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China's Internet Health Market

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Table of Contents

Preface to the Working Paper Series.....	i
1 Introduction	1
2 Current Landscape	2
2.1 Third-Party Private Platforms	2
2.2 Public Internet Hospitals	6
3 Impacts on Health System Performance	9
3.1 Impacts on Access	10
3.2 Impacts on Efficiency.....	10
3.3 Impacts on Quality of Care	11
4 Discussion and Conclusion	11
5 References	13

Preface to the Working Paper Series

The India Health Systems Project is motivated by the goal of advancing health system reforms in India to provide equitable access to good quality of care and financial risk protection for its citizens. The Project adopts a system approach to assess the strengths and weaknesses of India's current health care system, identify underlying causes, propose potential solutions drawing on best practices within India and international experience, and, finally, to monitor and evaluate progress and impacts of reforms.

The Working Paper Series presents products from the project. They include research papers, country cases, and analytical tools for conducting health system and reform analysis. The intended audiences are researchers, health policy analysts and practitioners of health systems reform in India—at the national- and state-level—and worldwide. The Working Papers are available at <https://www.hsph.harvard.edu/india-health-systems/>.

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1 Introduction

China serves as a model for developing an online healthcare industry. From 2013 to 2019, the total value of China's internet healthcare market grew from 4.5 billion CNY (US\$675 million; ¥1 = US\$0.15) to 37.9 billion CNY (US\$5.7 billion). In November 2020, there are 54.8 million active users of internet health care, up from 46.9 million in November 2019 before the COVID-19 pandemic (Fastdata, 2021). The COVID-19 pandemic has further increased the popularity of these online services and has boosted their popularity in China (Mou, 2020).

Among the earliest initiatives of internet health delivery in China was the establishment of the Guangdong Internet hospital in 2014, with the strong support by the Guangdong government (Tu et al., 2015). In 2015, the Wuzhen Internet Hospital in Tongxiang City, Zhejiang province was launched, which was a collaboration between the Tongxiang Municipal Government and internet technology company WeDoctor Group. After 2018, the establishment of internet hospitals accelerated and there were more than 1,700 internet hospitals at the end of 2022.

These internet hospitals provided a series of online healthcare services, such as teleconsultation, remote chronic disease management, and online pharmaceutical sales. These online services have been well-received across China since the healthcare market developed these new offerings. Especially during the pandemic, patients have benefited from online diagnosis, door-to-door delivery, online payment, and other services that meet their needs. People are more aware of online diagnosis and treatment, and it is becoming increasingly habitual. According to the China Internet Network Development Statistics Survey, by June 2022, the scale of internet health users reached 300 million people. This is the first time since the data was published that it has exceeded 300 million.

Chinese authorities take a supportive position because internet health care provides the convenience of a virtual appointment with doctors without having to visit overcrowded public tertiary hospitals (Milcent, 2018). Online healthcare services also hold the potential to reduce geographical disparities in healthcare access in China (State Council, 2018). In 2018, the General Office of the State Council released a document titled "Internet + Medicine and Health" detailing an overarching framework to integrate internet and information technologies into health care, and to develop the internet healthcare ecosystem. Internet health was an integral component of the country's 'Healthy China 2030' blueprint to fulfilling the country's long-term economic and social development goals. In addition, huge investments by internet companies were another important factor for the rapid developments of the internet healthcare market in China over the past decade.

China's experience can offer interesting insights on potential directions for virtual health care in India. In this article, we describe the current landscape, performance, challenges, and prospects of internet health in China. We conclude by discussing the potential impacts of internet health on China's health system and providing policy implications for other developing countries.

2 Current Landscape

According to the China National Health Commission, as of June 2022, there have been more than 1,700 internet hospitals in China. Public hospitals account for more than 70% of these internet hospitals and the rest are third-party private platforms run by private internet companies. However, the volume of online services provided by third-party private platforms are much larger than public hospitals. On average, a public internet hospital serves only 55 patients per day, in contrast with more than 20,000 patients per day in a third-party private platform (National Telemedicine and Connected Health Center, 2021). Next, we will describe third-party private platforms and public internet hospitals separately.

2.1 Third-Party Private Platforms

Third-party online healthcare platforms are the major providers for online services in China, though a growing number of public hospitals have started providing services online since the outbreak of COVID-19 (Han *et al.*, 2020). Table 1 shows a list of featured online healthcare platforms in China. These platforms are set up and run by private internet companies, delivering a wide range of direct-to-consumer healthcare services, including online medical consultations, scheduling of hospital appointments, drug prescriptions, and chronic disease management.

Table 1: Leading online healthcare platforms in China

Platforms	Main services	Year of Establishment	Year of launching online healthcare consultation
Haodf.com	Online consultations, appointment, and disease management	2006	2016
WeDoctor	Online consultations, medicine sales, and medical insurance	2010	2015
Chunyu Doctor	Online consultations and medicine sales	2011	2016
Ping'an Doctor	Medicine sales, online consultations, and health management	2014	2015
JD Health	Medicine sales, online consultation, and health management	2019 (Independent from JD.com inc.)	2017 (As a branch of JD.com inc.)
AliHealth	Medicine sales, online consultations	2004 (Acquired by Alibaba in 2014)	2015
Dxy.cn	Online consultation, appointment, medicine sales and health education	2000	2014
Medlinker	Chronic diseases management	2014	2017
Xiaolu TCM	Traditional Chinese Medicine sales and consultation	2015	2015

Sources: prepared by authors according to official websites of these online healthcare platforms.

Since 2010, China's investments in the sector of internet health have showed a sustained high growth trend. Tens of billions of capital investment has spawned a number of private internet health platforms. Many internet giants have actively deployed the medical industry, invested in many internet unicorn enterprises, and built self-operated internet health platforms relying on their own advantages. Enterprises represented by Alibaba, JD, etc., based on their own businesses such as medicine e-commerce, private insurance, and further explore the path of internet health platforms. Tencent and ByteDance enter the market focusing on medical and health content services. Baidu relies on the search engine and creates businesses such as Baidu Health Medical Dictionary.

These platforms have priorities and differences in the types of services they offer and the consumer groups they target. For example, Chunyu Doctor mainly provides direct-to-consumer telehealth consultations for patients with mild symptoms, whereas Haodf.com focuses more on virtual follow-up visits after diagnoses and treatments at public hospitals. Therefore, the share of complicated cases on Haodf.com is much higher than that on Chunyu Doctor. WeDoctor's orientation is similar to Haodf.com, and it also cooperates with some local governments and private insurance companies on disease management. Ping'an Good Doctor is a listed company and it mainly serves the enrollees of Ping'an Insurance Company. Now it focuses mostly on three medical specialties: dermatology, traditional Chinese medicine, and obstetrics/gynecology (OB/GYN). AliHealth and JD Health predominantly focus on the sale of medicines, relying on a strong supply chain, and have further extended their business to online health services in the past few years.

Although their focuses are different, most technology platforms serve as a third party to the patient-provider interaction as intermediaries, bringing together patients and physicians and facilitating transactions. These platforms usually embrace the "anything, anytime, anywhere" approach that aims to provide patients convenient services. Patients usually access health services through mobile devices via proprietary applications (apps) or internet portals. When accessing the app or portal for the first time, patients first create a user account which gives access to a user profile (leftmost panel in Figure 1) showing a host of information including past and upcoming appointments, prescriptions, and medications records. Patients can search for doctors through a search function by specifying diseases or conditions, doctors' names, location, and hospitals. Searching can also be done via a menu of options (2nd panel). The search identifies doctors that fit the search criteria after which patients can browse the profiles of doctors and obtain information including medical training, specialty, hospital affiliations, experience, number of patients served, and research outputs (3rd panel). Popularity ratings and user feedback are presented such as user satisfaction (across domains such as doctors' efficiency and attitude), receipt of virtual gifts from patients, as well as detailed user comments. These measures serve the role as indicators of doctor quality, assisting patients in making a choice of treatment doctors. Prior to making a decision, patients are presented options on the types of services available and a menu of prices (4th panel). The types of services offered vary across platforms, and include medical consultations via text or image messaging, phone, or video. (Cheng et al., 2022).

Figure 1: User Interface for Haodf.com

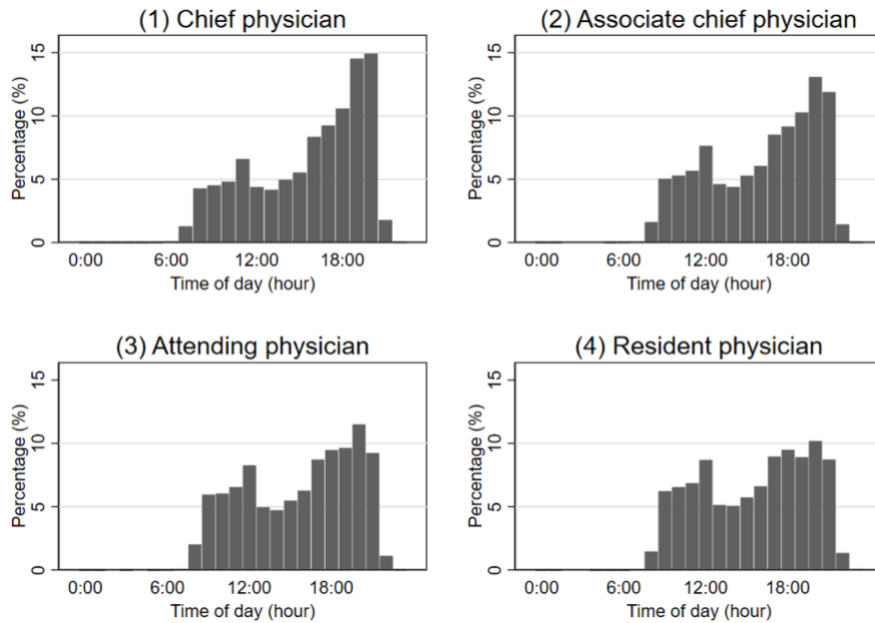


On the supply side, the majority of doctors on these commercial platforms are employees of Chinese public hospitals. For example, on Haodf.com and WeDoctor, two of the leading healthcare platforms in China, more than 90% of registered doctors are from public hospitals. These doctors work as independent contractors with the freedom to set service charges and share a pre-agreed percentage of online service earnings with the platforms. Such online service provision on private platforms by public hospital doctors creates a new form of dual practice, which is termed “online dual practice”. A previous study suggested that at least 16.5% of public hospital doctors in China engaged in online dual practice at the end of 2020, and its prevalence was much higher among senior public hospital doctors (Xu et al., 2022). Public hospital doctors mainly use small pockets of time during working hours and after-hours to render services on the platforms, as shown in Figure 2.

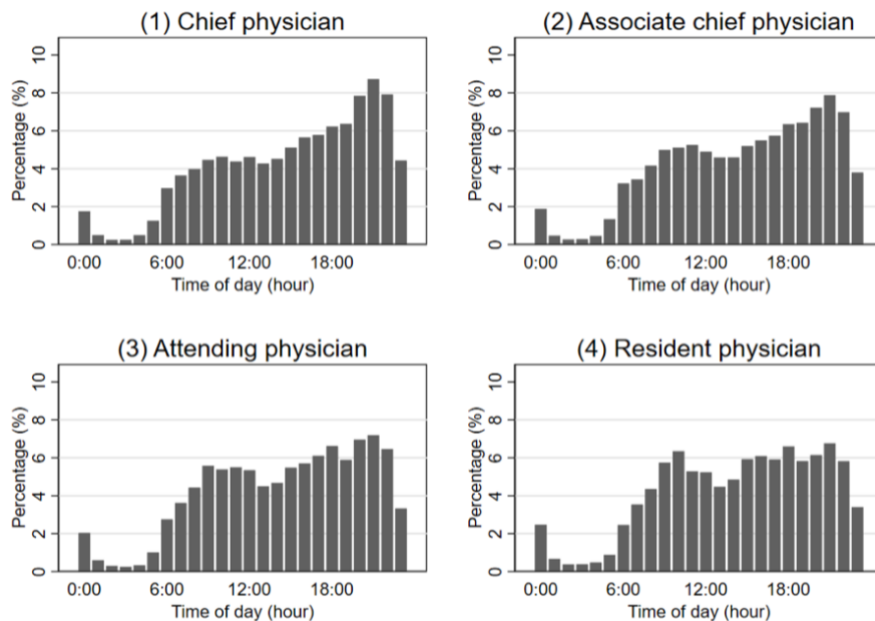
The five most commonly cited motivations for their engagement in online dual practice are efficiency improvement, personal control, career development, financial rewards, and serving the patients. It should be noted that such online dual practice offers a range of financial and professional rewards. In addition to the opportunity to supplement their public hospital incomes, physicians can exert greater control over the patients they see, treating patients with less severe conditions online and reserving public hospital appointments for patients with more complex medical needs. Moreover, online dual practice is perceived as important for career advancement, especially among junior doctors. It is seen as a way to develop and enhance doctors’ professional reputations nationwide, which helps in attracting more patients. This phenomenon is not unique to China and it is also prevalent in some other countries such as France, Australia, India, and Malaysia. Some doctors from public healthcare facilities in these countries also engage in online dual practice on private healthcare platforms (e.g., Doctolib in France, Prime Medic in Australia, Practo in India, WhatsDoc in Malaysia), according to our review on these platforms.

Figure 2: Time distribution of phone-call consultations and text-and-image consultations within a day, by physician seniority

(a) Phone-call consultation



(b) Text-and-image consultations



Notes: These figures are drawn based on the transaction data from Haodf.com between 2018 and 2019. The X-axis represents hours of the day. For example, 18:00 in the X-axis means that a doctor sends a text reply or answers a call during 18:00-18:59. The Y-axis represents the percentage of phone-call consultations or all text-and-image consultations that happen during this period.

On these private platforms, doctors can set prices for their online services and compete for patients from all over China. On average, charges for a text-and-image consultation and a phone-call consultation on Haodf.com in 2020 are 89.7 CNY (US\$13.0, 1 USD=6.9 CNY) and 109.7 CNY (US\$15.9), respectively. These prices are much higher than ones for outpatient services delivered at public tertiary hospitals. For comparison, the average public outpatient medical consultation fees in Beijing for primary care in 2020 are 20 CNY (US\$3.0) and 50 CNY (US\$7.5) in tertiary hospitals. Prices also vary considerably across platforms, reflecting differences in platform and provider quality and market power, physician seniority, and patients' willingness to pay. Unlike Medicare, Medicaid, and private health insurance plans in the United States, Chinese social health insurance schemes and private health insurance policies provided almost no reimbursements for telemedicine and telehealth services on these platforms, so patients had to pay out-of-pocket for online healthcare.

2.2 Public Internet Hospitals

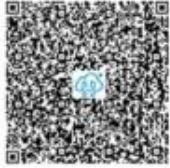
Traditionally, Chinese public hospitals were not engaged much in providing online services. However, the COVID-19 pandemic changed this situation. In 2020, the Chinese government had adopted a series of administrative measures to push public hospitals to vigorously carry out remote medical services. As a result, many public hospitals established their own internet hospitals and began to provide direct-to-consumer healthcare services. Like private internet hospitals, these public internet hospitals provided teleconsultation, remote diagnosis, and online pharmaceutical sales. In terms of geographic coverage, according to a previous study that collected data from 711 internet hospitals as of July 2020, public internet hospitals were mainly distributed in the east and southern coastal provinces.

Figure 3 show the steps when requesting online medical services from public internet hospitals in Shanghai, China. Patients who have seen a doctor in other Shanghai public hospitals can make an appointment through the Health Cloud Internet Hospital for online revisits and online prescription services.

- Step 1: Scan the QR code or follow the official account of "Shanghai Health Cloud" to enter the internet hospital.
- Step 2: Click on "Internet Hospital" and select "Follow-up visit and Dispensing medicine".
- Step 3: Select the doctor and time for revisit.
- Step 4: Fill in the application for revisit, the medical insurance card, and other information.
- Step 5: Fill in the disease information and click "Submit" to pay the order.
- Step 6: Communicate with the doctor online and receive online medical services.

Figure 3: The guidance of Shanghai Health Cloud

Step 1 Scan the QR code or follow the official account of "Shanghai Health Cloud" to enter the Internet hospital



Step 2 Click on "Internet Hospital" and select "Follow-up visit and Dispensing medicine".



Step 3 Select the doctor and time for revisit



Step 4 Fill in the application for revisit, the medical insurance card and other information



Step 5 Fill in the disease information and click Submit to pay the order



Step 6 Communicate with the doctor online and receive online medical services.



The investments of public internet hospitals are mainly from fiscal subsidies and hospitals' own funds. The expenditures of establishing a public internet hospital varies a lot, depending on the designed functions of internet hospitals and information technology capabilities beforehand. Moreover, after the construction of the internet hospital is completed, continuous function development and improvements are needed. Therefore, public internet hospitals need continuous additional investments if they cannot earn sufficient revenues. By now, according to expert interviews, most public internet hospitals are in a situation where they cannot make ends meet. A few successful cases in the construction and operation of public internet hospitals are national top tertiary hospitals in Beijing that have long enjoyed a good reputation and serve nationwide patients across China.

The prices for online services through public internet hospitals are restricted by the government. In 2019, the National Healthcare Security Administration issued the *Guidance on Improving the Price of Internet Health and Health Insurance Payment Policy*, which further clarifies the pricing requirements for internet health. Subsequently, each province has issued policies to announce the price of internet health, health insurance payment, and other issues. Generally, online services provided by the public internet hospital are covered by social insurance schemes but their prices are restricted to the level of "general outpatient consultation fee". For example, no matter what the seniority of the physician is, the price for online consultation in Beijing's public internet hospitals is 50 CNY. It is much lower than the price set on the third-party private platforms. It becomes a barrier for public hospital doctors to provide online services on their own platforms. A previous study suggests that the major providers on public internet hospitals are junior doctors rather than senior doctors (Cui et al., 2017). According to a survey in 2021, 53% of public internet hospitals in China were covered by public health insurance. It has become an advantage for public internet hospitals to attract patients.

In addition, public internet hospitals generally comply with the regulation issued by the government. For example, to ensure the safety of patients, the permitted scope of internet diagnostic services (irrespective of the nature of the provider) is generally limited to certain common or chronic diseases, such as dermatosis, chronic hypertension, and diabetes in a stable condition. To enhance accessibility to outpatient resources nationwide, patients can have follow-up visits via internet tools with physicians with whom they had previously had a face-to-face medical consultation. Importantly, the patient's first visit cannot be conducted online, with the goal presumably being to ensure the safety of patients and to reduce the risk of patients being duped by people posing as internet doctors. With medical credibility and professionalism and trust being an essential element of any internet diagnostic service. if it is discovered during return visits conducted online that there has been a change in the patient's medical condition requiring in-person diagnosis by a physician, the rules require that the internet diagnostic services must be stopped immediately and the patient must be directed to visit a bricks-and-mortar hospital. A standardized patient study shows that public internet hospitals can strictly follow these regulation measures but some private platforms cannot abide by these policies, leaving concerns for medical quality and safety.

3 Impacts on Health System Performance

In this section, we analyze the potential effects of online service provision on health system performance, with an emphasis on healthcare access and equity, efficiency in service provision, and quality of care (Roberts et al., 2008). Because the major providers of online services are private platforms, this section mainly focuses on their impacts on health system performance. Up to now, there is no high-quality evidence evaluating its impacts and this warrants more attention from researchers. Our theoretical analysis shows that the overall impact of online service provision on health system performance remains an open question, as shown in Figure 4.

Figure 4: Impacts of online service provision on health system performance



Notes: This figure summarizes the potential impacts of online service provision on access, efficiency, and quality; (+) suggests a positive impact and (-) indicates a negative impact.

3.1 Impacts on Access

The positive impacts on access to care are obvious. Because the Internet enables doctors to serve some patients with minor conditions, online service provision may contribute to alleviating the crowdedness and reducing waiting time at public hospitals. In addition, given that doctors use small pockets of time during working hours and after-hours to render online services, online service provision may contribute to increasing the supply of physician labor supply. In such cases, patients would receive timely feedback and suggestions from physicians in a convenient way.

In addition, the Internet enables patients in rural and remote areas to access high-quality medical resources in large cities. For example, patients with complicated conditions in remote areas may seek virtual consultations from medical experts located in Beijing and Shanghai with subsequent follow-up in-person appointments if necessary. Moreover, when these patients return home after diagnoses and treatments at public hospitals in large cities, they can still virtually access these public hospital doctors. By lowering the transportation costs to access higher quality care in large cities, online service provision could improve the equity of access.

However, online service provision on private platforms is also likely to generate negative impacts on the equity of access. For example, if doctors require that patients must pay for an online consultation before making an offline appointment, the equity of access to public hospital services would be jeopardized. In addition, there is a concern that some senior doctors were selectively providing their services on private third-party platforms, but they were unwilling to provide online services at public hospitals' online platforms. This was partly because the charges for online services at public hospitals' online platforms were regulated by the government while doctors had the freedom to adjust prices upward on private platforms. Motivated by higher charges on third-party platforms, some public hospital doctors preferred to devote more time to private online practices. In such cases, patients would have to pay more to seek for essential online services, which might worsen equitable healthcare access.

3.2 Impacts on Efficiency

Online service provision may improve the efficiency of service delivery at public hospitals. With efficient tools to improve patient management, doctors can intentionally reduce unnecessary visits and attract complicated cases through the Internet. All these behaviors would be conducive to improving the efficiency of public hospitals. In addition, online platforms can save doctors' time on repetitive tasks and optimize their productivity. For example, using tools developed by third-party platforms, they could help patients become more prepared for their visits by sending the patients guidance beforehand. Since these patients read the basic information in advance, it could save substantial time during in-person visits.

On the flip side, online service provision on private platforms can undermine health system efficiency. Public hospital doctors might be distracted from their designated work due to online service provision. Some public hospital doctors worked late on the

Internet, resulting in lower daytime efficiency. At the same time, because Chinese patients can conveniently access public hospital doctors over the Internet, there are concerns that they may more readily bypass primary care providers to seek out doctors from prestigious public hospitals even for minor conditions. In the long run, this deviation from the government's goal to build a primary-care-based integrated delivery system may further undermine the already weakened primary healthcare system in China, exacerbating the overuse of secondary and tertiary medical services and generating further health system inefficiency.

3.3 Impacts on Quality of Care

The effect of online service provision on healthcare quality is potentially mixed. On one hand, online service provision could substantially improve the continuity of care and contribute to raising the quality of care. As discussed, public hospital doctors could communicate with patients through the Internet and instruct them to prepare for on-site visits. Meanwhile, via the Internet, doctors could follow up with their patients more easily after on-site visits and treatments. These services greatly filled the gaps in public hospital care in China. On the other hand, given the lack of strict regulations, unqualified and inexperienced doctors can also provide health services on platforms, potentially resulting in treatment delays and even erroneous treatments. In addition, the convenience of the Internet may induce overutilization of healthcare services.

4 Discussion and Conclusion

Globally, China is at the forefront of harnessing internet technologies and this is dramatically changing how health care is delivered. However, substantial challenges exist. As the majority of internet health care is delivered through private third-party platforms rather than public tertiary hospitals, the physical and virtual care delivery systems remain highly segmented. Collaborations between private online platforms and public hospitals are likely to increase in the future, further bringing the two delivery systems together.

Moreover, as more and more physicians engage in online service provision on private platforms, the government should maintain a careful watch towards its negative impacts and develop regulatory responses accordingly. Distraction from designated work at public hospitals might simultaneously worsen access, efficiency, and the quality of public hospital care; over-utilization and inappropriate use of virtual care might cause additional inefficiency due to the hospital-centered health system in China; and unethical physician behaviors (i.e., over-prescription, kickbacks, sales of in-person appointments at public hospitals) could jeopardize healthcare access and quality. In response, a monitoring and evaluation system should be established. In addition, to address the concern of relatively low provision of online services at public hospitals, incentive approaches should be taken. The government and public hospitals can incentivize physicians to deliver online medical services via the public hospital

platforms by adjusting prices upward at public hospitals. Lastly, self-regulation by professional bodies can be encouraged.

India and China have some similar national conditions, such as large populations, high internet penetration, and uneven distribution of medical resources. Internet health holds the potential for both countries to address these problems. China's experience shows that appropriately integrating telemedicine into the existing health delivery system may be a useful strategy to promote doctors' acceptance of telemedicine and telehealth. A previous study found that efficiency improvement was one of the frequently mentioned motivations for online service provision: public hospital doctors used internet tools to reduce the workload of repetitive and inefficient tasks (Xu et al., 2022). It is consistent with the previous finding that doctors' adoption of telemedicine and telehealth relied on their perceived effectiveness (Akhlaq et al., 2016). Personal control and career development were two other motivations that were frequently mentioned by interviewed doctors. They used the Internet to attract complicated cases across China and to establish a nationwide reputation.

China's case also suggests that support from the government and leverage of the market power are essential. The Chinese government takes an "accommodating and prudent" regulatory strategy for online service provision. Public hospitals and healthcare regulatory agencies in China adopt a permissive attitude towards doctors' online service provision on commercial platforms. In most cases, public hospital doctors register as independent providers on commercial platforms without official permissions from their affiliated public hospitals. Revenues generated from online healthcare services are directly shared by doctors and platforms according to the agreements between them. Public hospitals do not receive any share of the revenues. However, in contrast with the widespread opposition to physical dual practice at private hospitals, public hospital directors generally take a tolerant attitude towards online dual practice. Some of them consider online healthcare services as "new forms" and would like to observe how things evolve before imposing restrictions. Chinese authorities also take a supportive position because they regard online healthcare services as a solution to reducing geographical disparities in healthcare access. These reasons partly explain the fast-growing number of public hospital doctors registered on commercial platforms in China.

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