private hospitals by the total market entry frequency for private providers. The same strategy was used to assess the relative strength of policies that encouraged private PCFs and hospitals in relation

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to government procurement and insurance coverage. Notably, the total frequency of private provider promotion policies often exceeded the combined sentence frequencies for PCFs and hospitals, as some policies did not specify facility levels.

To assess the validity of using sentence frequency as a proxy for private-sector promotion policies, we conducted a set of validation exercises drawing on temporal trends, diffusion patterns, and external correlates (Appendix Figures A2–A5). First, we examined the alignment of policy activity across levels of government. As shown in Figure A2, peaks in national-level policy statements coincide with major central government directives issued in 2013, 2015, 2017, and 2019. A similar, though slightly lagged, pattern appears at the provincial and prefectural levels, consistent with the expected process of policy diffusion from the central to local governments. Further evidence of this alignment is provided in Figure A3, which groups provinces by the year they first adopted private-sector promotion policies. Policy counts, measured as annual averages within each adoption-year cohort, reveal surges in activity during 2016 and 2017—closely following national policy signals identified in Figure A2. This consistency across levels of government reinforces the construct validity of our sentence-frequency measure by showing that it is responsive to coordinated policy initiatives.

Second, we validated our measures against external indicators of policy attention. As shown in Figures A4 and A5, prefecture-level sentence frequencies are positively correlated with the number of related academic publications and news articles, respectively. These associations suggest that our measure not only captures formal government activity but also resonates with broader scholarly and media attention. Taken together, these results support both the construct and criterion validity of our LLM-based policy coding approach, providing confidence in the robustness of sentence frequency as an indicator of policy activity.

Third, we assessed potential misclassifications in the LLM-based coding. While the models achieved over 92% accuracy in identifying private-sector promotion statements, some misclassifications occurred, primarily due to ambiguous language or sentences mentioning the private sector without indicating promotion. To examine the robustness of our results to these potential errors, we conducted sensitivity checks using higher predicted-probability thresholds for classification in the robustness analysis.

3.2.3 | Covariates

We adjusted for individual and prefecture-level factors that might influence patients' care-seeking behaviors. At the individual level, three sets of covariates were included. Demographic characteristics included gender (0 = female, 1 = male), age in years, and household size. Socioeconomic factors included educational level (0 = below middle school, 1 = others), Hukou status (0 = rural, 1 = nonrural), household income per capita, and the type of social health insurance (0 = Uninsured, 1 = URRBMI, 2 = UEBMI). Hukou is a household registration system that categorizes residents based on their birthplace and family origin, restricting migration and access to social services like education and pension. Health condition was assessed by self-rated health status (0 = poor, 1 = fair or good).

Prefecture-level factors encompassed population size, GDP per capita, per capita fiscal expenditure, and healthcare resources. Healthcare resources were assessed by the number of doctors and hospital beds per 1,000 residents. These data were sourced from the China City Statistical Yearbooks. All prefecture-level factors and household income per capita were log-transformed to correct for skewness. A detailed summary of the variable measurements is provided in Appendix Table A6.

3.3 | Analysis

Using policy statements identified from prefecture-level documents, we first described trends in the three policy domains that supported the development of private sectors at the PCF and hospital levels from 2009 to 2022. We also compared the cumulative frequency of these policies at the PCF and hospital levels, both within and across the three domains.

To investigate the effects of private-sector promotion policies on patient choice, we incorporated prefecture-level policy data with individual-level data from the CHARLS. We employed a high-dimensional fixed-effect model, controlling for prefecture and year fixed effects. This approach was chosen for its robustness in estimating models with multiple fixed effects, especially given the large number of prefectures ($N = 108$ in our analysis) and years [49, 50]. Notably, since China's policies to promote private healthcare providers were not implemented through pilot programs, and no local governments adopted pilot-based approaches to advance private-sector development, this study is unable to employ alternative econometric models (such as staggered difference-in-differences) to facilitate causal inference. Nevertheless, the use of LLM-based policy coding provides an important advantage: Our policy measure, validated through temporal alignment and external correlates, is sensitive to capture meaningful local policy initiatives. This strengthens our ability to identify associations between policy activity and patient choice, even in the absence of a quasi-experimental variation. The equation to be estimated is the following:

$$Y_{ijt} = \beta_0 + \beta_1 \text{Entry}_{jt} + \beta_2 \text{Procure}_{jt} + \beta_3 \text{Insurance}_{jt} + \beta_4 X_{ijt} + \beta_5 Z_{jt} + \beta_6 P_j + \beta_7 \text{Year}_t + \epsilon_{ijt}, \quad (1)$$

where the dependent variable Y_{ijt} represents the provider choice of individual i living in prefecture j in year t, specifically whether the individual chose private healthcare for outpatient or inpatient visits at the PCF and hospital levels. β_0 indicates the intercept term. Our explanatory variables are prefecture-level private provider promotion policies. Parameters β_1, β_2, and β_3 capture the effects of market entry, government procurement, and insurance designation policies promoting private-sector development. X_{ijt} denotes a vector of individual-level time-varying characteristics, while Z_{jt} is a vector of prefecture-level time-varying characteristics. P_j indexes prefecture fixed effect, capturing unobserved time-invariant characteristics at the

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prefecture level. $Year_t$ refers to the year fixed effect, which controls for time-specific effects common to all individuals and prefectures. ϵ_{ijt} is the error term. The analysis was conducted using the Stata module reghdfe [51].

4 | Results

4.1 | Descriptive Statistics

Table 2 summarizes the descriptive statistics for all variables. Fewer than half of the respondents received healthcare services from the private sector. Among the four types of patient choices, PCFs for outpatient services were the most common, with proportions ranging from 15.9% in 2011 to 48% in 2013. In contrast, the respondents were less likely to choose private hospitals for outpatient services (4.8%–8.5%) and inpatient services (4.7%–9.5%).

Figure 2 visualizes the trend in prefecture-level policies (absolute values) encouraging private providers in the three domains—market entry, government procurement, and insurance designation—across all 333 prefectures between 2009 and 2022. The most substantial increases and highest numbers of policies were observed in market entry promotion for hospitals and PCFs, suggesting that prefecture-level governments prioritized market entry over expanding service provision through government procurement and insurance designation.

Disparities in the cumulative sentence frequency across national, provincial, and prefectural levels are illustrated in Appendix Figures A6, A7, and A8. On average, the number of policy statements encouraging private providers at national level was higher than at the provincial and prefectural levels, with the provincial level surpassing the prefectural level. These discrepancies suggest that not all prefecture-level governments enacted every policy announced by the central government, indicating that local governments may exercise discretion in policy implementation. This finding is supported by observed geographic variations in prefecture-level policies promoting private providers (see Appendix Figure A9 to Figure A14).

4.2 | Regression Results

Table 3 presents the results from the fixed-effect models, with Column 1 focusing on outpatient care and Column 2 on inpatient care (full coefficients of covariates are reported in Appendix Tables A7 and A8). In the analysis of PCFs (Panel 1), Model A1 indicates a nonsignificant negative effect of policies promoting market entry for private PCFs on the choice of private providers for outpatient services (Coef. $= -0.028$, $p = 0.505$). The significance level remained unchanged after including additional policy variables in Models A2, A3, and A4. Policies promoting private providers through government procurement and insurance designation had significantly positive effects on patient choice of private PCFs for outpatient care, as shown in Models A2 and A3. These results remained statistically significant after accounting for all policy variables in Model A4. A one-unit increase in the share of government procurement and insurance designation policies promoting the development of PCFs was associated with a 6.7% point ($p = 0.034$) and 13.1% point ($p = 0.003$) increase in the probability of visiting PCFs for outpatient care, respectively. However, none of these three policy variables had significant effects on the choice of private PCFs for inpatient care. As shown in Panel 2, policies encouraging the involvement of private hospitals in all three domains had positive impacts on the choice of private hospitals for both outpatient and inpatient care. However, these effects were not statistically significant at the 0.05 level.

4.3 | Mediation Analysis

To examine the mechanisms through which private-sector promotion policies enhance patient choice of private providers, we conducted an additional mediation analysis. We hypothesize that the supply of private providers may mediate the relationship between these policies and patients' selection of private providers. One potential pathway of influence is the expansion in both the quantity and quality of healthcare services offered by the private sector. As private providers expand, patients may become more inclined to seek care from them. In the absence of service quality data, we used the number of private providers at the prefecture level as a proxy for the availability of private-sector healthcare services. To obtain this information, we used Python programming to extract the details on healthcare facilities from the websites of provincial, prefecture-level, and county-/district-level Health Commissions. The extracted data included facility names, types (PCFs or hospitals), ownership, location, and year of establishment. In total, we retrieved information for 118,698 facilities. Due to the lack of information on the establishment year for many healthcare facilities, we excluded those established after 2018 and matched the remaining data with individual-level information from Wave 4 of CHARLS (2018), yielding a cross-sectional dataset up to 2018. We used the proportion of private PCFs/hospitals—calculated as the number of private PCFs/hospitals divided by the total number of both public and private PCFs/hospitals—as a proxy to examine the mediating effects of private-sector supply. To address concerns about reverse causality between private-sector promotion policies and the growth of private providers, we used 1-year lagged policy variables as independent variables.

As shown in Table 4, our cross-sectional analysis (Panel 1: Model A1) yielded results consistent with our main findings, suggesting significant positive associations of both government procurement and insurance designation policies with the choice of private PCFs for outpatient care. Model A2 shows that government procurement (Coef. $= 0.070$, $p = 0.083$) and insurance designation (Coef. $= 0.118$, $p < 0.001$) policies were positively associated with the proportion of private PCFs. In Model A3, the proportion of private PCFs was positively associated with the choice of these facilities for outpatient care, albeit not statistically significant ($p = 0.409$) at the 0.10 level. We speculate that factors beyond the quantity of private PCFs, such as unmeasured aspects of service quality, may mediate the relationship between prefecture-level policies and the choice of private PCFs for outpatient care.

Similarly, we examined whether the supply of private healthcare providers mediated the relationship between policies and patient choices for inpatient care at private PCFs (Models B1–B3), outpatient care at private hospitals (Models C1–C3), and inpatient care at private hospitals (Models D1–D3). Across all models, the results provided no evidence that the supply of private providers acted as a mediating factor.

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TABLE 2 | Descriptive statistics.

	2011 Wave 1		2013 Wave 2		2015 Wave 3		2018 Wave 4	
	N	Mean (SD)	*N*	Mean (SD)	*N*	Mean (SD)	*N*	Mean (SD)
Outpatient care at private PCFs	825	0.159 (0.366)	2044	0.480 (0.500)	1923	0.460 (0.499)	1332	0.430 (0.495)
Outpatient care at private hospitals	984	0.049 (0.216)	1209	0.048 (0.214)	1315	0.075 (0.263)	1256	0.085 (0.279)
Inpatient care at private PCFs	294	0.129 (0.336)	347	0.110 (0.313)	301	0.103 (0.304)	363	0.052 (0.223)
Inpatient care at private hospitals	829	0.047 (0.212)	1165	0.069 (0.253)	1437	0.088 (0.284)	1791	0.095 (0.294)
Market entry for private PCFs	2803	0.084 (0.202)	4392	0.148 (0.202)	4648	0.155 (0.205)	4418	0.235 (0.173)
Market entry for private hospitals	2803	0.185 (0.292)	4392	0.204 (0.256)	4648	0.255 (0.235)	4418	0.313 (0.172)
Procurement from private PCFs	2803	0.207 (0.334)	4392	0.302 (0.353)	4648	0.299 (0.301)	4418	0.292 (0.200)
Procurement from private hospitals	2803	0.003 (0.053)	4392	0.011 (0.084)	4648	0.012 (0.056)	4418	0.016 (0.050)
Insurance designation for private PCFs	2803	0.072 (0.214)	4392	0.086 (0.189)	4648	0.094 (0.215)	4418	0.127 (0.206)
Insurance designation for private hospitals	2803	0.073 (0.223)	4392	0.064 (0.194)	4648	0.065 (0.172)	4418	0.061 (0.130)
Gender	2803	0.457 (0.498)	4392	0.439 (0.496)	4648	0.448 (0.497)	4418	0.448 (0.497)
Age	2803	60.809 (10.499)	4392	60.864 (9.971)	4648	60.690 (10.369)	4418	62.926 (10.208)
Household size	2803	3.534 (1.822)	4392	2.188 (0.988)	4648	4.383 (1.315)	4418	2.745 (1.430)
Education level	2803	0.340 (0.474)	4392	0.309 (0.462)	4648	0.412 (0.492)	4418	0.337 (0.473)
Hukou status	2803	0.271 (0.444)	4392	0.233 (0.423)	4648	0.262 (0.440)	4418	0.241 (0.428)
Household income per capita	2803	8.435 (13.447)	4392	11.142 (26.745)	4648	4.167 (18.003)	4418	16.520 (62.875)
Health insurance (uninsured)	2803	0.057 (0.232)	4392	0.038 (0.192)	4648	0.193 (0.395)	4418	0.027 (0.162)
Health insurance (URRBMI)	2803	0.770 (0.421)	4392	0.807 (0.395)	4648	0.666 (0.472)	4418	0.803 (0.398)
Health insurance (UEBMI)	2803	0.173 (0.378)	4392	0.155 (0.362)	4648	0.141 (0.348)	4418	0.170 (0.376)
Health status	2803	0.486 (0.500)	4392	0.408 (0.492)	4648	0.614 (0.487)	4418	0.567 (0.495)
Population size (million)	2803	6.265 (4.287)	4392	6.562 (4.767)	4648	6.561 (4.847)	4418	6.493 (4.528)
GDP per capital (million)	2803	0.037 (0.022)	4392	0.046 (0.042)	4648	0.048 (0.027)	4418	0.058 (0.033)
Fiscal expenditure per capita (¥1000)	2803	5.586 (4.967)	4392	7.197 (6.107)	4648	8.599 (6.347)	4418	10.636 (7.294)
Number of doctors (per 1000 residents)	2803	1.873 (0.965)	4392	2.015 (1.050)	4648	2.152 (1.072)	4418	2.532 (1.153)
Number of hospital beds (per 1000 residents)	2803	3.698 (1.455)	4392	4.241 (1.557)	4648	4.766 (1.636)	4418	4.662 (1.847)

Abbreviations: PCF = primary care facility, SD = standard deviation.

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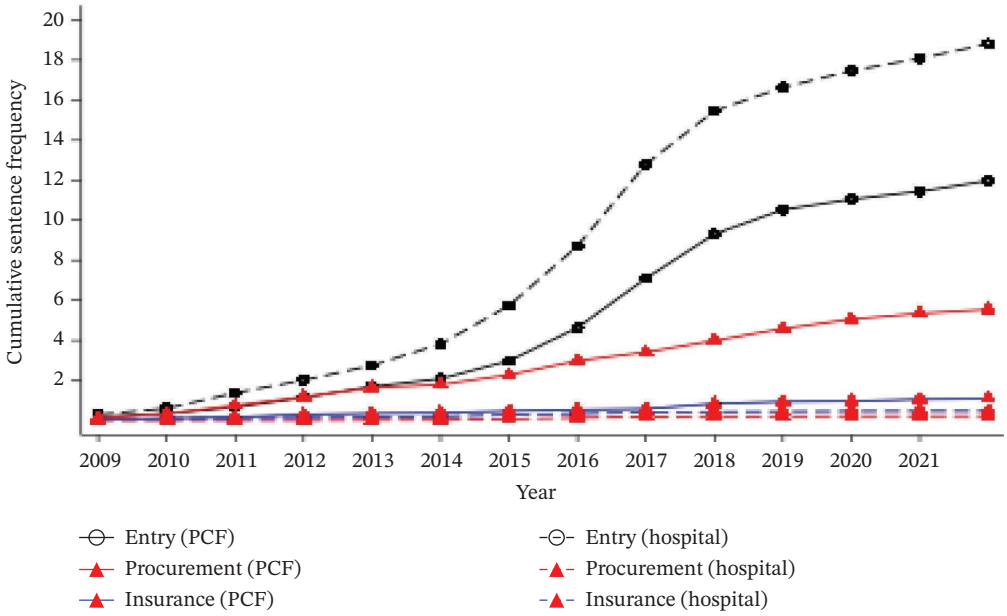


FIGURE 2 | Trends in private-sector promotion policies regarding market entry, government procurement, and insurance designation. Values for each year were calculated based on the average number of cumulative sentences across prefecture-level cities.

4.4 | Robustness Tests

We conducted two additional sets of analyses to test the robustness of our findings. First, given the unique characteristics (e.g., higher economic development and special administrative status) of the four municipalities directly under the central government (Beijing, Tianjin, Shanghai, and Chongqing), we performed an analysis using a restricted sample that excluded these municipalities. The results were consistent with our main findings (see Appendix Table A9). Second, we tested the robustness of the results by adjusting the probability thresholds for our independent variables. Specifically, we created alternative policy variables using texts with LLM-predicted probabilities higher than 80% and 90%. The results remained largely unchanged even with stricter thresholds, except for one case: When using the 90% probability threshold, government procurement policies had a nonsignificant effect on the choice of private PCFs for outpatient care ($p = 0.179$).

5 | Discussion

Using LLMs and high-dimensional fixed-effect analyses, this study examined the effects of private-sector promotion policies on patient choice of private healthcare. We find that fewer than 50% of patients chose private healthcare, with a relatively higher proportion seeking outpatient care at private PCFs compared to other types and levels of healthcare. The Chinese government prioritized policies encouraging market entry over those that focused on government procurement and insurance designation. Policies promoting the private sector through government procurement and insurance designation had a significantly positive impact on the patient choice of private PCFs for outpatient care. However, these policies did not significantly affect inpatient visits at private PCFs or outpatient and inpatient services at private hospitals.

Policies that promote market entry for the private sector had no significant effect on the choice of private healthcare, even when adjusting for other policy variables. This finding indicates that simply increasing the service availability of private healthcare does not necessarily promote patient access to these facilities. One plausible interpretation is that patient choices between private and public providers are determined by various demand-side and supply-side factors. Improved service availability alone cannot address barriers related to quality and affordability [19]. Without appropriate policy support and oversight, the affordability and quality of care provided by the private sector vary considerably, and service delivery may remain unregulated, especially when the private sector is still in its formative stages [6]. Despite the rapid growth of private healthcare providers, a lack of trust in these providers discourages patients from using private healthcare [4]. Therefore, a policy focused exclusively on market entry is inadequate for expanding the service capacity of the private sector. Additionally, our mediation analysis indicates that the supply of private PCFs does not mediate the relationship between market entry policies and the choice of these facilities for outpatient care. This implies that other mediating factors, such as service quality, affordability, and acceptability, may play a crucial role. These results, to some extent, underscore the importance of government procurement and insurance designation policies in improving the service quality and affordability of private healthcare, thereby incentivizing patients to choose private providers.

Although government procurement and insurance designation policies have been less emphasized compared to those facilitating market entry, we find that they can significantly enhance the choice of private PCFs for outpatient care. These findings align with existing literature that underscores the positive impact of insurance designation on patient preferences for private healthcare [4, 14]. Our study contributes to understanding policies that encourage government procurement from the

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TABLE 3 | Effects of private-sector promotion policies on the choice of healthcare providers.

	Outpatient care				Inpatient care			
Panel 1: PCFs	**A1**	**A2**	**A3**	**A4**	**B1**	**B2**	**B3**	**B4**
Market entry	−0.028 (0.042)	−0.040 (0.042)	−0.063 (0.043)	−0.066 (0.043)	−0.060 (0.051)	−0.060 (0.052)	−0.042 (0.053)	−0.045 (0.054)
Government procurement		0.091** (0.030)		0.067* (0.032)		0.005 (0.041)		0.014 (0.041)
Insurance designation			0.155*** (0.042)	0.131** (0.044)			−0.062 (0.056)	−0.066 (0.056)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6203	6124	6124	6124	1320	1303	1303	1303
Panel 2: hospitals	**C1**	**C2**	**C3**	**C4**	**D1**	**D2**	**D3**	**D4**
Market entry	0.008 (0.022)	0.009 (0.023)	0.007 (0.023)	0.007 (0.023)	0.033 (0.024)	0.032 (0.025)	0.031 (0.025)	0.031 (0.025)
Government procurement		0.076 (0.074)		0.024 (0.088)		0.037 (0.123)		−0.001 (0.141)
Insurance designation			0.030 (0.027)	0.027 (0.032)			0.018 (0.032)	0.018 (0.036)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4847	4764	4764	4764	5282	5222	5222	5222

Note: Coefficients outside parentheses; robust standard errors in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

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TABLE 4 | Tests of the proportion of private healthcare providers as a mediator.

Panel 1: PCFs	Model A1 Outpatient care at private PCFs	Model A2 % of private PCFs	Model A3 Outpatient care at private PCFs	Model B1 Inpatient care at private PCFs	Model B2 % of private PCFs	Model B3 Inpatient care at private PCFs
Market entry	0.060 (0.071)	−0.039 (0.032)	0.062 (0.071)	−0.138* (0.055)	0.044 (0.034)	−0.143* (0.055)
Government procurement	0.219*** (0.062)	0.070# (0.040)	0.216** (0.062)	−0.041 (0.518)	−0.018 (0.059)	−0.039 (0.051)
Insurance designation	0.232** (0.088)	0.118*** (0.025)	0.226* (0.089)	0.020 (0.074)	0.204*** (0.053)	−0.001 (0.075)
% of private PCFs			0.051 (0.062)			0.103* (0.047)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
N	1332	1332	1332	367	367	367
Panel 2: Hospital	**Model C1 Outpatient care at private hospitals**	**Model C2 % of private hospitals**	**Model C3 Outpatient care at private hospitals**	**Model D1 Inpatient care at private hospitals**	**Model D2 % of private hospitals**	**Model D3 Inpatient care at private hospitals**
Market entry	0.018 (0.054)	−0.061* (0.031)	0.017 (0.054)	0.083# (0.045)	−0.099*** (0.025)	0.087# (0.044)
Government procurement	0.231 (0.259)	0.225* (0.107)	0.236 (0.260)	0.163 (0.192)	0.090 (0.084)	0.159 (0.190)
Insurance designation	0.084 (0.084)	−0.115* (0.049)	0.081 (0.085)	−0.067 (0.051)	0.105** (0.035)	−0.071 (0.050)
% of private PCFs			−0.025 (0.045)			0.039 (0.039)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
N	1256	1256	1256	1791	1791	1791

Note: Policy variables (market entry, government procurement, and insurance designation) were measured using 1-year lagged values, specifically the proportion of cumulative private-sector promotion policy statements up to 2017. All models employ multiple linear regression analysis. Robust standard errors in parentheses.

# $p < 0.1$.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

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private sector, demonstrating their beneficial effects on patient choice—an important area not previously explored empirically.

Notably, our findings suggest that policy impacts are concentrated in outpatient care at private PCFs, largely driven by government procurement and insurance designation policies. This pattern reflects the distinct role of PCFs and hospitals, as well as the unbalanced development of private providers in China. PCFs deliver labor-intensive services for minor health issues, requiring less advanced technology and specialization, which allows private facilities to provide care of comparable quality to public counterparts and, in some cases, more person-centered services such as home visits for older adults [22, 52, 53]. These characteristics make patients more willing to choose private PCFs for outpatient care. By contrast, hospitals manage complex and severe cases requiring advanced expertise and resources. Public hospitals, with strong state support, attract the bulk of high-quality staff and equipment, reinforcing their dominance and limiting private hospitals' ability to compete effectively [54, 55]. Consequently, policies encouraging private-sector development have limited influence on the patient choice of hospital care.

This study has several limitations. First, given the broad scope of health policies, we focused on those prioritized by the government and highlighted in prior research, which means some policies (e.g., tax exemptions) may not have been fully captured. Therefore, the interpretation of our findings requires caution regarding the potential effects of these excluded policies. Future studies could explore other relevant policies and assess their effects on patients' choice of private healthcare. Second, while we used the frequency of policy statements to measure private-sector promotion policies, this approach treats all identified statements equally and may overlook the variation in policy strength. For example, statements employing mandatory language (e.g., "shall," "must") may signal a stronger governmental commitment than those using hortatory language (e.g., "encourage," "support"). Future research could address this limitation through several approaches. One approach is to apply sentiment analysis or stance detection models to classify policy statements along a continuum of commitment intensity, ranging from advisory to mandatory. Another approach is to introduce keyword intensity weighting, assigning differential weights based on the strength of policy verbs to construct more nuanced composite measures. In addition, as LLMs continue to advance, prompt-based methods using models such as ChatGPT and Gemini could be employed to score policy strength at scale, providing a scalable alternative to manual coding. Third, our policy coding relies on publicly available documents, potentially underestimating policy strength where disclosure is incomplete. While policy data were available through 2022, our outcomes were observed only through 2018 because the 2020 CHARLS lacks information on the ownership of healthcare providers. Our estimates may not capture effects after 2018. Fourth, limited data on provider characteristics, such as infrastructure and service quality, restricted our ability to perform a more robust mediation analysis and fully examine the mechanisms linking private-sector promotion policies with patients' care-seeking behaviors. Fifth, the findings may not be generalizable to the broader population, as CHARLS mainly surveys adults aged 45 and over. Lastly, although high-dimensional fixed-effects models address time-invariant confounding, unobserved time-varying factors may still bias the estimated effects.

Our findings yield several policy implications. First, government procurement and insurance designation policies effectively promote access to private PCFs, suggesting that scaling up such initiatives could expand patient choice, enhance competition, and strengthen the primary care–based delivery system. Second, the limited impact of policies on private hospitals highlights the need for additional strategies to build their service capacity and credibility. Finally, the differing effects across PCFs and hospitals indicate that a "one-size-fits-all" approach is insufficient. Policymakers should tailor interventions to the characteristics of different care levels and local contexts, balancing the roles of public and private providers.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are openly available in China Health and Retirement Longitudinal Study (CHARLS) at https://charls.pku.edu.cn/en/.

References

1. L. Coveney, D. Musoke, and G. Russo, "Do Private Health Providers Help Achieve Universal Health Coverage? A Scoping Review of the Evidence From Low-Income Countries," *Health Policy and Planning* 38, no. 9 (2023): 1050–1063, https://doi.org/10.1093/heapol/czad075.

2. D. Montagu and N. Chakraborty, "Standard Survey Data: Insights Into Private Sector Utilization," *Frontiers of Medicine* 8 (2021): 624285, https://doi.org/10.3389/fmed.2021.624285.

3. J. Harris and J. Libardi Maia, "Universal Healthcare Does Not Look the Same Everywhere: Divergent Experiences With the Private Sector in Brazil and Thailand," *Global Public Health* 17, no. 9 (2022): 1809–1826, https://doi.org/10.1080/17441692.2021.1981973.

4. Q. Wang, D. Zhang, and Z. Hou, "Insurance Coverage and Socioeconomic Differences in Patient Choice Between Private and Public Health Care Providers in China," *Social Science & Medicine* 170 (2016): 124–132, https://doi.org/10.1016/j.socscimed.2016.10.016.

5. X. Zhang, A. Zimmerman, Y. Zhang, O. Ogbuoji, and S. Tang, "Rapid Growth of Private Hospitals in China: Emerging Challenges and Opportunities to Health Sector Management," *Lancet Regional Health. Western Pacific* 44 (2024): 100991, https://doi.org/10.1016/j.lanwpc.2023.100991.

6. J. E. Doherty, "Regulating the For-Profit Private Health Sector: Lessons From East and Southern Africa," *Health Policy and Planning* 30, no. suppl 1 (2015): i93–i102, https://doi.org/10.1093/heapol/czu111.

7. W. Qian, W. Huang, and Y. Xie, "Analysis on the Contents, Features and Trends of Private Health Institutions in Deepening Health-Care System," *Chinese Journal of Health Policy* 11, no. 8 (2018): 56–62.

8. L. Xue, S. Wu, S. Wang, J. Chen, and X. Dai, "Analysis of Policies About the Non-Governmental Hospital in China Based on Text Mining Method," *Health Development and Policy Research* 23, no. 3 (2020): 258–264.

9. D. Montagu and C. Goodman, "Prohibit, Constrain, Encourage, or Purchase: How Should We Engage With the Private Health-Care Sector?" *The Lancet* 388, no. 10044 (2016): 613–621, https://doi.org/10.1016/s0140-6736(16)30242-2.

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10. S. L. Barber, M. Borowitz, H. Bekedam, and J. Ma, "The Hospital of the Future in China: China's Reform of Public Hospitals and Trends From Industrialized Countries," *Health Policy and Planning* 29, no. 3 (2014): 367–378, https://doi.org/10.1093/heapol/czt023.

11. L. Lostao, D. Blane, D. Gimeno, G. Netuveli, and E. Regidor, "Socioeconomic Patterns in Use of Private and Public Health Services in Spain and Britain: Implications for Equity in Health Care," *Health & Place* 25 (2014): 19–25, https://doi.org/10.1016/j.healthplace.2013.09.011.

12. K. D. Rao, A. Mehta, C. Noonan, M. A. Peters, and H. Perry, "Voting With Their Feet: Primary Care Provider Choice and Its Implications for Public Sector Primary Care Services in India," *Social Science & Medicine* 340 (2024): 116414, https://doi.org/10.1016/j.socscimed.2023.116414.

13. K. Eggleston, M. Lu, C. Li, et al., "Comparing Public and Private Hospitals in China: Evidence From Guangdong," *BMC Health Services Research* 10, no. 1 (2010): 76, https://doi.org/10.1186/1472-6963-10-76.

14. Y. Liu, P. Berman, W. Yip, et al., "Health Care in China: The Role of Non-Government Providers," *Health Policy* 77, no. 2 (2006): 212–220, https://doi.org/10.1016/j.healthpol.2005.07.002.

15. W. Agyemang-Duah, C. Peprah, and P. Peprah, "Factors Influencing the Use of Public and Private Health Care Facilities Among Poor Older People in Rural Ghana," *Journal of Public Health* 28, no. 1 (2020): 53–63, https://doi.org/10.1007/s10389-018-01010-y.

16. C. Brindley, N. Wijemunige, C. Dieteren, J. Bom, B. Meessen, and I. Bonfrer, "Health Seeking Behaviours and Private Sector Delivery of Care for Non-Communicable Diseases in Low- and Middle-Income Countries: A Systematic Review," *BMC Health Services Research* 24, no. 1 (2024): 127, https://doi.org/10.1186/s12913-023-10464-0.

17. Y. Liu, Q. Kong, and E. W. de Bekker-Grob, "Public Preferences for Health Care Facilities in Rural China: A Discrete Choice Experiment," *Social Science & Medicine* 237 (2019): 112396, https://doi.org/10.1016/j.socscimed.2019.112396.

18. S. Jiang, Y. Gu, F. Yang, et al., "Tertiary Hospitals or Community Clinics? An Enquiry Into the Factors Affecting Patients' Choice for Healthcare Facilities in Urban China," *China Economic Review* 63 (2020): 101538, https://doi.org/10.1016/j.chieco.2020.101538.

19. J.-F. Levesque, M. F. Harris, and G. Russell, "Patient-Centred Access to Health Care: Conceptualising Access at the Interface of Health Systems and Populations," *International Journal for Equity in Health* 12, no. 1 (2013): 18, https://doi.org/10.1186/1475-9276-12-18.

20. S. Hooda, "Private Sector in Healthcare Delivery Market in India: Structure, Growth and Implications," *ISID Working Paper* 185 (2015).

21. S. K. Rout, K. S. Sahu, and S. Mahapatra, "Utilization of Health Care Services in Public and Private Healthcare in India: Causes and Determinants," *International Journal of Healthcare Management* 14, no. 2 (2021): 509–516, https://doi.org/10.1080/20479700.2019.1665882.

22. Y. Wang, K. Eggleston, Z. Yu, and Q. Zhang, "Contracting With Private Providers for Primary Care Services: Evidence From Urban China," *Health Economics Review* 3, no. 1 (2013): 1, https://doi.org/10.1186/2191-1991-3-1.

23. N. Krachler, I. Greer, and C. Umney, "Can Public Healthcare Afford Marketization? Market Principles, Mechanisms, and Effects in Five Health Systems," *Public Administration Review* 82, no. 5 (2022): 876–886, https://doi.org/10.1111/puar.13388.

24. P. D. Jacobs, "The Impact of Medicare on Access to and Affordability of Health Care," *Health Affairs* 40, no. 2 (2021): 266–273, https://doi.org/10.1377/hlthaff.2020.00940.

25. A. Katyal, P. V. Singh, S. Bergkvist, A. Samarth, and M. Rao, "Private Sector Participation in Delivering Tertiary Health Care: A Dichotomy of Access and Affordability Across Two Indian States," *Health Policy and Planning* 30, no. suppl_1 (2015): i23–i31, https://doi.org/10.1093/heapol/czu061.

26. C. Exley, N. Rousseau, C. Donaldson, and J. G. Steele, "Beyond Price: Individuals' Accounts of Deciding to Pay for Private Healthcare Treatment in the UK," *BMC Health Services Research* 12, no. 1 (2012): 53, https://doi.org/10.1186/1472-6963-12-53.

27. R. Busse, M. Blümel, F. Knieps, and T. Bärnighausen, "Statutory Health Insurance in Germany: A Health System Shaped by 135 Years of Solidarity, Self-Governance, and Competition," *The Lancet* 390, no. 10097 (2017): 882–897, https://doi.org/10.1016/s0140-6736(17)31280-1.

28. Y. Tang, R. Fu, and H. Noguchi, "Impact of Medical Insurance Integration on Reducing Urban-Rural Health Disparity: Evidence From China," *Social Science & Medicine* 357 (2024): 117163, https://doi.org/10.1016/j.socscimed.2024.117163.

29. J. Sun, Q. Lin, P. Zhao, et al., "Reducing Waiting Time and Raising Outpatient Satisfaction in a Chinese Public Tertiary General Hospital-An Interrupted Time Series Study," *BMC Public Health* 17, no. 1 (2017): 668, https://doi.org/10.1186/s12889-017-4667-z.

30. X. Wei and Q. Meng, "Study on Policies of Non-Public Hospitals Based on Content Analysis Method," *Chinese Hospital Management* 37 (2017): 20–23.

31. National Health Commission, *China Health Statistical Yearbook* (Beijing: Peking Union Medical College Press, 2022).

32. M. Altaweel, C. Bone, and J. Abrams, "Documents as Data: A Content Analysis and Topic Modeling Approach for Analyzing Responses to Ecological Disturbances," *Ecological Informatics* 51 (2019): 82–95, https://doi.org/10.1016/j.ecoinf.2019.02.014.

33. K. Liu, T. Wang, C. Bai, and L. Liu, "Strengthening Local Governance in Health Financing in China: A Text-Mining Analysis of Policy Changes Between 2009 and 2020," *Health Policy and Planning* 37, no. 6 (2022): 677–689, https://doi.org/10.1093/heapol/czab153.

34. D. Myers and J. W. McGuffee, "Choosing Scrapy," *Journal of Computing Sciences in Colleges* 31, no. 1 (2015): 83–89.

35. Selenium, "Selenium," https://www.selenium.dev/.

36. "Jieba Chinese Text Segmentation," (2012), https://github.com/fxsjy/jieba.

37. T. B. Brown, B. Mann, N. Ryder, et al., "Language Models Are Few-Shot Learners," in *Proceedings of the 34th International Conference on Neural Information Processing Systems* (Red Hook, NY: Curran Associates Inc, 2020).

38. H. Naveed, A. U. Khan, S. Qiu, et al., "A Comprehensive Overview of Large Language Models," *ACM Transactions on Intelligent Systems and Technology* 16, no. 5 (2025): 1–72, https://doi.org/10.1145/3744746.

39. Z. Zhang, H. Zhang, K. Chen, et al., *Mengzi: Towards Lightweight Yet Ingenious Pre-Trained Models for Chinese* (2021).

40. A. Paszke, S. Gross, F. Massa, et al., "Pytorch: An Imperative Style, High-Performance Deep Learning Library," in *Proceedings of the 33rd International Conference on Neural Information Processing Systems* (Red Hook, NY: Curran Associates Inc, 2019).

41. T. Wolf, L. Debut, V. Sanh, et al., "Transformers: State-Of-The-Art Natural Language Processing," in *Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing: System Demonstrations*, ed. Q. Liu and D. Schlangen (Online: Association for Computational Linguistics, 2020), 38–45.

42. W. McKinney, "Data Structures for Statistical Computing in Python," *SciPy 2010* (2010).

43. C. R. Harris, K. J. Millman, S. J. van der Walt, et al., "Array Programming With NumPy," *Nature* 585, no. 7825 (2020): 357–362, https://doi.org/10.1038/s41586-020-2649-2.

44. S. R. Baker, N. Bloom, and S. J. Davis, "Measuring Economic Policy Uncertainty," *Quarterly Journal of Economics* 131, no. 4 (2016): 1593–-1636, https://doi.org/10.1093/qje/qjw024.

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45. D. Caldara and M. Iacoviello, "Measuring Geopolitical Risk," *The American Economic Review* 112, no. 4 (2022): 1194–1225, https://doi.org/10.17016/ifdp.2018.1222r1.

46. A. H. Shapiro, M. Sudhof, and D. J. Wilson, "Measuring News Sentiment," *Journal of Econometrics* 228, no. 2 (2022): 221–243, https://doi.org/10.1016/j.jeconom.2020.07.053.

47. P. C. Tetlock, "Giving Content to Investor Sentiment: The Role of Media in the Stock Market," *The Journal of Finance* 62, no. 3 (2007): 1139–1168, https://doi.org/10.1111/j.1540-6261.2007.01232.x.

48. K. Liu, L. Shang, Q. Zhu, and S. Zhao, "Mixed Payment Methods and Health Cost Control in China: A Machine Learning Analysis of Policy Big Data," *International Journal of Social Welfare* 34, no. 2 (2025): e70002, https://doi.org/10.1111/ijsw.70002.

49. K. R. Brekke, T. H. Holmås, K. Monstad, and O. R. Straume, "Competition and Physician Behaviour: Does the Competitive Environment Affect the Propensity to Issue Sickness Certificates?" *Journal of Health Economics* 66 (2019): 117–135, https://doi.org/10.1016/j.jhealeco.2019.05.007.

50. M. T. Suleman and M. Yaghoubi, "Infectious Disease and Corporate Activities," *Economics Letters* 212 (2022): 110302, https://doi.org/10.1016/j.econlet.2022.110302.

51. S. Correia, *REGHDFE: Stata Module to Perform Linear or Instrumental-Variable Regression Absorbing Any Number of High-Dimensional Fixed Effects* (Statistical Software Components, 2014).

52. Y. Si, H. Bateman, S. Chen, et al., "Quantifying the Financial Impact of Overuse in Primary Care in China: A Standardised Patient Study," *Social Science & Medicine* 320 (2023): 115670, https://doi.org/10.1016/j.socscimed.2023.115670.

53. X. Yin, Y. Gong, C. Yang, et al., "A Comparison of Quality of Community Health Services Between Public and Private Community Health Centers in Urban China," *Medical Care* 53, no. 10 (2015): 888–893, https://doi.org/10.1097/mlr.0000000000000414.

54. S. Chi and Y. Zhang, "Marketization of Healthcare Services and Trust of Patients: An Analysis Based on the Private Hospitals' Development Stage Among Different Provinces," *Sociology Study* 39, no. 39 (2024): 181–203.

55. Q. Jiang and J. Pan, "The Evolving Hospital Market in China After the 2009 Healthcare Reform," *Inquiry: The Journal of Health Care Organization, Provision, and Financing* 57 (2020): 0046958020968783, https://doi.org/10.1177/0046958020968783.

Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Supporting Information.** Table A1. Healthcare system types and private providers. Table A2. Other policy measures aimed at promoting the private sector. Table A3. Domain-specific keyword–guided human annotation approach. Table A4. LLM training and testing results. Table A5. Pairwise correlation between proportions of policy statements in the domains of market entry, government procurement, and insurance designation. Table A6. Summary of variable measurements. Table A7. Effects of policies promoting private PCFs on the choice of providers. Table A8. Effects of policies that promoted private hospitals on the choice of providers. Table A9. Robustness tests. Figure A1. Data processing pipeline. Figure A2. The average number of private-sector promotion policies at the national, provincial, and prefectural levels. Figure A3. The average number of prefecture-level private-sector promotion policies by province groups, defined by the year of first provincial policy adoption. Figure A4. Association between prefecture-level private-sector promotion policies and academic publications (2009–2022). Figure A5. Association between prefecture-level private-sector promotion policies and news articles (2009–2022). Figure A6. Trends in policies encouraging private providers through market entry at the national, provincial, and prefectural levels. Figure A7. Trends in policies encouraging private providers through government procurement at the national, provincial, and prefectural levels. Figure A8. Trends in policies encouraging private providers through insurance designation at the national, provincial, and prefectural levels. Figure A9. Geographic variations in market entry policies for private PCFs at the prefecture level (cumulative sentence frequency in 2018). Figure A10. Geographic variations in market entry policies for private hospitals at the prefecture level (cumulative sentence frequency in 2018). Figure A11. Geographic variations in government procurement policies for private PCFs at the prefecture level (cumulative sentence frequency in 2018). Figure A12. Geographic variations in government procurement policies for private hospitals at the prefecture level (cumulative sentence frequency in 2018). Figure A13. Geographic variations in insurance designation policies for private PCFs at the prefecture level (cumulative sentence frequency in 2018). Figure A14. Geographic variations in insurance designation policies for private hospitals at the prefecture level (cumulative sentence frequency in 2018).

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