



# Too few doctors or too low wages? Labor supply of health care professionals in China



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## ABSTRACT

This paper estimates the labor supply functions for health care professionals in China using Census-based data in 2005. The rapid economic growth and population aging in China led to a substantial increase in the demand for health care services and the *derived* demand for health care professionals in recent years. However, the increase in the supply of doctors and nurses lags behind the growth in demand, raising the question of whether the excess demand should be met by expanding the health care manpower or by inducing the existing personnel to work more hours through wage increase. Our findings indicate that wage rate adjustment has a significant impact on the length of working time among the self-employed practitioners (with an estimated short-run elasticity of 0.575), while the labor supply of hospital employees is inelastic due to their fixed payment scheme. Instead, hours worked in the employee group are related to non-wage factors such as asset holdings and the hospital ownership type. An important policy implication of our study is that adjustments of labor compensation methods and hospital ownership structure are potentially effective approaches for coping with the excess demand for health care professionals and improving the quality of health care in China.

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## 1. Introduction

During the past three decades, China has experienced rapid growth in its economic output, and witnessed a rapid change in its demographic structure. As a result, the demand for health care in China has increased significantly over the past three decades, which in turn has increased the *derived* demand for the services of physicians and nurses. By contrast, the increase in the labor and capital inputs for health care, such as the number of health care professionals or the number of hospital beds per 1000 population, has been relatively moderate during the same period. As the growth in the supply of health care professionals failed to match an increasing demand and as the prices of these health care inputs were not allowed to adjust, China faces a situation of excess demand for both physicians and nurses.

This paper aims to address the important empirical question of why markets for health care professionals do not seem to clear, and to what extent the supply of health care can be raised through two alternative approaches – wage adjustment versus capacity building. What is the real cause of the excess demand in the market for health care professionals? Are there too few doctors and nurses in China, or alternatively, are their wages too low so that each one works too few hours? On one hand, if there is a shortage of doctors and nurses, then increasing the supply of health care manpower by expanding the output of the medical education system is recognized as a policy option. On the other hand, if the real cause is the persistently low earnings due to wage restraint, then the

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payoffs from expanding the education system will be greatly reduced, as incentives are not developed to keep health care professionals practicing and supplying enough services.

The key to answering the above empirical questions is to understand the determinants of the labor supply of health care professionals in China, the item of particular interest being the impact of wage. In this paper, we estimate the response of health care professionals' weekly working hours to changes in the hourly wage rate and the other non-wage factors using the Tobit model with instrumental variables. The primary data source is the 2005 Inter-Census Population Survey by the National Bureau of Statistics (NBS), which contains 11,623 individual health care professionals, covering all the 31 provincial level administrative units in China.

The major contribution of our analysis lies in the following aspects. First, empirical studies on the labor supply of health care professionals have been largely confined to the United States, Canada and European countries, where the labor supply curve is found to be upward-sloping with the elasticity estimates falling within a wide range (e.g., Antonazzo, Skatun, et al., 2003; Baltagi, Bratberg, & Holmås, 2005; Ferrall, Gregory, & Tholl, 1998; Rizzo & Blumenthal, 1994; Sloan & Richupan, 1975). Studies are needed in other regions, including middle-income and low-income countries, given that health care systems vary substantially across countries. To our knowledge, this paper is the first study to investigate the labor supply of health care professionals in low and middle income countries. Second, we capitalize on the Census-based data which provides labor supply information even for people who are temporarily out of the labor force, and thus we are able to reduce the truncation bias in the previous studies. Our estimation strategy also explicitly addresses the measurement error and simultaneity issues in the wage variables, which may lead to more precise estimates compared to previous labor supply studies. Third, by exploring the determinants of health care professional's labor supply, our study bears important policy implications for solving the persistent excess demand issues in China's health care market, and may shed light in guiding the future policies to cope with the challenge of inaccessible and unaffordable health care (*kan bing nan, kan bing gui*) in China's health system reform.

The remainder of this paper proceeds as follows. In Section 2, we briefly outline the health care system in China, paying particular attention to the institutional background relevant to the demand for and supply of health care professionals. Sections 3 and 4 describe the methodology and data used in the analysis, respectively. Section 5 presents the results, and Section 6 summarizes our findings and discusses the policy implications.

## 2. Health care professionals in the Chinese health system

One conclusion drawn from the health economics literature is that the prosperity of the overall economy, as measured by the growth of income, will lead to a more than proportional increase in the expansion of the health sector, as measured by the growth of health expenditure (Gerdtam & Jonsson, 2000; Newhouse, 1992). The case observed in China is consistent with this international experience. Between 1978 and 2008, the mean annual growth rate of real per capita health expenditure was 10.35%, which was greater than the mean annual growth rate of per capita income (8.61%) during the same period (National Bureau of Statistics of China, 2010).<sup>3</sup>

Although the rapid economic growth has led to a sharp increase in health expenditure, the major driving force behind the rapid increase has been the upsurge in the price of health care as opposed to the increase in the quantity of health care provided per capita (Chow, 2010). An obvious piece of evidence supporting this argument is that the increase in the supply of health care professionals in China did not match the rapid increase in the demand for health care services during the post-reform era. Fig. 1 shows the long-term trend in the number of nurses and physicians per 1000 population in China between 1960 and 2009. Although there was a rising trend in the physician-to-population ratio between 1970 and 1990, from 0.8 to 1.6, the ratio remained almost constant within the 1.6 to 1.7 range between 1990 and 2009. With a few exceptions, the time trend of the nurse-to-population ratio was parallel to the trend of the physician-to-population ratio, indicating that there was a significant gap between the increase in the demand for health care services and the increase in the supply of health care professionals.

Compared to the developed countries, the shortage of health care professionals in China is even more obvious. As shown in Fig. 2, the number of nurses per 1000 population is around 10 in five representative high-income countries, namely, Japan, Australia, Germany, the UK and the USA. By contrast, this ratio is only about 1.3 in China. Similarly, the number of physicians per 1000 population ranges from 2 to 4 in the above-mentioned high-income countries, while this ratio is only about 1.7 in China. In addition, the number of nurses per 1000 population is greater than the number of physicians per 1000 population in most countries. However, the situation in China is reversed. China has a higher physician density than nurse density, and the ratio of active nurses to active physicians is only 0.76, which is significantly lower than that in the high-income countries with 3 to 4 nurses per physician. This suggests that a wide range of input substitution between physicians and nurses still exists.

A plausible explanation for the shortage of health care professionals in China is that the earnings of health care workers are not so "attractive" as compared to other occupational categories during the post-reform era. Although the economic reform transformed the ownership structure of the Chinese economy from the dominance of state-owned enterprises to the dominance of private firms in many industry sectors including the pharmaceuticals industry, the delivery of health care services still relies on the government. In China, public hospitals provide more than 90% of outpatient and inpatient health care services. In addition, the majority of health care professionals, including physicians and nurses, are employees of public hospitals and receive payments on a salary basis. Furthermore, the government in China regulates the salary for health care professionals who are employed by public hospitals. As more and more sectors follow market forces in deciding the wages for their employees, the mean earnings in the regulated health sector are being ranked among the lowest in the Chinese economy (see Fig. 3). This is a sharp contrast to the United States and other Western

<sup>3</sup> Another important reason for the rapid growth in the demand for health care is the regulated prices for both the buyers (patients) and sellers (hospitals) in the market for health care.

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