The positive impacts and unintended consequences of the nationwide pricing reform for drugs and medical services in the urban public hospitals in China

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Abstract

Since 2015, China has been rolling out the pricing reform for drugs and medical services (PRDMS) in the urban public hospitals in order to reduce the drug expenditure and to relieve the financial burden of patients. This study aims at evaluating the effectiveness of the reform implementation and investigating its positive impacts and unintended consequences to provide evidence base for further policy making. The Difference-in-difference (DID) approach was employed to analyze the reform impact on the 31 provincial administrative areas in China based on the data abstracted from China Statistics Yearbooks and China Health Statistics Yearbooks from 2012 to 2018. The reform resulted in the decrease of 7.59% in drug cost per outpatient visit, the decrease of 5.73% in drug cost per inpatient admission, the decrease of 3.63% in total cost per outpatient visit and an increase of 9.10% in the surgery cost per inpatient admission in the intervention group. However, no significant change in examination cost was found, and the reduction in the medical cost per inpatient admission was yet to be demonstrated, nor was the total outpatient/ inpatient expenses. The nationwide pricing reform for drugs and medical services in the urban public hospitals (PRDMS-U) in China is demonstrated to be effective in cutting down the drug expenditure. However, the revealed unintended consequences indicate that there are still significant challenges for the reform to encounter in the way ahead to reach the ultimate goal in curbing the medical expenditure. The underlying issue with the incentives of providers in service delivery remains to be unsolved and the pricing instrument alone should not be enough to change the behavior of providers. Our conclusion holds lessons for other low- and middle-income countries (LMICs) who are also conducting reforms to public hospitals.

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Introduction

Over the past 70 years, China's health system has undergone vast changes under the profound impact of the country's economic reform [1]. In the early years after the founding of the PRC in 1949, China's government took the complete charge of its health system. At that time, the government decided on the allocation of health resources and directed the health financing and service delivery. All the health facilities, including public hospitals, were sorely owned, financed and operated by the government [2]. Under that highly centrally-planned system, equity was accorded priority and achievements in health outcome improvement were made [3]. In 1978, China embarked on its economic reform and the market performed an important role in the economy, which also led to the marketization of the health sector in the country. With the original aim of improving productivity and efficiency of health service, a series of policy interventions were staged to strengthen the market force in the health sector, including the decentralization of the public hospital management [4].

As such, the subsidies from the government to public hospital shrank sharply from more than 60% of its total revenue by 1980 to less than 25% by 2008 [5]. That is, instead of relying on the government to finance as before, the public hospitals had to make profits from the drugs and services provided to

finance themselves [6,7]. Consequently, government subsidies, health services and drug sales became the three main sources of hospital's revenues. In order to achieve the profit margin, the drugs were allowed to be priced with up to 15% mark-up on the actual purchase price [8]. Moreover, the physician's incentive scheme to prescribe profitable drug or service was established by linking their merit pay, which constituted the majority of their income, to the hospital's profits [9,10]. In 2012, over 40% of the hospital's revenues came from drug sales while only approximately 10% came from government subsidies [11].

Unlike the successes in the economic reform [12], the marketization of the health sector in China has experienced severe challenges. Once the for-profit management scheme of the public hospital had been established, the motivation of profit-seeking became perverse among health care providers, which stimulated the expansion of the public hospital whereas brought about substantial negative impacts [13]. The health care providers are motivated to induce the demand of patients and over-prescribe drugs and diagnostic tests, which resulted in the alarming escalation of health expenditure [14]. From 2007 to 2012, the growth rate of health expenditure (14.9%) far exceeded that of gross domestic product (GDP) (10.2%) [15]. In 2012, the drug expenses accounted for over 50% of the total medical expenditure per outpatient visit and over 40% per inpatient admission [11]. Not only that, extensive over-prescription gave rise to the occurrence of microbial resistance and false-positives diagnostic tests, threatening the quality of health care [16,17].

Thereupon, the complaints from Chinese people on the difficulties in affording quality health care prevailed [18], which were frequently referred to as the lament of "kanbingnan, kanbinggui," or "insurmountable access barriers to health care, insurmountable high health costs." [1] The outbreak of SARS epidemic in 2003 further intensified people's dissatisfaction and thereby the pressing necessities to reexamine the health system [19], which eventually led to the launch of the 2009 reform [20]. With the goal of "everyone has affordable access to basic health care", the equivalent of $230 billion was committed heavily to the reform between 2009 and 2011 [21]. After several years of efforts, some significant achievements were made, especially in improving the health insurance coverage [22,23]. However, the reform to the public hospital failed to yield any encouraging progress [1,24].

In China, the public hospitals, with the capability to provide over 80% of the overall inpatient and outpatient services, constitute the most influential health care provider [11]. Therefore, the intervention to public hospital is of crucial importance to the consequence of the health system reform [25], and the essence is to break up the profiting scheme and recover its welfare nature in management [26]. Among the various interventions to public hospital, the pricing reform is regarded as the most substantial instrument, with the core measure as the zero drug mark-up policy, which is to eliminate the up to 15% profit margin that was previously allowed to be added on the actual drug purchase price. In order to ensure the sustainability of the intervention on drug pricing, the pricing of medical services was also adjusted, including raising surgical fee and reducing laboratory fee. [27,28]

The primary aim of PRDMS is to reduce the drug expenditure and thereby to reduce the medical expenditure and the financial burden of patients. Meanwhile, by cutting off the economic linkage between

drug sales and drug use, the policy also intendsto rectify the physicians' behavior in service provision, so as to contribute to the improvement of the quality and accessibility of health care [29]. For the sake of smooth and stable implementation, the government has adopted a step-by-step strategy to push forward the pricing reform. Before intervening the urban public hospital, the policy had been put into effect in every county-level public hospital (PRDMS-C) by 2015 [30]. Based on the lessons from the implementation in county-level hospitals, some provinces, like Zhejiang and Anhui, took the lead to launch the reform to urban public hospitals. Subsequently, the PRDMS-U has been able to roll out in every public hospital throughout the country as of September, 2017. [31]

A few studies in the existing literature have been conducted to evaluate the impact of PRDMS-C in different areas in China, such as Sanming [32], Zhejiang [33], Hubei [34,24], Guangxi [35], etc. Most of the studies showed that the reform reduced the drug cost whereas its effectiveness in containing the medical expenditure was questionable with some unintended consequences occurred [36–38]. For example, through the DID approach, Fu et al. [32] analyzed the public hospital reform in Sanming and showed that the Sanming model was successful to reduce the drug cost and the total medical expenditure without measurably sacrificing the quality or the efficiency of health service provision, which justified the nationwide promotion of Sanming model. Using a retrospective pre/post-reform design, Zhang et al. [33] analyzed the questionnaire data from selected county-level public hospitals in Zhejiang from 2011 to 2012 and concluded witha decrease of the supplier-induced demand in drug but an increase in medical services. Besides, in a study conducted in Hubei, Zhang et al. [24] found that the decrease of drug costs resulted from the reform did not lead to the reduction of the personal health spending. As for the nationwide evaluation of the PRDMS-C, Fu et al. [39] conducted a sample investigation to 1880 county-level hospitals across the country and found that the policy resulted in the reduction in drug expenditures together with the increase in diagnostic tests expenditures, which had not measurably contributed to the containing of total health expenditures.

After the reform was completed in the county-level hospitals, it is now fully practiced in urban public hospitals in China. Detecting the positive influences and unintended consequences of the nationwide PRDMS-U is urgent for policy makers to draw lessons from, because the urban public hospitals are the most influential players in the health service provision in China. Despite the previous studies on the effects of PRDMS-C, however, there are relatively few works on the effects of PRDMS-U. And the fundamental differences between county-level and urban hospitals limited the generalizability of the conclusions of those previous studies on county-level hospitals to urban ones. Although several literatures presented preliminary evaluations in urban cities like Nanjing [40], Beijing [41], etc., the conclusions could be significantly biased because of the uniqueness of the selected areas.Therefore, a nationwide evaluation of the PRDMS-U with improved methods might be necessary to provide some empirical evidence for further policy-making.

Method

Hypothesis

The objectives of the PRDMS-U include four aspects. Firstly, it aims to reduce the drug cost through the elimination of the drug mark-up. Secondly, it intends to adjust the cost structure by meanwhile increasing the surgical fee and decreasing the examination fee. Thirdly, it endeavors to contribute to the reduction of the total medical expenditure. At last, it attempts to rectify the supplier-induced demand and to improve the accessibility of medical service for people. The hypothesis of our study is that, the policy has almost achieved the first and the second objectives but not yet realized the third and the fourth ones.

Data sources and variables selection

We investigate the macroeconomic data of 31 provinces/ municipalities collected from China Health Statistics Yearbooks 2012–2018 and China Statistics Yearbooks 2012–2018. Exact launch dates of the PRDMS-U are unavailable in the data, although we know that it took effect from 2015 to 2017 in different areas. Twelve provinces that implemented the PRDMS-U in 2017 are defined as the control group (Beijing, Chongqing, Guangdong, Guangxi, Hainan, Henan, Hubei, Jilin, Shanxi, Tibet, Gansu, Ningxia), and the other nineteen provinces that initiated the PRDMS-U in 2015–2016 are defined as the intervention group (Anhui, Fujian, Hebei, Heilongjiang, Hunan, Nei Mongol, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Shanghai, Tianjin, Zhejiang, Guizhou, Qinghai, Sichuan, Xinjiang, Yunnan).

To test the previous hypothesis, we select seven expenditure variables to measure the effect of the PRDMS-U, which are total outpatient expenditure, total inpatient expenditure, total expenditure per outpatient visit, total expenditure per inpatient admission, the drug cost per outpatient visit, the examination cost per outpatient visit, the drug cost per inpatient admission, the examination cost per inpatient admission, and the surgical cost per inpatient admission respectively.

Following Fu et al. [32], we also include per capita GDP, per capita public budget revenue, and the ratio of primary industry production to GDP in the analysis as the control variables. All the expenditure variables are adjusted by 2010 yuan (CN¥) using the CPI and all the variables are estimated in logarithms in this study.

Study design and model specification

Our empirical strategy is to compare the pre- and post-reform changes between the intervention and the control groups that were both impacted by PRDMS-U. We employ the difference-in-difference (DID) method to evaluate the effectiveness of PRDMS-U by using the panel data from 31 provinces/ municipalities during the year period 2012–2018 in China. The basic model is as follows:

$$Y_{pt} = \beta \cdot Intervention_{p} \cdot postPRDMSU_{t} + \boldsymbol{\delta} \cdot \boldsymbol{Control_{pt}} + \alpha_{p} + \gamma_{t} + \varepsilon_{pt}, (1)$$

whereYpt denotes the outcome variables for the p-th province at the t-th year; the dummy variable Intervention p equals 1 if the p-th province is from the intervention group and 0 otherwise; the dummy variable postPRDMSt equals 1 if the province implemented the PRDMS-Uafter the t-th year; Controlptis a vector of control variables to control the unobservable factors; the variableαp represents the fixed effect used to control those unobserved time-invariant characteristics of the p-th province that may affect the outcome variable; the variableγt represents the fixed effect used to control the impact of some nation-wide shocks that occur in the t-th year; the term εpt refers to the random error term; the parameterof interest in the difference-in-differences model is the interaction term β between Intervention p and$postPRDM$SUt; and δis the corresponding vector of coefficients for the control variables.

Comparing the pre-reform trends for the intervention and control group

The difference-in-differences estimator is consistent only if differences in outcome medical expenditures between the intervention and the control groups remain constant. Therefore, unparalleled differences derived from the preexisting difference between two groups would bring a potential challenge to the difference-in-differences strategy. To address this problem, we replace the first term in the right side of Model (1) by where theequals 1 if the year is before 2015 and is a vector of year dummy variables. Tdescribes the differential change in medical expenditures between two groups in year *t*before the PRDMS-U. The nationwide PRDMS-U initiated in five provinces in 2015 and was then extended to the whole country, hence, annual treatment effects before 2015 can be used to verify the parallel trends.

$$Y_{pt} = \beta_t \cdot Intervention_{\ p} \cdot \ pre2015_t \cdot \boldsymbol{Year}_t + \boldsymbol{\delta} \cdot \boldsymbol{Control_{pt}} + \alpha_p + \gamma_t + \varepsilon_{pt} \qquad (2)$$

Robustness Check: Controlling for Preexisting Time Trends

Both intervention and control groups may have an increasing trend in medical expenditures after the PRDMS-U because of the preexisting time tends or the price rigidity, causing the underestimation of the effects of the PRDMS-U in the DID analysis. We extend the model(1)byincluding an additional term of the time trend to control the potential time trends from pre-reform period:

$$Y_{pt} = \beta_t \cdot Intervention_{\ p} \cdot \boldsymbol{YEARpostPRDMSU_t} + \boldsymbol{\delta} \cdot \boldsymbol{Control_{pt}}$$

$$+ \varphi \cdot Intervention_{\ p} \cdot \mathrm{T} + \ \alpha_p + \gamma_t + \varepsilon_{pt} \qquad (3)$$

where βt presents the annual reform effects of the PRDMS-U in year t after the PRDMS-U and γt indicates year fixed effects controlling for preexisting time trends φ•Intervention p•T, where T is a vector of time variables.

Results

Summary statistics

Table 1 shows the mean values of the observed outcome variables before (period = 0) and after (period = 1)the reform in the intervention group and the control group. The drug cost per inpatient admission experiences a sharp decrease both in the intervention group, 11.80% (Table 1, column 6), and in the control group, 16.20% (Table 1, column 3), after the reform.

For the intervention group, the annual growth rate of the drug cost per outpatient visit decreases from 3.34% to −2.05% (Table 1 column 4–5) and that of the drug cost per inpatient admission decreases from 0.66% to −7.05% (Table 1 column 4–5).The mean of surgery cost per inpatient service increases from 448.63 Yuan to 565.52 Yuan (Table 1 column 4–5) after the reform in the intervention group, and the growth rate of the surgery cost per inpatient service is 26.06% (Table 1 column 6), significantly higher than 21.96% (Table 1 column 3) in the control group. These results have provided evidence in favor of our hypothesis.

Moreover, in the intervention group, the annual growth rate of the total cost per outpatient visit decreases from 4.98% to 2.69% (Table 1 column 4–5) after the reform, and the annual growth rate of the total cost per inpatient admission decreases from 4.22% to 1.98% (Table 1 column 4–5) after the reform. Likewise, the annual growth rate of the total outpatient cost decreases from 11.86% to 7.52% (Table 1 column 4–5) after the reform and the total inpatient cost decreases from 11.46% to 8.14% (Table 1 column 4–5) after the reform in the intervention group. Additionally, it is noticeable that the examination cost per outpatient visit increases by 10.53% after the reform took into effect in the intervention group.

Based on the t-test results, the difference between the two groups in the selected variables isnot found to be significant, which reveals that the two groups are not heterogeneous in terms of economic and social conditions.

In order to verify the plausibility of applying DID method (i.e., satisfying the parallel trend assumption), we compare the means of outcome variables between the intervention group and the control group for every year in Figure 1. All the mean outcome trajectories in the intervention group remain parallel to those in the control group before 2015, although they are separate from each other for all the outcome variables except the total cost per inpatient admission, which demonstrates that there is no heterogeneity trend between the two groups. It is also seen that both the average drug cost per outpatient and the average drug cost per inpatient have a decrease appearing in 2016and 2017 in the intervention group and the

control group respectively. And the magnitude of increase in surgery cost is shown to be larger in intervention group.

We also use model (2) to testwhether there exists any unparalleled pre-reform time trendbetween the intervention and control group. The results are shown in Appendix Table a., which reveal no significant differences in pre-trends between the intervention and the control group for most expenditure variables except drug cost per outpatient visit and drug cost per inpatient admission.

Medical care cost per outpatient visit / inpatient admission

Based on the findings from our parallel trend analysis, we employ the basic DID model (1) for seven outcome variables to evaluate the effectiveness of the PRDMS-U. The regression results are shown in Table 2.

Firstly, compared with the control group, the PRDMS-U results in a decrease of 7.50% (= 1-e−0.078, $p<0.05$) in drug cost per outpatient visit (Table 2, column 2) and 5.73% (= 1-e−0.059,$p<0.05$ = 1-e−0.059,$p<0.05$) in drug cost per inpatient admission in the intervention group (Table 2, column 5), which indicates that the reform policy was effective in cutting the drug expenditure.

Secondly, in the intervention group, the PRDMS-U produces 3.63% (= 1-e−0.037,$p<0.05$) decrease of the total cost per outpatient per year after the reform's implementation (Table 2, column 1), which demonstrates the effect of the policy on decreasing the total medical care cost per outpatient visit. However, the coefficient of the total cost per inpatient admission is not statistically significant (Table 2, column 4), implying that the reform effects in decreasing the total cost per inpatient admission is not yet observable.

Thirdly, the coefficients of the examination cost per outpatient visit or per inpatient admission are not significant (Table 2, column 3 and 6), indicating that the reform has no significant impact on the examination cost. Additionally, the coefficient of the examination cost per inpatient admission is positive (Table 2, column 6), which implies the potential unintended consequence of the reform in increasing the examination cost.

Finally, compared with the control group, the surgery cost increases by 9.10%□ = e0.087−1,$p<0.05$□after the reform in the intervention group (Table 2, column 7), indicating that the reform leads to the increase in surgery cost. Along with the decreased drug cost, it is shown that the reform to some extent promotes the optimization of the fee schedule for drugs and medical services in the urban public hospitals in China.

Total outpatient/ inpatient expenses

In order to examine the impact of the PRDMS-U on the total expenditure, we multiply the cost per outpatient visit/ inpatient admission to the number of visits/admissions and obtain the total outpatient/ inpatient expenses as the outcome variables for analysis. From the results of the DID analysis in Table 3, there is no evidence that the PRDMS-U has statistically significant effects on decreasing either the total outpatient expenses or the inpatient expenses. Nonetheless, we find that the coefficients are shown to be negative and the decreasing trend in the annual growth rate of the total expenses can be found in the intervention group from Table 1.It remains to be judged whether the reform has achieved its goals in curbing the upraise of the total medical expenses.

Robustness Checks

We apply model (3) to control for preexisting time trends (results shown in Figure a. and b. in Appendix) and present robustness checks for drug cost per outpatient visit and drug cost per inpatient admission respectively. The results of model (3) confirm that the drug expense decreases more significantly in the intervention group than in the control group after the implementation of PRDMS-U, even controlling for preexisting time trends.

Discusssion

Through examining the province-level data of 31 areas in China from 2012–2018 with the difference-in-difference (DID) approach, our study results indicate that the implementation of the PRDMS-U, with the core measure of zero drug mark-up policy, is associated with significant reductions in the drug expenses per inpatient admission/ outpatient visit. In other words, the results show that the policy contributes to the reduction in the drug expenditure, which suggests that the intervention of the policy is on the right track and its preliminary goal has been achieved.

In spite of the striking decrease in drug cost along with the measurable increase in surgical cost per inpatient admission presented, no significant change in examination cost is found, which suggests that the reform objective in adjusting the fee schedule for drugs and medical services has not been fully realized despite of some positive progress seen. Moreover, the reduction in the medical cost per inpatient admission is yet to be demonstrated, nor is the total outpatient/ inpatient expenses.

These results indicate that, cost shifting with supplier-induced demand occurs as physicians tend to prescribe more examinations and tests to compensate for the profit loss from drugs, which notably undermine the effectiveness of the PRDMS-Uas a whole and result in the failure to reach the ultimate goal of curbing unnecessary expenditure. Similar unintended consequences were also reported in previous studies on the impact of the PRDMS-U carried out in other scenarios [42,43].

The results suggest that the pricing intervention alone is not able to relieve the incentives for supplier-induced demand. Essentially, despite of the elimination of the drug profit margin, the compensation scheme for public hospital and the payment scheme for physicians remain unreformed. The profits

generated from drugs and services still constitute major part of the revenue of the hospital, a proportion of which makes up the merit pay for physicians. With unaltered economic motivations of suppliers, the reform policy can barely rectify the behavior of health service providers in the concrete sense.

The underlying issue is that the current China's health system suffers from serious market failures [44]. China's health care reform since 1978 has been pertinent to the debate on which instrument- government or market- would be better to use for the national health system [45–48]. In theory, the government allocates the resources for the maximization of social benefits [49] while the market pursues the profit maximization based on the exchange among suppliers and demanders [50]. Overuse of the market force in service delivery may cause hazards to the equity and affordability of health care [51].

Moreover, the particular characteristics of health care market have exerted uncertainty in the adaptation of general laws of economics and resulted in the failure in drawing upon the path of economic reform for health care [14]. Different from the general commodity market, the health care market features extensive asymmetry of information between suppliers (physicians and hospitals) and demanders (patients). The suppliers have the absolute information advantage, and actually take on the role of the surrogates for demanders in decision-making during the process of service delivery [52]. Moreover, the supply of health care service features the scale effect, and a few public hospitals with large service volume and resources investment actually have formed up natural monopoly [44]. In addition, the use of health service largely depends on the physical needs and is less influenced by the price, meaning that the price elasticity of health demand is relatively lowercompared to other commodities [53]. For all these characteristics, once the for-profit motives gets deeply entrenched, the suppliers are prone to induce the demand and push up the price of some profitable drugs or services [54,55]. Regrettably, the aforementioned uniqueness of health care market have not been identified thoroughly and the strategy for enterprise management in China's economic reformhas been simply carried over into reforming public hospital [1].

Interventions should be aligned appropriatelyfrom comprehensive scopes to encounter the unintended consequence of PRDMS-U. First of all, from macroscopic perspective, the role of the government in the health service system should be strengthened to rectify the past mistakes [56] in over marketization, including the over decentralization in the management and development of public hospital.

Secondly, from mesoscopic perspective, the financial incentive mechanisms for suppliers (hospitals and physicians) should be redesigned to positively drive the practice in service provision. On one hand, the financingmechanism of public hospitals should be changed to reduce the dependence of hospital economic operations on drugs and service income. On the other hand, the incentive mechanism for medical staff in public hospitals should be reformed to delink their income from service provision, and meanwhile the public hospital's authority in using their revenue for staff merit payment should be limited [57].

Thirdly, from microscopic perspective, the government should consider increasing the financial subsidies to public hospitals so as to impose greater influence on its economic operation. Additionally, a value-based pricing scheme [58,59] for health care service should be established. What is of critical importance

is that the reform measures should be systematically integrated to avoid circumvention caused by fragmented and uncoordinated policies, which was also concluded in other relevant study [32].

Strengths and Limitations

This study reassures the conclusions in some of the previous studies conducted in piloting areas and demonstrates the effectiveness of the reform on cutting the drug expenditure despite of some unintended consequence. With the rolling out of the reform to every urban public hospital in 2017, our research fills the gap in the nationwide assessment of the reform impact using DID approach. Based on the clarification of the reform goals, our research attempts to evaluate the comprehensive effectiveness of the policy implementation other than decreasing thedrug price.

As our data werecollected from the secondary routine databases, the concerns over the report biases haveinevitably limited the quality of the data and caused our incapability to deepen the analysis to the micro level. However, considering that our study aims at investigating the macro impact of the policy, it is assumedthat some of the individual effects might be offset in the macro-aggregate data, which might be able to reduce the bias caused by the heterogeneity among individuals in the analysis.

Additionally, our analysis focuses on evaluating the impact of reform in the expenditure of service, while further research would be needed to investigate on thequality of service. Besides, continuous monitoring research should also be conducted so as to shed light on the long-term impact of the reform.

Conclusion

Up until now, the PRDMS has been applied to all the public hospitals including county-level and urban ones, which demonstrates the determination of the government in curbing the inflation of the medical expenditure and promoting the affordability of health care for the people.Our study proves the effectiveness of the policy in decreasing the pharmaceutical expenditure. However, the revealed unintended consequences indicate that there are still significant challenges for the reform to be encountered in the way ahead to reach the ultimate goal. The reform strategy of overly relying on the market force to steward the health system in the early 1980s has resulted in the fundamental motives' deviation from social benefits in service delivery [4], which severely impedes the attainment of affordable and equitable health care and sets up enormous obstacles for the 2009 reform to achieve the expected outcome.

Several potential solutions are proposed. It is evident that unintegrated policy measures are likely to cause circumvention and the pricing instrument alone should not be enough to change the behavior of providers. Therefore, the combination of interventions in the financingmechanisms for hospitals and physicians is essential. In addition, to enhance the pursuit of social benefits [60], the government should play the fundamental role in service provision and increase the financial support to public hospital so as to confront the profit motives. These conclusions hold lessons for other low- and middle-income

countries (LMICs) who are also conducting reforms to public hospitals for the optimization of their health service delivery [61,62].

The policy implementation is never a liner process but full of complexity, which suggests the necessity to conduct continuous monitoring of the policy impact and perform interventions accordingly.

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Tables

Table 1 Summary statistics

Variables	Mean of the control group			Mean of the intervention group			Pr(|T|>|t|)	
	Period 0	Period 1	Increase (%)	Period 0	Period 1	Increase (%)	Period 0	Period 1
	(1)	(2)	(3)[1]	(4)	(5)	(6)[1]	(7)[2]	(8)[2]
Medical care cost per outpatient visit								
Total cost (Yuan)	192.34	224.95	16.95	197.67	219.31	10.95	0.58	0.63
Drug cost (Yuan)	94.39	95.71	1.40	95.61	95.66	0.05	0.85	0.99
Examination cost (Yuan)	36.96	45.57	23.29	40.40	44.66	10.53	0.04**	0.66
Annual growth rate of drug cost (%)	4.54	-0.66	-114.54	3.34	-2.05	-161.38	0.11	0.12
Annual growth rate of total cost (%)	6.17	3.85	-37.57	4.98	2.69	-45.99	0.35	0.05*
Medical care cost per inpatient admission								
Total cost (Yuan)	7926.29	8625.08	8.82	7798.24	8580.48	10.03	0.80	0.94
Drug cost (Yuan)	2958.79	2479.61	-16.20	3140.82	2770.24	-11.80	0.29	0.09*
Examination cost (Yuan)	657.14	788.73	20.02	607.41	738.18	21.53	0.11	0.10
Surgery cost (Yuan)	436.81	532.75	21.96	448.63	565.52	26.06	0.69	0.47
Annual growth rate of drug cost (%)	1.54	-9.15	-694.16	0.66	-7.05	-1168.18	0.34	0.08*
Annual growth rate of total cost (%)	4.89	2.58	-47.29	4.22	1.98	-53.08	0.50	0.38
Total outpatient medical care cost								
Total cost (million, Yuan)	16464.23	20263.04	23.07	16674.49	23351.06	40.04	0.94	0.42
Annual growth rate of total cost (%)	13.39	7.63	-42.99	11.86	7.52	-36.61	0.50	0.88
Total inpatient medical care cost								
Total cost	28856.81	40373.40	39.91	33118.11	46031.82	38.99	0.28	0.36

(million, Yuan)								
Annual growth rate of total cost (%)	14.03	7.19	-48.73	11.46	8.14	-29.00	0.23	0.35
Control variables								
GDP per capita (Yuan)	42421.84	50669.58	19.44	48384.41	57160.08	18.14	0.09*	0.20
Public budget revenue per capita (Yuan)	5388.83	6017.84	11.67	5744.62	6662.80	15.98	0.62	0.54
Primary industry output as a share of GDP (%)	10.49	9.34	-10.95	10.03	8.71	-13.23	0.62	0.55

Note: [1] Column (3) = (column(2)-column(1))/column(1); Column (6)=(column(5)-column(4))/column(4); [2] Column (7) shows the P value of t-tests for column(1) and column(4). Column (8) shows the P value of t-tests for column(2) and column(5). *** p<0.01; ** p<0.05; * p<0.1

Table 2 Impact of the reform on medical care cost per outpatient visit / inpatient admission

Variable	Medicare cost per outpatient visit			Medicare cost per inpatient admission			
	Total cost (1)	Drug cost (2)	Examination cost (3)	Total cost (4)	Drug cost (5)	Examination cost (6)	Surgery cost (7)
PRDMS-U	-0.037**	-0.078***	-0.027	-0.020	-0.059*	0.016	0.087**
t-value	-2.22	-3.63	-0.95	-0.91	-1.82	0.4	2.04
p	0.034	0.001	0.352	0.371	0.079	0.689	0.05
ıtrol variable	√	√	√	√	√	√	√
.r fixed effect	√	√	√	√	√	√	√
ovince fixed effect	√	√	√	√	√	√	√
ɔ. of sample	217	217	217	217	217	217	217
Adjusted R square	0.8569	0.574	0.6141	0.7965	0.7485	0.8431	0.6447

Note: *** p<0.01; ** p<0.05; * p<0.1

Table 3 Impact of the reform on total outpatient/ inpatient medical care expenses

Variable	Total outpatient expenses (1)	Total inpatient expenses (2)	Total expenses (3)
PRDMS-U	-0.020	-0.019	-0.019
t-value	-0.71	-0.72	-0.79
p	0.48	0.478	0.438
Control variable	√	√	√
Year fixed effect	√	√	√
Province fixed effect	√	√	√
No. of sample	217	217	217
Adjusted R square	0.9283	0.9219	0.9315

Noter: *** p<0.01; ** p<0.05; * p<0.1

Figures

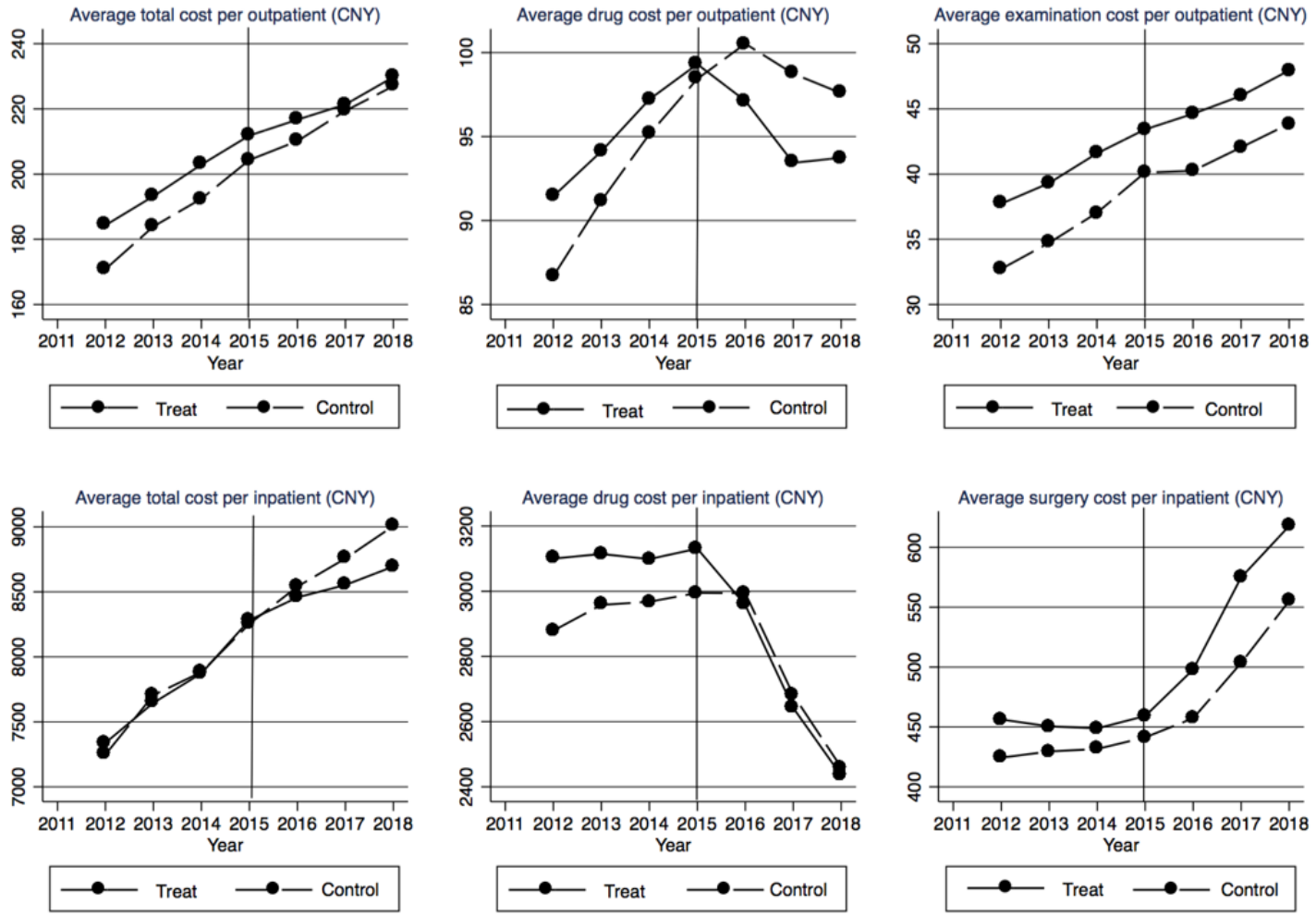

Figure 1

The time trends of outcome variables measuring medical care cost per outpatient visit/ inpatient admission.

Supplementary Files

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- 0414Appendix.docx