THE IMPACTS OF CHINA’S URBAN EMPLOYEE BASIC MEDICAL INSURANCE ON HEALTHCARE EXPENDITURES AND HEALTH OUTCOMES

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ABSTRACT

At the end of 1998, China launched a government-run mandatory insurance program, the urban employee basic medical insurance (UEBMI), to replace the previous medical insurance system. Using the UEBMI reform in China as a natural experiment, this study identifies variations in patient cost sharing that were imposed by the UEBMI reform and examines their effects on the demand for healthcare services. Using data from the 1991–2006 waves of the China Health and Nutrition Survey, we find that increased cost sharing is associated with decreased outpatient medical care utilization and expenditures but not with decreased inpatient care utilization and expenditures. Patients from low-income and middle-income households or with less severe medical conditions are more sensitive to prices. We observe little impact on patient’s health, as measured by self-reported health status. Copyright © 2015 John Wiley & Sons, Ltd.

Received 18 July 2013; Revised 3 June 2015; Accepted 25 September 2015

KEY WORDS: health insurance; cost-sharing; health expenditure; urban China

1. INTRODUCTION

The effects of health insurance on health care and health have been one of the most important and heated debate topics in health economics for decades. The majority of studies focus on the effect of health insurance provision per se (extensive margin) on the demand for healthcare and health outcomes.1 Nonetheless, relatively few studies focus on the changes in health insurance cost sharing (intensive margin). One possible reason is the difficulty in identifying the causal effects of cost sharing without a controlled experiment due to unobserved characteristics in the presence of self-selection (for a review, see Baicker and Goldman, 2011). The most influential Research and Development Corporation (RAND) Health Insurance Experiment (1974–1981) offers the best experimental evidence on the effects of demand-side cost sharing on utilization and health outcomes (Manning et al., 1987; Newhouse, 1993; Aron-Dine et al., 2013), but such experiments are rarely available.

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1Many studies, including studies that have investigated the effects of Medicare and Medicaid coverage expansion in the U.S. (Card et al., 2008; Finkelstein and McKnight, 2008; Cutler and Gruber, 1996; Currie and Gruber, 2001; Finkelstein et al., 2012) and of National Health Insurance (NHI) in Taiwan (Chen et al., 2007; Chang, 2012), as well as the New Cooperative Medical Scheme (NCMS) (Lei and Lin, 2009; Chen and Jin, 2012) and Urban Resident Basic Medical Insurance (URBMI) in mainland China (Lin et al., 2009; Liu and Zhao, 2014), have evaluated the effects of health insurance provisions per se (i.e., the extensive margin) on the demand for healthcare and on health outcomes.
Subsequent works seek to utilize quasi-experiments to draw causal inferences on the effect of cost sharing (Chandra et al., 2010; Skipper, 2013; Shigeoka, 2014; Chandra et al., 2014). For example, Chandra, Gruber, and McKnight (2010) analyze the effects of an increased co-payment for supplemental insurance for retired public employees in California, but changes in co-payments in their study are small and restricted to office visits and prescription drugs. Schiller (2014) explores a reduction in cost sharing for patients older than 70 years of age in Japan to examine the causal effect on utilization, patient health, and financial protection against risk. As the studies primarily focus on developed economies, little is known about the impact of cost sharing in developing countries.

This study will provide insights on the sensitivity of medical consumption to its price in developing countries. In this paper, we use urban employee basic medical insurance (UEBMI) reform in China as a natural experiment to identify substantial variations in patient cost sharing and investigate their effects on the demand for healthcare services. Prior to the reform, China’s medical insurance system for urban employees provided comprehensive benefits with minimal cost sharing (Liu, 2002). Nearly full insurance coverage led to healthcare services being over-utilized (Yip and Hsiao, 1997). To contain medical expenses and widen the coverage, the Chinese government launched a reform of the health insurance system in 1998. This reform increased cost sharing for patients through a combination of deductible, coinsurance, and individual medical savings accounts (MSAs). Therefore, the UEBMI reform provides a unique opportunity to examine the price sensitivity of healthcare consumption behavior in China. To our knowledge, this study is the first to investigate how increased patient cost sharing in the UEBMI affects utilization, expenditures, and health among urban employees.

Few empirical studies have focused on the UEBMI reform since its inception in 1998 (Yip and Hsiao, 1997; Liu et al., 2002; Dong, 2003; Liu and Zhao, 2006; Ding and Zhu, 2007). The existing studies have limitations that must be considered. First, the UEBMI reform has different effects on different groups of employees. For previously uninsured employees, the UEBMI reform may increase healthcare access and expenditures because of the coverage expansion, while for former enrollees, the reform may decrease their demand for health care because of increased patient cost sharing. Failing to disentangle these two effects on different groups could lead to ambiguous results. Second, a simple pre-post comparison analysis cannot identify the true effects of the UEBMI reform because the results of such analysis are confounded by other supply-side interventions. Finally, some previous studies investigate relatively small pilot areas or short observation periods, and hence, the results of such studies may not be nationally representative.

This study offers several advantages that allow us to address this topic and improve upon the existing literature. First, we use the respondents who never enrolled in any public health insurance for the entire study period as the control group to eliminate the potential influence of other changes during the same period. Second, to assess the effects of cost sharing, rather than of new insurance provision, we restrict our treatment group to respondents who initially participated in the Government Insurance Scheme (GIS) or Labor Insurance Scheme (LIS) and then switched to the UEBMI after the reform. In other words, we exclude individuals who were covered by the UEBMI after the reform but were previously uninsured. Third, the China Health and Nutrition Survey (CHNS) did not incorporate ‘UEBMI’ as a new insurance option until the 2006 wave. Thus, we are unable to determine when the transition from the previous system to the UEBMI occurred for each individual. We employ two complementary methods to address this problem: first, we impute the probability of UEBMI enrollment for each individual based on geographical and time variations in enrollment, and second, we exclude all of the observations with ambiguous insurance status in the 2000 wave. We find broadly similar results using these two methods. Finally, the CHNS data that we employ cover nine provinces that vary substantially in geography and economic development, including both less developed provinces and developed coastal provinces. We fully exploit the information from the pre-UEBMI period (the 1991, 1993, and 1997 waves) and the post-UEBMI period (the 2000, 2004, and 2006 waves) so that we are able to provide more generalized evidence of the UEBMI reform.

We have two main findings. First, we find that increased cost sharing in UEBMI is associated with decreased medical utilization and expenditures. Examining the patterns of access and expenses in more detail, we find that the probability of utilizing outpatient care decreases 7.0%, and that outpatient expenditures decline by 35.2%.
because of the UEBMI reform. In contrast, the effects of UEBMI on inpatient care utilization and expenditures are consistently insignificant and small because of either smaller changes in cost sharing for inpatient care or to smaller responses to cost sharing for more serious medical conditions. Second, we do not find that greater patient cost sharing significantly affects health outcomes, as measured by self-reported status. Because health is a stock, it might still be too early to evaluate the long-term effects of cost sharing on self-reported health (SRH) status. Our findings suggest that moral hazard has a great impact on the demand for health care in China and that overuse has been mitigated by the UEBMI reform via the introduction of a cost-sharing mechanism, to some extent.

The remaining sections are organized as follows. Section 2 briefly introduces the institutional background; Section 3 describes the data and presents the identification strategy; and Section 4 discusses the main results of our study. The final section discusses several policy implications of our findings.

2. URBAN EMPLOYEE BASIC MEDICAL INSURANCE

Before the reform, China’s medical insurance system for urban employees primarily consisted of the GIS and LIS. Both schemes provided comprehensive benefits with minimal cost sharing for employees in the public sector, state-owned enterprises, collectively owned enterprises, and partial coverage for their dependents. The nearly full insurance coverage of GIS and LIS coupled with a fee-for-service payment method on the supply side led to healthcare services being over-utilized, resulting in an excessive escalation of healthcare costs and inefficient resource allocations. Although these two programs covered only 15% of the total population in 1993, they accounted for 36% of total health spending and approximately two-thirds of all public spending on health (World Bank, 1996).

To contain medical costs and widen insurance coverage, the Chinese government launched a health insurance reform in 1998 by merging the GIS and LIS systems into the new UEBMI system. UEBMI is a government-run mandatory insurance program based on employment. UEBMI began as a pilot program in 1994 and rapidly expanded from 40 of 349 prefecture-level cities in 1998 to 339 cities in 2001 and to most cities in 2002. By the end of 2002, 69.3m workers were covered by the UEBMI; this number is equivalent to 96% of urban employees in public sectors and enterprises (72.1m).3

The UEBMI is the largest social medical insurance plan in China in terms of fund revenue and surplus and is primarily financed by payroll taxes paid by both employers (6%) and employees (2%). The contributions of employers are divided into two accounts: 70% goes into a social pooling account (SPA), and 30% is deposited into individual medical savings accounts (MSAs). All of the funds paid by employees are deposited into their MSAs.

The SPA is administered by the local government and primarily used for inpatient services and outpatient services for catastrophic illness. MSAs are mainly used for outpatient services, as well as for drug purchases from contracted providers. Before the SPA pays inpatient expenditures, however, patients must first pay a deductible (approximately 10% of average annual wages of a local urban worker) and coinsurance (usually 20–30%). When the maximum benefits (fourfold average annual wages) have been paid by an SPA or an individual’s MSA is exhausted, then the individual must pay his or her expenses out-of-pocket. Unspent funds in MSAs can be carried forward to the next year. Any remaining balance of an enrollee’s MSA at death can become part of his or her estate.

2The beneficiaries only paid fees and expenditures for registration, plastic surgery and orthodontics out of pocket, and the GIS and LIS covered the rest. However, the reimbursement plan was developed and implemented by each local government or state-owned enterprises. It is difficult to find the data and estimate the average level of cost-sharing in the GIS and LIS system. According to surveys carried out by the Chinese Ministry of Health in the city of Zhenjiang, Liu and Zhao (2006) report that the out-of-pocket share of total healthcare costs was approximately 9% in the GIS and LIS systems two years before the UEBMI reform.

3The data resource is China Labor and Social Security Yearbook, 2000–2006. See Table I for more information.
Medical savings accounts were initiated in Singapore and then experimented with in USA, China, and South Africa (Hanjvoravongchai, 2002). MSAs can reduce the waste from the excessive use of generously insured care by providing incentives for patients to be more cost-conscious in their consumption of medical services (Keeler et al., 1996). Compared with the GIS and LIS, the UEBMI increases cost sharing for patients through a combination of deductibles, coinsurance, and individual MSAs. As the reform raises individuals’ out-of-pocket spending for medical services, both the utilization of medical services and health outcomes may change. However, few studies are available in the literature.

In Figure 1, we plot the changes in cost sharing that occurred during the reform period using CHNS data. Before the reform, approximately 30–40% of outpatient medical expenditures were paid out-of-pocket by LIS beneficiaries. After the reform, out-of-pocket payments accounted for a greater proportion of spending; this proportion amounted to 86% in 2006. In contrast, the share of inpatient expenditures paid by patients increased only modestly, from 20 to 35%, and fell to 28% in 2006. Thus, MSAs, together with higher deductibles and coinsurance payments, increased the actual level of patient cost sharing, particularly for outpatient care, and thereby, created strong incentives for patients to save their money by choosing healthcare services in a cost-conscious manner.

The LIS was replaced by the new UEBMI a decade ago. Nonetheless, the integration of GIS is still not complete. Some central government agencies and several provincial government agencies have not participated in the UEBMI simply because government civil servants would like to enjoy nearly free medical care under the GIS (Xu et al., 2007). Although cost sharing for GIS beneficiaries has increased slightly since the UEBMI reform, and the out-of-pocket spending has also increased, the GIS remains the most generous public health insurance program in China.

Although UEBMI has expanded coverage for employees, there are still a large number of uninsured urban residents due to lack of formal employment. To provide health protection for those people, the government launched the urban resident basic medical insurance (URBMI) program in 2007. For uninsured rural residents, the New Cooperative Medical Scheme (NCMS) was implemented in 2003.

So far, China has achieved nearly universal health insurance coverage. By 2011, 1.28bn people, more than 95% of the population of China (National Bureau of Statistics of China, 2012), were covered by public health insurance, namely the UEBMI, URBMI, and the NCMS. As stated by Yip et al. (2012), accomplishing nearly universal insurance coverage in such a short period is commendable, but transforming insurance coverage into cost-effective services is difficult. It is a real challenge for policymakers to develop a fair, affordable, and sustainable system of social health insurance. Our study sheds light on how to control the over-consumption of medical services and improve the efficiency of public health care spending.
3. DATA AND IDENTIFICATION

3.1. Data

China Health and Nutrition Survey data in this study are provided by the Chinese Center for Disease Control and Prevention and by the Population Research Center of the University of North Carolina in USA. The first round of the CHNS was conducted in 1989. Eight subsequent waves followed, in 1991, 1993, 1997, 2000, 2004, 2006, 2009, and 2011. The household and individual surveys contain modules on respondent demographics, health, nutrition, and income. Since 1991, detailed information has been collected on healthcare utilization and health-related behaviors. In this study, data from six CHNS waves surrounding the UEBMI reform are examined, including data from the 1991–1997 waves, which were collected before the reform, and data from the 2000–2006 waves, which were collected following the enactment of UEBMI.

The UEBMI reform affects the medical care utilization and health outcomes differently in different population groups. After the reform, UEBMI provided insurance coverage for the previously uninsured and reduced their out-of-pocket spending. However, for individuals with former generous GIS or LIS coverage, the reform increased their cost sharing through coinsurance and MSAs. The aim of this study is to estimate the effects of increased cost sharing imposed by the UEBMI reform; therefore, we exclude respondents who were covered by UEBMI in the 2006 wave but were uninsured before. The final sample consists of 1,764 urban respondents in each pre-UEBMI and post-UEBMI period. A total of 382 respondents who initially enrolled in GIS or LIS but switched to the UEBMI in 2006 are classified as the treatment group, and 1,382 respondents who never enrolled in any public health insurance throughout the entire study period are classified as the control group.

The respondents in our sample were interviewed at least twice, that is, at least once in each period, yielding an unbalanced panel of 7,065 observations. The main variables and summary statistics are presented in Table II.

3.2. Variables

The main dependent variables in our study are the medical utilization and medical expenditures. The utilization variables take a value of one when total expenses, outpatient, or inpatient expenses are positive and take a value of zero otherwise. The expenditure variables are the amount of medical spending in the previous 4 weeks (in 2011 Ren Min Bi).

The goals of the UEBMI reform are to curb the overutilization of healthcare services and to improve the efficiency and equity of medical resource allocation. Nonetheless, medical cost containment should not decrease appropriate healthcare utilization nor deteriorate the population’s health. However, defining appropriate care requires detailed information about clinical situations and their interventions for each patient (Sanmartín et al., 2008), which is not available in CHNS data. Thus, we make a crude assumption that if patients are more likely to experience adverse health consequences after the reform, they may suffer from a lack of necessary care as a result of increased cost sharing; otherwise, they may just reduce the use of inappropriate care. For this purpose, we examine not only the effects of UEBMI on medical utilization and spending but also on health outcomes, which are measured by SRH status.

The key explainable variable is whether an individual is enrolled in UEBMI. Ideally, after the enactment of UEBMI in 1998, the CHNS would have added UEBMI as a new medical insurance option. Unfortunately, however, the survey did not update this question until the 2006 wave, nearly 8 years after the inception of the UEBMI. Thus, we do know that all of the treated switched from the previous GIS/LIS system to the new UEBMI system by 2006, but we do not know when these transitions occurred. Because urban employees who were actually covered by the UEBMI in the 2000 and 2004 waves could not choose this option, they probably instead misreported that they had the previous insurance plans.

4Beginning in the 1991 wave, CHNS respondents were asked whether they had any medical insurance. If they answered yes, the respondents were then asked which of the following types of medical insurance they had: GIS, LIS, Cooperative insurance, or other insurance. In the 2006 wave, the UEBMI replaced LIS as an option.
We employ two complementary methods to correct for the UEBMI misreporting. First, we follow the Brown and Goolsbee (2002) procedure by imputing the probability of UEBMI enrollment for each individual using geographical and time variations in the UEBMI coverage. We use official statistics to calculate this measure. Numbers of UEBMI enrollees for each province in each year are published in the China labor and social security yearbook 2000–2006. As shown in Table I, we calculate the coverage as the ratio of workers covered by the UEBMI of total urban employment in public sectors and enterprises in a given province. We then match the UEBMI coverage data to the CHNS data and use this measure as the probability that the individual makes the transition from the previous GIS/LIS to the current UEBMI. For example, for those individuals in our treatment group from Liaoning province, the key independent variable UEBMI takes a value of 0.1662 for the 2000 wave and a value of 1 (we top-coded the probability at 1) for the 2004 wave.

The second approach we use is to exclude observations with ambiguous insurance status. As previously mentioned, UEBMI expanded rapidly, from being implemented in 40 cities of a total of 349 prefecture-level cities in 1998 to 339 cities in 2001 and most cities in 2002. As shown in Table I, all surveyed provinces (except for Guizhou) had more workers covered by the UEBMI than the reported local urban employment in the government, institutions, and enterprises in 2004. Even in Guizhou province, the coverage rate is greater than 95%. Thus, it is reasonable to assume that the vast majority of urban employees with previous GIS/LIS transitioned into the new UEBMI by this time. Therefore, for all treated individuals, the key independent variable UEBMI takes the value of 1 in the 2004 wave. However, the year 2000 is in the middle of the transition, and the extent to which people were enrolled in the UEBMI at that time is unknown. Thus, we exclude all observations in the 2000 wave and instead use data from the 2004 and 2006 waves for the post-UEBMI period. Although this exclusion causes our sample to shrink to 5013 observations, it is a cleaner specification. Moreover, this specification provides assurance that our results are not driven by patients who stockpiled drugs or sought care in anticipation of the policy change. Such behavior may magnify the reduction in utilization and expenditures after the UEBMI reform, and hence, lead to an overestimation of the effect. Therefore, we will use this specification as our baseline for the remaining results.

Following the literature (Chen et al., 2007; Ding and Zhu, 2007; Chang, 2012; Liu and Zhao, 2014), we also control for a set of demographic, socioeconomic, and health characteristics in the model. The demographic characteristics that we consider are age, gender, marital status, and residential area; the socioeconomic characteristics that we control for are education and household income level. The health variables include SRH status and chronic diseases. We divide the SRH status into five groups: great, good, fair, poor, and

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Table I. Urban employee basic medical insurance coverage from 1999 to 2005

<table>
<thead>
<tr>
<th></th>
<th>1999 (%)</th>
<th>2000 (%)</th>
<th>2001 (%)</th>
<th>2002 (%)</th>
<th>2003 (%)</th>
<th>2004 (%)</th>
<th>2005 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>18.25</td>
<td>36.89</td>
<td>74.59</td>
<td>96.08</td>
<td>111.19</td>
<td>124.58</td>
<td>133.37</td>
</tr>
<tr>
<td>Liaoning</td>
<td>8.81</td>
<td>16.62</td>
<td>55.94</td>
<td>137.26</td>
<td>138.63</td>
<td>153.87</td>
<td>170.03</td>
</tr>
<tr>
<td>Heilongjiang</td>
<td>6.26</td>
<td>8.79</td>
<td>54.49</td>
<td>71.94</td>
<td>80.76</td>
<td>102.62</td>
<td>117.65</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>7.85</td>
<td>48.48</td>
<td>77.05</td>
<td>122.01</td>
<td>143.02</td>
<td>174.54</td>
<td>190.68</td>
</tr>
<tr>
<td>Shandong</td>
<td>30.34</td>
<td>37.44</td>
<td>76.63</td>
<td>97.38</td>
<td>107.23</td>
<td>117.57</td>
<td>110.19</td>
</tr>
<tr>
<td>Henan</td>
<td>5.38</td>
<td>49.27</td>
<td>79.37</td>
<td>93.66</td>
<td>100.32</td>
<td>105.91</td>
<td>113.61</td>
</tr>
<tr>
<td>Hubei</td>
<td>5.02</td>
<td>34.87</td>
<td>61.49</td>
<td>80.85</td>
<td>94.19</td>
<td>100.81</td>
<td>106.66</td>
</tr>
<tr>
<td>Hunan</td>
<td>1.75</td>
<td>34.94</td>
<td>111.49</td>
<td>124.01</td>
<td>136.20</td>
<td>158.55</td>
<td>154.66</td>
</tr>
<tr>
<td>Guangxi</td>
<td>3.99</td>
<td>4.89</td>
<td>73.95</td>
<td>95.23</td>
<td>113.05</td>
<td>128.49</td>
<td>130.17</td>
</tr>
<tr>
<td>Guizhou</td>
<td>0.00</td>
<td>0.00</td>
<td>20.93</td>
<td>60.28</td>
<td>86.32</td>
<td>95.26</td>
<td>106.89</td>
</tr>
</tbody>
</table>

We calculate coverage as the ratio of the urban employee basic medical insurance enrollees to urban employment in the public sectors and enterprises in a given province. Data is from the China labor and social security yearbook, 2000–2006.

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It is true that the coverage above 100% does not necessarily mean that every worker with LIS has made the transition into the UEBMI because the UEBMI also increased coverage for the previously uninsured. However, it is much easier to persuade an employer to transition from self-insurance to social insurance than to ask an employer to provide additional benefits. Thus, in the early stages, most UEBMI enrollees were former GIS/LIS enrollees.
We measure the incidence of the chronic disease by a diagnosis of hypertension, diabetes, heart disease, and/or stroke.

### 3.3. Descriptive statistics

Table II illustrates the outcomes and characteristics of the UEBMI beneficiaries (treated) and the non-beneficiaries (control) before and after the enactment of the UEBMI reform. There were differences in health utilization and expenditures between the treated and control groups before the reform, but the gaps narrowed after the reform. Before the reform, the enrollees were 3.2% (0.089–0.057) more likely to use medical care and had 86% ((0.067–0.036)/0.036) higher total spending. After the reform, these numbers declined to 1.7% (0.144–0.127) and 44% ((0.196–0.136)/0.136), respectively. These exploratory results are supported by the regression analyses discussed in the next section.

Compared with the treatment group, respondents in the control group were more likely to be women, younger, less educated, and have lower household incomes. They were also less likely to suffer from chronic conditions, as shown in Table II.

SRH missing. We measure the incidence of the chronic disease by a diagnosis of hypertension, diabetes, heart disease, and/or stroke.

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SRH missing. In the 1991 and 1993 waves, the survey did not ask for self-reported health status. This information has been collected since the 1997 wave. Considering that the missing SRH is mainly because of the design of the survey, not of the self-selection by the respondents, we classify SRH non-reporters as the fifth group, so that we can fully utilize the sample information. To check the robustness of the results, we restrict the sample to those who report SRH in both periods as one referee suggested; the results are quantitatively similar.

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Medical expenditure and household income are all inflated to the 2011 price level.
UBEML, urban employee basic medical insurance.

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Health Econ. (2015)

DOI: 10.1002/hec
chronic diseases (e.g., hypertension and diabetes) but more likely to report poor health status. It is not surprising that individuals in disadvantaged socioeconomic conditions were more likely to be uninsured because the urban public health insurance programs were primarily employment-based during the study period.

3.4. Identification strategy

The UEBMI reform in China aims to address the moral hazard problem by establishing a cost-sharing mechanism for patients, particularly through individual savings accounts that can be used to pay for outpatient treatment. To evaluate whether reform has resulted in expectable achievements, we must investigate whether the reform has reduced the overuse of medical resources.

However, a simple pre-post comparison analysis could not identify the true UEBMI reform effects because the results are confounded by other supply-side interventions, such as changes in provider payment methods and price regulations. To isolate the insurance effect from the impact of other policies, we specify a reduced-form relationship and conduct a difference-in-difference (DID) analysis, with the uninsured as the control group and the insured as the treatment group. This strategy compares the post-reform and pre-reform changes in medical utilization and expenditures for the treatment group to the corresponding changes for the uninsured over the same period. These two changes produce a negative DID if the UEBMI reform effectively controls the overuse of medical services. Unlike voluntary enrollment of the URBMI and NCMS, the UEBMI enrollment is mandatory. Individuals have little influence on the UEBMI enrollment decision after they are employed. Therefore, it is reasonable to assume that the UEBMI reform is exogenous to individuals. To control for time-invariant unobservables, we take advantage of the longitudinal data and specify the individual fixed effects. We denote an individual by \( i \), the residential province by \( s \), and the year by \( t \). Following the literature (Chen et al., 2007; Aron-Dine et al., 2013; Liu and Zhao, 2014), the baseline DID model takes the following form:

\[
Y_{ist} = \beta_0 + \beta_1 \text{UEBMI}_{ist} + \beta_2 X_{ist} + \tau_t + \alpha_{st} + \mu_i + \epsilon_{ist}
\]  

where an outcome \( Y_{ist} \) (i.e., medical utilization or expenditures) is the dependent variable. We transform the medical expenditure data, which is skewed, by taking the natural logarithm. The key explanatory variable \( \text{UEBMI}_{ist} \) indicates individual \( i \)'s UEBMI enrollment status at time \( t \) (specifically, an interaction between an indicator variable for being in the treated group, who experience a substantial increase in cost sharing, and an indicator variable for being in the post-UEBMI period). \( X_{ist} \) is a vector of individual observable characteristics. We include year fixed effects (\( \tau_t \)) and a full set of province-by-year interactions (\( \alpha_{st} \)) to account for any effects of time trends or province-specific time trends. We also include individual fixed effects (\( \mu_i \)) to control for time-invariant unobservable confounders. In all of our analyses, we cluster the standard errors on the household identifier.

The key identifying assumption here is that other factors exert identical influences on the control group and treatment group so that all of the changes in utilization and expenditures can only be attributed to the UEBMI reform. However, it has been reported that in Zhenjiang city, where the UEBMI is strictly regulated by a local social insurance agency, hospitals are constrained in making profits from insured patients; thus, hospitals turn to making profits from uninsured patients and give such patients unnecessary checkups and drugs (Development Research Center of the State Council, 2005). Such different influences alone will also lead to a relative reduction in care use and costs for the insured, which will cause us to overstate the effect of cost sharing. In contrast, a recent study by Lu (2014) examines doctors’ prescription decisions using a field experiment in China and finds that when expecting revenues from drug prescriptions, doctors write 43% more expensive prescriptions to insured patients than to uninsured patients. Such behavior will then lead us to underestimate the effect of cost sharing. Taken together, the impacts of supply-side behavior on utilization and expenditures are ambiguous and may offset each other.
4. EMPIRICAL RESULTS

4.1. Urban employee basic medical insurance effects on healthcare utilization and expenditure

Table III shows the treatment effects of the UEBMI reform on several measures of healthcare utilization and expenditures. Each cell reports a coefficient of UEBMI and its standard error (in parentheses). The first column shows the fixed effect estimates of the intent-to-treat (ITT) effect of UEBMI for the target population. Columns (2) and (3) report the impact of the UEBMI reform using provincial UEBMI coverage data and no ambiguous insurance status data, respectively, to correct for UEBMI misreports.

In Table III, the first panel examines the impact of the UEBMI reform on medical utilization. The results indicate a 5.0–9.2 percentage point decrease in the probability of an individual’s utilization of formal medical services due to the UEBMI reform. As expected, the ITT estimate tends to underestimate the true effect of the reform because the ITT estimate assumes that all individuals in the treatment group had been treated since 2000. In fact, the UEBMI system was not available in all of the cities until the end of 2002. Therefore, the ITT estimate mixes the effect of the UEBMI reform with the effect of the previous GIS/LIS.

Because the CHNS questionnaire was not updated until several years after the enactment of UEBMI, we are not able to determine from the survey exactly when the GIS/LIS enrollees became UEBMI enrollees. Thus, to clearly identify the impact of the UEBMI reform, we employ two complementary strategies. First, we use provincial UEBMI coverage to proxy the possibility of UEBMI enrollment for each individual in that province for that year. The second approach we use is to exclude observations with ambiguous insurance status. Thus, we exclude all observations from the 2000 wave, and instead, utilize the 2004 and 2006 waves as the post-UEBMI period. We find broadly similar results using these plausible alternative models: the possibility of formal healthcare utilization decreases 8.7–9.2 percentage points because of the UEBMI reform.

Panels (2) and (3) present the results for outpatient care and inpatient care separately. As mentioned previously, the UEBMI reform primarily increased the cost sharing of outpatient care; in contrast, the cost sharing of inpatient care remained relatively stable. The results for outpatient care exhibit the same pattern as those for all health care. The probability of outpatient care utilization decreased 6.9–7.0 percentage points because of the UEBMI reform. In contrast, the effects of the UEBMI on inpatient care utilization are consistently insignificant and small, suggesting either smaller changes in cost sharing for inpatient care or smaller responses to cost sharing for more serious medical conditions.

Table III. Effects of UEBMI on medical care utilization and expenditures

<table>
<thead>
<tr>
<th>Utilization</th>
<th>Pre-UEBMI (91–97)</th>
<th>Pre-UEBMI (91–97) using coverage</th>
<th>Pre-UEBMI (09–06)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Post-UEBMI (00–06)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Utilization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-0.050** (0.023)</td>
<td>-0.092*** (0.025)</td>
<td>-0.087** (0.027)</td>
</tr>
<tr>
<td>Outpatient</td>
<td>-0.039** (0.018)</td>
<td>-0.069** (0.021)</td>
<td>-0.070** (0.023)</td>
</tr>
<tr>
<td>Inpatient</td>
<td>-0.004 (0.007)</td>
<td>0.0003 (0.009)</td>
<td>0.001 (0.010)</td>
</tr>
<tr>
<td>Spending</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-0.213* (0.114)</td>
<td>-0.391** (0.135)</td>
<td>-0.357** (0.144)</td>
</tr>
<tr>
<td>Outpatient</td>
<td>-0.199** (0.084)</td>
<td>-0.354*** (0.100)</td>
<td>-0.352** (0.108)</td>
</tr>
<tr>
<td>Inpatient</td>
<td>0.003 (0.056)</td>
<td>0.045 (0.072)</td>
<td>0.041 (0.078)</td>
</tr>
<tr>
<td>N</td>
<td>7065</td>
<td>7065</td>
<td>5013</td>
</tr>
</tbody>
</table>

UEBMI, urban employee basic medical insurance. In each cell, we report the effect of the UEBMI reform. Other control variables include individual characteristics such as age, marital status, education, household income, self-reported health status, and chronic illnesses. We also control for province by wave dummy variables, year fixed effects, and individual fixed effects. Cluster-robust standard errors are reported in parenthesis.

***p<0.01, **p<0.05, *p<0.1.
Panels (4) to (6) report results for logged medical expenditures. The ITT estimate suggests a 21.3% decline in average total medical spending for the UEBMI target population. After correcting the misreports, there is a sizeable and statistically significant reduction of 35.7–39.1% of total medical expenditures. A similar pattern is again observed for outpatient spending but not for inpatient spending. The UEBMI reform significantly reduced outpatient expenditures by 35.2–35.4%. The increased cost sharing associated with the UEBMI had no impact on inpatient expenditures; this finding is consistent with the results of a study by Aron-Dine et al. (2013) using the RAND health insurance experiment data.

Table IV displays our baseline results about the UEBMI reform and other characteristics’ effects on healthcare utilization and expenditures. The estimation results of control variables are consistent with the literature. For medical utilization and expenses, the most predictive variables are self-perceived health status and the presence of any chronic diseases (Chen et al., 2007). Compared with those with poor health status, respondents who report better health status are not only less likely to use medical services but also spend less on those services. We find that the total medical expenses of people with high blood pressure and heart disease are 55.4 and 160% greater, respectively, than those of people without these illnesses.

4.2. Heterogeneous effects of urban employee basic medical insurance

Table V shows the treatment effects of the UEBMI reform for different subgroups using the baseline specification. As shown previously, the sensitivity of medical consumption to its price varies with patients’ health conditions. If cost-sharing mechanisms in the UEBMI system lower the actual reimbursement rate and insured patients first reduce their excessive demands, we should find that such an effect is stronger for less serious medical conditions, such as the common cold. We further restrict the sample to those individuals who ever had symptoms, for example, fever, sore throat, or cough, during the previous 4 weeks. As shown in column 1, patients suffering from such less severe medical conditions are more responsive because they are more likely to take some unnecessary diagnostic services or drugs.

In column (2), we focus on working-age adults and exclude the respondents older than 60 years of age. People are still covered by the UEBMI when they are retired but are not covered when they are unemployed. We find that the UEBMI reform has broad negative effects on total and outpatient utilization and expenditures for working-age adults, and their probabilities of outpatient care utilization decrease 6.6 percentage points, and their outpatient expenditures fall by 25.4%. The results suggest that although working-age adults may be less price sensitive than the elderly, the baseline results in Table III could not be driven only by the elderly. These findings are consistent with Skipper’s (2013) results on the price elasticity of demand for prescription drugs in Denmark. The elderly are more price sensitive in his study.

In columns (3) to (5), we examine the differential effects of the UEBMI reform for low-income (30th percentile or below), middle-income (between the 30th and 70th percentiles), and high-income (70th percentile or above) households. The results show that the increased cost sharing of the UEBMI has stronger negative impacts for low-income and middle-income groups: the two groups’ probabilities of utilizing the outpatient care decrease 23.4 and 6.5 percentage points, and their outpatient spending declines by 63.5 and 41.4%, respectively. However, the UEBMI reform has no significant effect on the outpatient care utilization and expenditures for high-income households. The MSA balances, mainly used for the outpatient services, are typically proportional to wages. The low-income and middle-income groups are likely to use up their MSA funds more quickly and to incur larger out-of-pocket payments. As a result, the low-income and middle-income groups are more sensitive to changes in cost sharing. These findings are consistent with those of Liu and Zhao (2014), who investigate the effects of the URBMI provision and find that the high-income group is less responsive to price changes.

7Excluding the respondents with ambiguous insurance status in the 2000 wave, we obtain a sample of 5013 respondents from the other five waves. Column (3) in Table III and Table IV presents the results based on this sample.
Table IV. Estimation of UEBMI and other characteristics’ effect: pre-UEBMI (91–97) versus post-UEBMI (04–06)

<table>
<thead>
<tr>
<th></th>
<th>Utilization</th>
<th></th>
<th>Spending</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Outpatient</td>
<td>Inpatient</td>
<td>Total</td>
<td>Outpatient</td>
</tr>
<tr>
<td>UEBMI</td>
<td>-0.087** (0.027)</td>
<td>-0.070** (0.023)</td>
<td>-0.001 (0.010)</td>
<td>-0.357** (0.144)</td>
<td>-0.352** (0.108)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.180 (0.118)</td>
<td>0.063 (0.100)</td>
<td>-0.097** (0.041)</td>
<td>-0.930 (0.630)</td>
<td>0.154 (0.486)</td>
</tr>
<tr>
<td>Married</td>
<td>-0.015 (0.021)</td>
<td>0.020 (0.019)</td>
<td>-0.003 (0.009)</td>
<td>-0.064 (0.112)</td>
<td>-0.086 (0.087)</td>
</tr>
<tr>
<td>Years of schooling</td>
<td>-0.002 (0.005)</td>
<td>0.002 (0.004)</td>
<td>0.000 (0.001)</td>
<td>-0.006 (0.024)</td>
<td>0.006 (0.021)</td>
</tr>
<tr>
<td>Log(1+household income per capita)</td>
<td>0.010** (0.005)</td>
<td>0.008** (0.004)</td>
<td>0.001 (0.001)</td>
<td>0.058** (0.024)</td>
<td>0.045** (0.020)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.098** (0.030)</td>
<td>0.098*** (0.026)</td>
<td>0.026* (0.014)</td>
<td>0.554*** (0.165)</td>
<td>0.356** (0.135)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.032 (0.063)</td>
<td>0.113* (0.064)</td>
<td>0.018 (0.031)</td>
<td>0.298 (0.352)</td>
<td>0.228 (0.299)</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>0.174 (0.109)</td>
<td>-0.063 (0.070)</td>
<td>0.175** (0.087)</td>
<td>1.600** (0.793)</td>
<td>0.263 (0.484)</td>
</tr>
<tr>
<td>Stroke</td>
<td>0.031 (0.083)</td>
<td>0.041 (0.069)</td>
<td>0.034 (0.054)</td>
<td>0.442 (0.570)</td>
<td>0.166 (0.415)</td>
</tr>
<tr>
<td>Great</td>
<td>-0.250*** (0.037)</td>
<td>-0.260*** (0.039)</td>
<td>-0.066** (0.020)</td>
<td>-1.471*** (0.208)</td>
<td>-0.887*** (0.182)</td>
</tr>
<tr>
<td>Good</td>
<td>-0.244*** (0.036)</td>
<td>-0.245*** (0.037)</td>
<td>-0.067*** (0.020)</td>
<td>-1.421*** (0.201)</td>
<td>-0.832*** (0.176)</td>
</tr>
<tr>
<td>Fair</td>
<td>-0.177*** (0.035)</td>
<td>-0.200*** (0.036)</td>
<td>-0.056** (0.019)</td>
<td>-1.058*** (0.201)</td>
<td>-0.663*** (0.179)</td>
</tr>
<tr>
<td>Self-reported health missing</td>
<td>-0.097 (0.080)</td>
<td>-0.155* (0.084)</td>
<td>-0.060** (0.019)</td>
<td>-0.661* (0.362)</td>
<td>-0.364 (0.341)</td>
</tr>
<tr>
<td>N</td>
<td>5013</td>
<td>5013</td>
<td>5013</td>
<td>5013</td>
<td>5013</td>
</tr>
</tbody>
</table>

All regressions include province by wave dummy variables, year fixed effects, and health status missing dummy. Cluster-robust standard errors are reported in parenthesis.

***p<0.01, **p<0.05, *p<0.1

UEBMI, urban employee basic medical insurance.
4.3. Urban employee basic medical insurance effects on health outcome

We find that the UEBMI reform reduces healthcare utilization and expenditures through cost-sharing mechanisms. Nonetheless, little is known about whether the reform has any detrimental effect on health status. To answer this question, we investigate the impact of the reform on health outcomes, as measured by self-reported poor health status. The dependent variable takes a value of one if the SRH is poor and of 0 otherwise. For the precision of the dependent variable, we restrict our sample to those who report self-rated health in both periods.8

In contrast to the effects on utilization and expenditures, we do not observe any evidence that the UEBMI reform affects health outcomes. As shown in Table VI, the UEBMI reform has a consistently negative but

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8As mentioned in Footnote 6, the CHNS 1991 and 1993 did not collect the information on self-reported health status. By excluding SRH non-reporters, the sample size of columns (1) and (2) of Table VI is reduced from 7065 observations (the full sample) to 5030 observations; and the sample size of column (3) is reduced from 5013 observations (the baseline) to 3404 observations.
statistically insignificant association with self-perceived poor health status in all specifications. The RAND experiment also finds that higher patient payments significantly reduce medical care utilization, without any adverse health outcome on average (Newhouse, 1993). However, the long-term health consequences of increased cost sharing are unclear.

Taken together, these results suggest that greater patient cost sharing instituted by the UEBMI reform has significantly reduced both the medical care utilization and expenditures, without any adverse health outcome. Therefore, much of the savings may be derived from decreased excessive use, such as unnecessary high-tech diagnostic procedures or expensive drugs. Hence, increased cost sharing can help reduce excessive medical demands and moral hazard to some extent.

5. CONCLUSION REMARKS

It is difficult in identifying the causal effects of cost sharing without a controlled experiment because of unobserved characteristics in the presence of self-selection. This paper attempts to contribute to the literature by using the UEBMI reform in China as a natural experiment and examining the effect of increased patient cost sharing instituted by the UEBMI. We exploit the changes in healthcare consumption and health status both across groups (the treated group vs. the control group) and across time (before and after the UEBMI reform) to estimate the causal effect of the UEBMI reform.

There are two main findings of this study. First, we find that increased cost sharing in the UEBMI is associated with a decrease in medical care utilization and expenditures. After examining the patterns of access and expenditures in more detail, we find that the probability of utilizing outpatient care decreases by 7.0 percentage points and that outpatient expenditures decline by 35.2% because of the UEBMI reform. In contrast, the effects of the UEBMI on inpatient care utilization and expenses are consistently insignificant and small either because cost sharing changes for inpatient care are smaller than those for outpatient care or because people exhibit smaller sensitivity to cost sharing under more serious medical conditions.

Second, we do not find that the greater patient cost sharing significantly affects health outcomes, as measured by self-reported poor health. Because health is a stock, it might be still too early to be able to determine the long-term effects of cost sharing on health outcomes. These findings suggest that moral hazard has great impacts on the demand for health care in China, and that overuse has been mitigated after the reform by the introduction of a cost-sharing mechanism, to some extent.

The study also has strong policy implications. According to an article published in The Lancet (Hu et al., 2008), the most important health-related challenges that will be faced in the 21st century are how to finance, provide, and organize health care. China has preliminarily established a social health insurance system that covers the largest population in the world. The development of a fair, affordable, and sustainable system of social health insurance offers real challenges for policymakers. Our study indicates that a restraint mechanism of the public medical insurance with appropriate supply-side controls may be an effective method of mitigating the overconsumption of medical services and promoting the efficiency of medical resource allocation. Thus, the government should accelerate the integration of the GIS into the UEBMI to improve both efficiency and equity.

The results of this study should be interpreted with caution because they are subject to some limitations. First, we could not directly measure the coinsurance rate using CHNS data. Thus, in contrast with previous literature (Manning et al., 1987), we could not precisely estimate the price elasticity of healthcare demand. Second, because the UEBMI run less than two decades, it may still be too early to assess its long-term effects on health.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.
ACKNOWLEDGEMENTS

The authors are grateful to the seminar participants at Peking University for helpful comments. Comments from the editor Thomas DeLeire and from anonymous referees have greatly improved this paper. Feng Huang thanks financial support from the Key Laboratory of Mathematical Economics (SUFE) (No. 201301KF01), the Natural Science Foundation of China (No. 71203133), the Chinese Ministry of Education Research Project of Humanities and Social Sciences (No. 12YJC790067), the Shanghai Pujiang Talents Program (No. 12PJJC049). This research uses data from China Health and Nutrition Survey (CHNS). We thank the National Institute of Nutrition and Food Safety, China Center for Disease Control and Prevention, Carolina Population Center, the University of North Carolina at Chapel Hill, the NIH (R01-HD30880, DK056350, and R01-HD38700) and the Fogarty International Center, NIH for financial support for the CHNS data collection and analysis files from 1989 to 2006 and both parties plus the China-Japan Friendship Hospital, Ministry of Health for support for CHNS 2009 and future surveys. The authors alone are responsible for any findings and errors.

REFERENCES


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