

Original Paper

The Impact of Outpatient Pooling Reform on Patients' Out-of-Pocket Burden: Evidence from China

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Abstract

Objective: This study aims to systematically evaluate the effects of the outpatient pooling reform under the Urban Employee Basic Medical Insurance (UEBMI) in Chongqing, focusing on patient utilization outcomes in a tertiary hospital setting. The primary objective is to assess the extent to which the policy reduces patients' outpatient financial burden. In addition, through heterogeneity analysis of chronic disease patients and elderly populations, the study further examines the institutional effectiveness of the policy in providing targeted protection for high-need groups.

Methods: This study is based on comprehensive outpatient claims data from a large tertiary hospital in Chongqing, covering the period from January 2023 to December 2024. The dataset comprises approximately 600,000 insured individuals and 1.67 million outpatient visit records, forming a high-frequency micro-level panel dataset. First, an interrupted time series (ITS) model is employed to identify macro-level trends and immediate structural breaks at the time of policy implementation, with Newey–West heteroskedasticity and autocorrelation consistent standard errors applied to correct for serial correlation. Second, a two-way fixed effects (TWFE) model is constructed to track within-individual behavioral changes before and after policy implementation, controlling for individual heterogeneity and seasonal effects to identify the net micro-level impact of the policy. Finally, robustness checks are conducted through placebo tests using pseudo-policy implementation dates and by replacing the age threshold used to define elderly status.

Results: The empirical analysis yields several key findings. In terms of financial burden, the policy demonstrates a significant and robust reduction effect. The ITS results show an immediate decline of 12.5 percentage points in the self-payment ratio (95% CI: -0.169, -0.080). The TWFE model indicates that, for the same individual, the self-payment ratio decreases by an average of 24.2 percentage points, while

total out-of-pocket expenditure declines by more than 58%. Heterogeneity analysis further reveals that the policy provides disproportionately greater protection for high-need populations. Specifically, the reductions in total out-of-pocket expenditure for chronic disease patients and elderly individuals exceed those of the baseline group by an additional 5.3% and 5.1%, respectively.

Conclusion: *This study demonstrates that the outpatient pooling reform under UEBMI in Chongqing has led to a substantial reduction in patients' outpatient financial burden. By incorporating pooled fund reimbursement, the policy effectively lowers out-of-pocket payments, with particularly pronounced benefits observed among elderly individuals and patients with chronic diseases.*

Keywords

Urban Employee Basic Medical Insurance, outpatient pooling, policy evaluation

1. Introduction

China's social health insurance system is undergoing a fundamental structural transition from a model that prioritizes inpatient care to one that balances both inpatient and outpatient services. Historically, the Urban Employee Basic Medical Insurance (UEBMI) was centered on inpatient coverage. Outpatient expenses were primarily funded through individual accounts or out-of-pocket (OOP) payments by the insured, with a notable absence of a unified pooling fund arrangement. This institutional design created a significant "inpatient-leaning" bias. However, with rapid economic development, an aging population, and the rising burden of chronic diseases, there is a surging demand for frequent and continuous outpatient services. The inherent limitations of individual accounts in terms of protection capability have increasingly become a systemic barrier, preventing rational medical needs from being converted into actual service utilization. Furthermore, the massive accumulation of funds in individual accounts—restricted by their limited scope of use—not only diminishes the overall efficiency of the fund but also poses challenges to the equity and sustainability of the system.

To address these systemic issues, China launched a nationwide reform of the UEBMI outpatient mutual aid and protection mechanism in 2021. The core of this reform involves establishing an independent pooling fund for general outpatient services to cover eligible outpatient expenses at designated medical institutions. By defining parameters such as deductibles, reimbursement ratios, and annual caps, the reform aims to provide mutual aid protection for common and chronic diseases [1,2]. Nevertheless, the implementation of this reform faces several practical challenges. The long-standing "combination of pooling and individual accounts" model has fostered a strong sense of private ownership and psychological attachment to individual account funds among the insured, potentially leading to behavioral adaptation difficulties and issues with policy acceptance. Additionally, influenced by varying levels of economic development, demographic structures, and fund capacities, significant regional disparities exist in outpatient coverage scope and reimbursement parameters. This policy fragmentation underscores the urgent need for provincial-level coordination. Furthermore, outpatient services are characterized by high frequency, low per-visit costs, and lower controllability, which place higher

demands on the management and supervision capabilities of health insurance agencies.

Extant literature has increasingly examined the impact of outpatient pooling reforms. Overall, existing evidence suggests that strengthening outpatient coverage improves financial protection and reduces OOP expenditure [2,3]. In addition, such reforms may help reduce inequality in healthcare utilization, with greater benefits observed among low-income populations [4]. For specific populations, studies based on administrative data indicate that outpatient coverage significantly increases service utilization and reimbursement levels among patients with chronic and special diseases [5]. Related research also shows that chronic conditions substantially elevate the risk of catastrophic health expenditure, particularly among elderly and low-income groups, while improved outpatient protection can mitigate this burden [6,7]. For the elderly, evidence from the China Health and Retirement Longitudinal Study (CHARLS) suggests that medical insurance promotes outpatient service use, especially among those living alone or with multimorbidity, highlighting the importance of outpatient protection in reducing their financial risk [8–11].

While existing research has extensively revealed the heterogeneous protective effects of outpatient pooling policies on chronic disease patients and the elderly, several limitations persist. First, most studies focus on a single disease or a specific population, lacking a systematic comparison of policy effect differences between chronic disease patients and the elderly. Second, research has heavily relied on questionnaires or macro-statistical data, leaving a scarcity of precise measurements of heterogeneous effects based on real-world medical settlement data. Third, there is a lack of longitudinal tracking of the dynamic evolution of policy effects, providing insufficient empirical evidence on whether the cost-reduction effects remain stable over time.

Against this backdrop, this study aims to evaluate the actual impact of the UEBMI outpatient policy implementation in Chongqing. Guided by the core policy objectives of “improving the efficiency of medical insurance funds, gradually reducing the medical burden on the insured, and achieving a more equitable and sustainable system,” we utilize micro-level outpatient settlement data from a large tertiary hospital in Chongqing. This study systematically assesses the impact of the policy on patients' financial burden and tests the precision of its protective function for chronic disease patients and the elderly, thereby providing evidence-based references for further deepening the reform of the outpatient mutual aid system.

2. Materials and Methods

2.1 Study Setting and Sample Source

Chongqing is the only municipality in Western China, characterized by a large population, complex urban-rural structure, rapid aging, and a high prevalence of chronic diseases. These factors create a substantial demand for outpatient services. Recently, Chongqing has implemented the UEBMI outpatient pooling reform. The clear implementation timeline and standardized institutional design provide identifiable nodes for policy evaluation. Chongqing's UEBMI has a large scale of participants and stable

fund operation, making its outpatient policy adjustments representative. Selecting Chongqing as the research area facilitates an analysis of patient effects under a well-defined policy background.

This study selected a large tertiary hospital in Chongqing as the sample source. The hospital's annual outpatient volume is among the highest in the city, and its patient population covers various age groups, occupations, and disease spectrums, representing the characteristics of the UEBMI population. Located in the core urban area, it serves local residents, migrant workers, and patients from surrounding regions. As a designated medical institution, the hospital has a mature insurance settlement system and standardized information records, ensuring data consistency before and after the reform. The settlement data, directly obtained from real-time reimbursement, covers core indicators such as OOP ratios and cost composition. This accurately reflects the impact of the policy on the outpatient cost burden and avoids recall bias and aggregation errors common in surveys or macro-data.

2.2 Data Screening and Processing

The study period from January 2023 to December 2024 was selected to avoid potential contamination from COVID-19-related disruptions in 2022, while also maintaining a balanced time window to facilitate the construction of a panel dataset.

The processing and cleaning of the original outpatient claim data were conducted in three sequential stages. In the first stage (sample selection), only outpatient claim records of individuals enrolled in the UEBMI scheme were retained in accordance with the study objectives and the policy's coverage scope. Records from the Urban and Rural Resident Basic Medical Insurance, supplementary insurance schemes, and mixed insurance types were excluded. The observation period was restricted to January 2023 through December 2024, and records outside this range were removed. Within the eligible insurance category, both general outpatient services and outpatient chronic disease management claims were retained, while emergency department visits were excluded, resulting in the final baseline sample.

In the second stage (data aggregation), a unique identifier was generated for each insured individual. The dataset was then aggregated at the individual-month level to construct a longitudinal panel structure. Based on this structure, key analytical variables were derived, including monthly outpatient visit counts, total monthly medical expenditures, total out-of-pocket payments, and various cost share indicators.

In the third stage (variable construction and transformation), given that healthcare expenditure variables typically exhibit a right-skewed distribution, a natural logarithmic transformation of the form $\ln(x+1)$ was applied to variables such as per-visit expenditure and monthly out-of-pocket spending in order to reduce the influence of extreme values and improve estimation stability. Cost-sharing indicators, including the self-payment ratio and other expenditure shares, were calculated conditional on positive total outpatient expenditure, ensuring the validity and comparability of the constructed measures.

2.3 Methods

To systematically evaluate the effects of the outpatient pooling reform under the UEBMI on patient utilization, this study adopts a multi-method empirical strategy that accounts for policy characteristics, data structure, and potential identification biases. Specifically, an interrupted time series (ITS) model and

a two-way fixed effects (TWFE) model are employed. These two approaches are complementary in their identification logic: the ITS model captures aggregate-level changes in patient utilization before and after the policy intervention, while the TWFE model enables within-individual comparisons over time. By triangulating evidence across different analytical frameworks, this study seeks to enhance the credibility of policy effect estimation.

2.3.1 Interrupted Time Series Model

In settings where a policy is implemented universally and no unaffected control group is available, the traditional difference-in-differences (DID) approach is not directly applicable. The interrupted time series model treats the policy implementation as an exogenous shock and uses continuous pre- and post-policy monthly data to identify level shifts and trend changes in outcome variables. Without requiring a control group, it is well suited for capturing structural changes at the aggregate level and is widely used in policy evaluations with clearly defined intervention timing and continuous observations [12,13].

In the context of this study—characterized by a clearly defined policy onset, continuous monthly data, and seasonal variation in outcome indicators (controlled through month fixed effects)—the ITS model is particularly appropriate. The specification is as follows:

$$Y_t = \beta_0 + \beta_1 Time_t + \beta_2 Post_t + \beta_3 (Time_t \times Post_t) + \sum_{m=1}^{11} \gamma_m Month_{m,t} + \varepsilon_t$$

where Y_t denotes the outcome variable in month t ; $Time_t$ is a continuous time trend; $Post_t$ is a policy dummy equal to 1 for $t \geq$ January 2024 and 0 otherwise; the interaction term $Time_t \times Post_t$ captures post-policy trend changes; $Month_{m,t}$ represents month dummies controlling for seasonality; and ε_t is the error term. The coefficient β_2 reflects the immediate (level) effect of the policy, while β_3 captures the change in trend following implementation.

Given that the ITS analysis is based on only 24 monthly observations, including a full set of month dummies may consume substantial degrees of freedom. Therefore, the ITS results are primarily interpreted as evidence of overall structural changes and are cross-validated with the TWFE estimates.

2.3.2 Two-way Fixed Effects Model

While the ITS model focuses on aggregate temporal variation, it cannot fully account for unobserved heterogeneity across patients, such as differences in health status, care-seeking preferences, and risk attitudes. To address this limitation, this study constructs an individual–month panel dataset and estimates a two-way fixed effects model. By incorporating both individual and time fixed effects, the model enables within-individual comparisons before and after policy implementation, effectively controlling for time-invariant individual characteristics and common time trends, and thus identifying the net micro-level effect of the policy.

The baseline specification is:

$$Y_{it} = \alpha_i + \delta_t + \beta post_t + \varepsilon_{it}$$

where Y_{it} denotes the outcome variable for individual i in month t ; α_i represents individual fixed effects; δ_t denotes month fixed effects; $post_t$ is the policy implementation dummy; and ε_{it} is the

error term. The coefficient β captures the average within-individual change in the outcome variable following policy implementation.

To further investigate heterogeneous effects, interaction terms between the policy variable and time-varying group indicators are introduced. It is important to note that both chronic disease status and elderly status are defined at the individual–month level (i.e., whether an individual is in a given state in month t), making them time-varying variables. As such, both their main effects and their interactions with the policy variable can be identified within the fixed effects framework.

The extended model is specified as:

$$Y_{it} = \alpha_i + \delta_t + \beta_1 post_t + \beta_2 Group_{it} + \beta_3 (post_t \times Group_{it}) + \varepsilon_{it}$$

where $Group_{it}$ denotes the time-varying status variable (e.g., chronic disease status or elderly status).

The coefficient β_3 captures the differential effect of the policy across population subgroups.

2.4 Variable Selection

To evaluate the utilization effects of the outpatient pooling reform after the implementation of the outpatient co-payment policy, the dependent variables are constructed to capture patients' financial burden. The key independent variable is the implementation of the outpatient pooling policy, and heterogeneity is examined across chronic disease status and elderly status. The definitions and coding of all key variables are presented in Table 1.

2.4.1 Dependent Variables

To comprehensively assess the burden-reducing effects of the outpatient co-payment reform, this study constructs outcome indicators from both relative and absolute burden perspectives. Specifically, the outpatient self-payment ratio captures the direct impact of the policy on the reimbursement structure. Since total monthly out-of-pocket expenditure is also influenced by healthcare utilization intensity, this study further introduces the average self-payment per visit to isolate the confounding effect of changes in visit frequency, thereby more precisely identifying the net change in per-visit financial burden.

The self-payment ratio is defined as the proportion of outpatient out-of-pocket expenditure to total outpatient costs within a given individual-month. It is a key indicator of insurance generosity and patient financial burden, and has been widely used in the literature evaluating outpatient pooling reforms [3,14]. According to risk-sharing theory, the introduction of pooled insurance funds directly reduces the self-payment ratio by expanding reimbursement coverage. From the perspective of health demand theory, a lower self-payment ratio reduces the “effective price” faced by patients, which may subsequently affect their healthcare-seeking behavior and utilization intensity. One of the core objectives of the outpatient pooling reform is to reduce patients' outpatient financial burden by expanding the scope of pooled fund reimbursement; therefore, the self-payment ratio serves as the most direct outcome variable for evaluating the policy's burden-reducing effect.

Total self-payment refers to the monthly outpatient out-of-pocket expenditure of an individual, which captures the absolute level of financial burden before and after policy implementation and complements the self-payment ratio [15] [16]. Given that outpatient expenditure typically exhibits a highly right-

skewed distribution, a logarithmic transformation is applied to mitigate the influence of extreme values on regression estimates, allowing coefficients to be interpreted in terms of relative changes. For observations with zero monthly self-payment, $\ln(\text{self-payment} + 1)$ is used to preserve sample size while reducing distributional skewness.

Average self-payment per visit is defined as the total monthly self-payment divided by the number of outpatient visits within the same month, reflecting the average economic burden per encounter. This indicator isolates the effect of the policy on per-visit cost intensity after controlling for changes in healthcare utilization frequency and is also log-transformed.

2.4.2 Key Independent Variable

The key independent variable is a policy implementation dummy, which equals 1 for January 2024 and onwards, and 0 otherwise, indicating the institutional change introduced by the outpatient pooling reform. Since the policy was implemented uniformly across the city without a natural control group, identification relies primarily on the policy timing. By combining this variable with time trends, individual fixed effects, and month fixed effects, the model captures the average changes in outcome variables before and after policy implementation, as well as their dynamic trajectories under controlled conditions.

2.4.3 Heterogeneity Variables

There are substantial differences in healthcare needs and insurance benefits across insured populations; therefore, the effects of the outpatient pooling policy may vary by subgroup characteristics. This study examines heterogeneous effects along two dimensions: chronic disease status and elderly status [16].

Chronic disease status is defined using the administrative classification of the medical insurance system, referring to individuals enrolled in chronic disease management programs who incurred outpatient visits related to chronic conditions in a given month. Compared with clinical diagnosis-based definitions, the administrative approach aligns more directly with policy coverage and benefit design, allowing for a more accurate identification of the population affected by institutional rules. This variable is defined at the individual-month level and takes the value of 1 if a chronic disease-related outpatient visit occurs in that month, and 0 otherwise, making it a time-varying status indicator.

Elderly status is defined based on the following considerations. The hospital billing data used in this study do not contain explicit retirement status indicators, and flexible retirement arrangements make it difficult to accurately identify retirees. Given that the outpatient pooling policy in Chongqing provides higher reimbursement rates for retired individuals, and that older populations may differ structurally in both healthcare demand and insurance benefits, age 60 is used as a proxy threshold for elderly status. This variable is also defined at the individual-month level, taking the value of 1 if the individual is aged 60 or above in a given month, and 0 otherwise, and is therefore time-varying. To test the robustness of this threshold choice, a sensitivity analysis is conducted using age 55 as an alternative cutoff.

Table 1. Definition of Core Variables

Variable Type	Variable Name	Measurement	Definition
Dependent Variables	Outpatient Self-Payment Ratio	Continuous	The proportion of outpatient out-of-pocket expenditure to total outpatient costs within a given month
	Total Out-of-Pocket Expenditure	Continuous	Total monthly out-of-pocket expenditure, log-transformed; observations with zero expenditure are converted using $\ln(\text{self-payment} + 1)$
	Average Out-of-Pocket Expenditure per Visit	Continuous	Natural logarithm of monthly out-of-pocket expenditure divided by the number of outpatient visits
Key Independent Variable	Policy Implementation Indicator	Dummy	Equals 1 for the post-policy period and 0 otherwise
Heterogeneity Variables	Chronic Disease Status	Dummy	Indicates whether the individual had a chronic disease-related outpatient claim in the given month (1 = yes, 0 = no)
	Elderly Status	Dummy	Indicates whether the individual is aged 60 years or above in the given month (1 = yes, 0 = no)

3. Results

3.1 Descriptive Statistics

Based on outpatient medical insurance settlement data from a large tertiary hospital in Chongqing spanning January 2023 to December 2024, this section presents descriptive statistics of the sample before and after the implementation of the outpatient co-payment reform. Independent-samples t-tests are employed to assess differences in means, with statistical significance reported using p-values. In subsequent regression analyses, results are presented as coefficients with 95% confidence intervals, and statistical significance is determined by whether the confidence interval includes zero.

After data cleaning, the final analytical sample consists of 1,667,847 outpatient visit records, including 781,730 observations in the pre-policy period and 886,117 in the post-policy period, covering 607,004 insured individuals. The mean age of the sample is 51.076 years ($SD = 16.951$), with pre- and post-policy means of 51.183 and 50.981 years, respectively. The difference is statistically significant ($t = 7.658$, $p < 0.001$); however, the absolute difference of 0.202 years is negligible in practical terms. Females account for 64.197% of the sample, with no statistically significant difference between the pre- and post-policy periods ($p = 0.053$). The proportion of elderly patients is 32.972% before the policy and 33.310% after the policy. The share of patients with chronic or special chronic diseases decreases from 24.806% pre-policy to 23.455% post-policy. Overall, the composition of the study population remains relatively stable over time. Table 2 presents the basic characteristics of the sample.

Table 2. Basic Characteristics of the Study Sample

Variable	Pre-reform (n = 781,730)	Post-reform (n = 886,117)	χ^2	p-value
Female	501,869 (64.197%)	570,158 (64.343%)	3.731	0.053
Elderly Patients	257,751 (32.972%)	295,167 (33.310%)	21.448	<0.001
Chronic Disease Patients	193,913 (24.806%)	207,837 (23.455%)	414.454	<0.001

Table 3 reports monthly aggregated statistics (n = 24 calendar months), presenting the evolution of key indicators of financial burden at the hospital level. Independent-samples t-tests are used to assess the statistical significance of differences between pre- and post-policy periods. It should be noted that these descriptive statistics reflect simple mean differences without controlling for time trends, seasonal fluctuations, or changes in sample composition. Therefore, they serve primarily to provide a descriptive overview, while causal inference regarding policy effects is addressed in subsequent interrupted time series models and two-way fixed effects regressions.

Table 3. Overall Descriptive Statistics

Variable	Mean (Pre-reform)	SD (Pre-reform)	Mean (Post-reform)	SD (Post-reform)	t-value	p-value
Self-Payment Ratio	0.62	0.019	0.465	0.019	20.194	<0.001***
Monthly Out-of-Pocket Expenditure (RMB)	482.691	31.474	371.403	8.254	11.848	<0.001***
Average Out-of-Pocket Expenditure per Visit (RMB)	364.56	24.912	281.215	8.428	10.978	<0.001***

The outpatient self-payment ratio decreases from a pre-reform monthly mean of 0.620 to 0.465 after policy implementation, representing a reduction of approximately 15.5%. The t-test indicates that this difference is highly statistically significant ($p < 0.001$), suggesting a substantial decline in patients' relative outpatient financial burden at the aggregate level following the reform. Monthly self-paid expenditure decreases from 482.69 RMB to 371.40 RMB, while average self-payment per visit declines from 364.56 RMB to 281.22 RMB. Both absolute burden indicators show statistically significant reductions (all $p < 0.001$), consistent with the direction of change observed in the self-payment ratio, jointly indicating that the policy has effectively alleviated patients' outpatient financial burden in practice.

3.2 Regression Results

3.2.1 Interrupted Time Series Analysis

This section applies an ITS design using monthly aggregated data to identify structural changes associated with the timing of policy implementation. All models include month fixed effects to control

for seasonal fluctuations and employ Newey–West heteroskedasticity and autocorrelation consistent standard errors to address serial correlation. Table 4 presents the results of ITS.

Following policy implementation, all key indicators exhibit a statistically significant immediate decline. The outpatient self-payment ratio decreases by 12.5 percentage points (95% CI: -0.169, -0.080), indicating a substantial reduction in patients' financial burden attributable to the policy shock. Similarly, the policy coefficients for the logarithm of total self-payment and average self-payment per visit are -0.084 and -0.070, respectively, both statistically significant with confidence intervals well below zero. In terms of post-policy trend dynamics, the change in the self-payment ratio trend is statistically insignificant (95% CI: -0.002, 0.004), suggesting that the initial reduction effect is sustained over time. Although the absolute expenditure measures exhibit a very slight upward tendency in the later period, this marginal increase does not offset the substantial initial decline induced by the policy intervention during the observation window.

Table 4. Results of Interrupted Time Series

Variables	Self-Payment Ratio	ln(Total OOP Expenditure)	ln(OOP per Visit)
Time Trend (Pre-policy)	-0.003 (-0.007, 0.001)	-0.021*** (-0.023, -0.019)	-0.023*** (-0.026, -0.020)
Immediate Policy Effect	-0.125* (-0.169, -0.080)	-0.084* (-0.106, -0.062)	-0.070* (-0.108, -0.031)
Post-policy Trend Change	0.001 (-0.002, 0.004)	0.015*** (0.012, 0.017)	0.013*** (0.010, 0.016)
Constant	0.649*** (0.605, 0.693)	6.378*** (6.358, 6.398)	6.051*** (6.020, 6.082)
Month Fixed Effects	Yes	Yes	Yes
Observations	24	24	24

3.2.2 Two-Way Fixed Effects Model

While the interrupted time series analysis provides evidence of aggregate structural breaks, the monthly aggregated results may still be influenced by changes in patient composition and individual heterogeneity. To identify within-patient net changes before and after policy implementation, this study further estimates a two-way fixed effects model using individual-level panel data, incorporating both individual and month fixed effects. Table 5 presents the results of TWFE.

The results from the two-way fixed effects specification indicate that patient financial burden is significantly reduced at the micro level following policy implementation. For the same individual, the outpatient self-payment ratio decreases by an average of 24.2 percentage points (95% CI: -0.246, -0.239) after the policy takes effect, demonstrating strong statistical robustness.

In terms of absolute expenditures, the policy coefficients for total self-payment and average self-payment per visit (in logarithmic form) are -0.879 and -0.871, respectively, corresponding to reductions in actual out-of-pocket spending exceeding 58%. These individual-level net effects provide strong evidence that the outpatient pooling reform has substantially and persistently alleviated the financial burden of healthcare utilization among insured patients.

Table 5. Results of Two-way Fixed Effects

Variables	Self-Payment Ratio	ln(Total OOP Expenditure)	ln(OOP per Visit)
Post-policy	-0.242*** (-0.246, -0.239)	-0.879*** (-0.899, -0.859)	-0.871*** (-0.890, -0.852)
Constant	0.693*** (0.690, 0.695)	5.576*** (5.561, 5.591)	5.338*** (5.324, 5.352)
Individual Fixed Effects	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes
Observations	1,650,572	1,667,847	1,667,847
Number of Individuals	599,852	607,004	607,004
Within R²	0.102	0.024	0.026

3.2.3 Heterogeneity Analysis Results

The overall estimates capture the average effect of the policy across the full sample. Given substantial heterogeneity in healthcare needs and outpatient utilization patterns across different population groups, the policy impact may vary accordingly. This section examines heterogeneous effects from two perspectives: chronic disease status and age group, in order to characterize the distributional features of the policy effects.

3.2.3.1 Chronic Disease Patients

Patients with chronic diseases generally exhibit higher outpatient expenditures and more frequent healthcare utilization than the general insured population, and they are already covered by dedicated outpatient chronic disease reimbursement schemes. Following the implementation of the outpatient pooling reform, the interaction between general outpatient pooling and existing chronic disease benefits may generate differentiated responses between chronic disease patients and non-chronic disease patients. Table 6 presents the heterogeneous results of chronic diseases patients.

In terms of financial burden, after policy implementation, the self-payment ratio for non-chronic disease patients declines by 27.1 percentage points (95% CI: -0.275, -0.267). The logarithm of total self-payment and average self-payment per visit also decrease by 0.829 (95% CI: -0.850, -0.808) and 0.826 (95% CI: -0.846, -0.807), respectively.

The interaction term between chronic disease status and policy implementation is positive for the self-

payment ratio, with a coefficient of 0.076 (95% CI: 0.074, 0.078), indicating that although the reduction in the self-payment ratio is smaller for chronic disease patients relative to non-chronic disease patients, the combined effect still corresponds to a net decline of approximately 19.5 percentage points. In terms of absolute expenditures, the interaction terms are -0.131 (95% CI: -0.144, -0.118) and -0.116 (95% CI: -0.129, -0.104), respectively. After transformation, these estimates imply reductions of approximately 61.7% and 61.0% in total self-payment and average per-visit self-payment for chronic disease patients, respectively, indicating a stronger redistributive and protective effect of the policy for high-expenditure populations.

Table 6. Heterogeneity Analysis: Chronic Disease Patients

Variables	Self-Payment Ratio	ln(Total OOP Expenditure)	ln(OOP per Visit)
Post-policy	-0.271*** (-0.275, -0.267)	-0.829*** (-0.850, -0.808)	-0.826*** (-0.846, -0.807)
Chronic Disease	-0.321*** (-0.324, -0.318)	0.597*** (0.580, 0.615)	0.482*** (0.466, 0.499)
Chronic Disease × Post-policy	0.076*** (0.074, 0.078)	-0.131*** (-0.144, -0.118)	-0.116*** (-0.129, -0.104)
Constant	0.783*** (0.780, 0.786)	5.411*** (5.395, 5.427)	5.204*** (5.189, 5.218)
Month Fixed Effects	Yes	Yes	Yes
Individual Fixed Effects	Yes	Yes	Yes
Observations	1,650,572	1,667,847	1,667,847
Number of Individuals	599,852	607,004	607,004
Within R²	0.171	0.031	0.031

3.2.3.2 Elderly Patients

The outpatient pooling reform is institutionally designed to provide relatively higher reimbursement levels for retired individuals. Therefore, it is necessary to examine heterogeneous effects across age groups. Due to limitations in hospital insurance settlement data, retirement status cannot be directly identified; thus, individuals aged 60 and above are used as a proxy for the elderly population. Table 7 presents the heterogeneous results of elderly patients.

In terms of financial burden, the results show that the policy generates a significant reduction effect for non-elderly patients, with their outpatient self-payment ratio decreasing by 23.7 percentage points (95% CI: -0.241, -0.233). The logarithmic measures of total self-payment and average self-payment per visit decline by 0.821 (95% CI: -0.842, -0.800) and 0.817 (95% CI: -0.837, -0.797), respectively.

The interaction terms between age and policy are significantly negative across all three indicators, with

coefficients of -0.008, -0.124, and -0.115, respectively, suggesting that elderly patients receive a more pronounced reduction in financial burden after policy implementation. After combining the main effects and interaction terms, the net reduction for elderly patients is approximately 24.5 percentage points in the self-payment ratio, while reductions in total self-payment and average per-visit expenditure are approximately 61.1% and 60.6%, respectively. Overall, elderly patients experience a significantly greater benefit from the reform than non-elderly patients.

Moreover, the main effect of elderly status is significantly negative in the self-payment ratio equation (95% CI: -0.031, -0.019), indicating that even prior to policy implementation, existing institutional arrangements provided a certain level of baseline financial protection for the elderly population.

Table 7. Heterogeneity Analysis: Elderly Patients

Variables	Self-Payment Ratio	ln(Total OOP Expenditure)	ln(OOP per Visit)
Post-policy	-0.237*** (-0.241, -0.233)	-0.821*** (-0.842, -0.800)	-0.817*** (-0.837, -0.797)
Elderly	-0.025*** (-0.031, -0.019)	0 (-0.033, 0.032)	0.002 (-0.029, 0.033)
Elderly × Post-policy	-0.008*** (-0.011, -0.006)	-0.124*** (-0.137, -0.110)	-0.115*** (-0.128, -0.103)
Constant	0.699*** (0.696, 0.703)	5.566*** (5.548, 5.584)	5.328*** (5.311, 5.345)
Month Fixed Effects	Yes	Yes	Yes
Individual Fixed Effects	Yes	Yes	Yes
Observations	1,650,572	1,667,847	1,667,847
Number of Individuals	599,852	607,004	607,004
Within R²	0.102	0.024	0.026

3.3 Robustness check

3.3.1 Placebo Test

This study conducts a placebo test by artificially assigning the policy implementation date to October 2023. In addition, a supplementary placebo test is performed using July 2023 as an alternative pseudo-policy cutoff, and both specifications yield consistent directional results. Table 8 reports the estimation results based on the October 2023 placebo policy date. Although statistically significant, the placebo estimates are approximately one-tenth the magnitude of the main policy effects, suggesting no economically meaningful pre-existing trend.

Table 8. Placebo Test Results Using a Fictitious Policy Implementation Date

Variables	Self-Payment Ratio	ln(Total OOP Expenditure)
Placebo Policy Effect	-0.012*** (-0.017, -0.007)	-0.029*** (-0.035, -0.023)
Post-placebo Trend Change	-0.01 (-0.027, 0.008)	-0.032* (-0.066, 0.003)
Time Trend	0 (-0.006, 0.005)	0.015*** (0.009, 0.021)
Constant	0.657*** (0.615, 0.700)	6.386*** (6.363, 6.410)
Observations	24	24

3.3.2 Alternative Age Threshold

The robustness analysis shows that when 55 years of age is used as an alternative threshold to define the elderly group, both the sign and statistical significance of the interaction term between policy implementation and elderly status remain consistent with the baseline specification. This suggests that the specific choice of age cutoff does not alter the main conclusion regarding the reduction in financial burden among the elderly population, thereby reinforcing the generalizability and stability of the findings. Table 9 presents the analysis results of replacing age variables.

Regression results indicate that the policy reduces the logarithm of total self-payment by 0.810 for the baseline group aged below 55 (95% CI: -0.832, -0.789), corresponding to an approximate 55.6% reduction in absolute expenditure. Meanwhile, the interaction term between the policy and the 55-year threshold is estimated at -0.125 (95% CI: -0.139, -0.112), implying an additional 11.8% reduction in financial burden for individuals aged 55 and above beyond the baseline policy effect.

After combining the main and interaction effects, the total reduction in out-of-pocket expenditure for this group reaches approximately 60.8%. This result is highly consistent with the baseline specification using the 60-year threshold in both magnitude and direction, providing strong evidence that the estimated beneficial effects for the elderly population are not sensitive to the specific age classification used in the analysis.

Table 9. Alternative Age Threshold (Age 55)

Variables	ln(Total OOP Expenditure)
Post-policy	-0.810*** (-0.832, -0.789)
Age ≥ 55	0.073*** (0.036, 0.110)

Age $\geq 55 \times$ Post-policy	-0.125*** (-0.139, -0.112)
Constant	5.536*** (5.514, 5.557)
Month Fixed Effects	Yes
Individual Fixed Effects	Yes
Observations	1,667,754
Number of Individuals	607,004
Within R²	0.025

4. Discussion

This study evaluates the post-implementation effects of the outpatient pooling reform on patients' healthcare utilization from the perspective of financial burden. This section further analyzes the underlying mechanisms, aiming to reveal the deeper operational logic of the reform within the healthcare system and to discuss its institutional implications and policy directions.

4.1 Outpatient Pooling Reform Reduces Patient Financial Burden

The empirical results indicate that after the implementation of the outpatient pooling policy, both the average outpatient out-of-pocket expenditure per visit and the self-payment ratio of insured patients declined significantly, while the reduction in total monthly individual out-of-pocket expenditure was relatively modest. This finding is broadly consistent with existing literature [17], suggesting that the reform has reshaped the structure of patient financial burden rather than uniformly reducing all cost components.

The significant decline in the self-payment ratio reflects the institutional effectiveness of the policy in risk-sharing. Prior to the reform, outpatient expenditures under the employee health insurance system were predominantly financed through individual medical savings accounts. This vertically accumulated financing mechanism essentially functions as intra-individual lifecycle savings and lacks inter-personal risk pooling. With the epidemiological transition toward chronic disease dominance, high-frequency users of healthcare services often face depletion of personal accounts and are forced into full out-of-pocket payments. The outpatient pooling reform integrates outpatient expenditure risk, previously borne individually, into a collective financing pool shared among all insured participants, thereby establishing a more socially distributed risk-sharing arrangement between individuals and the pooled fund. This is consistent with the theoretical proposition that horizontal risk pooling is superior to vertical accumulation in insurance design.

The relatively moderate decline in total out-of-pocket expenditure can be explained by the partial release of suppressed demand for outpatient services following the reform. According to Grossman's health demand model, increases in insurance reimbursement effectively reduce the "effective price" of healthcare and lower the marginal cost of seeking care [18–20]. When the effective price decreases,

liquidity constraints faced by patients are alleviated, leading to an increase in healthcare utilization. Prior to the policy, some insured individuals delayed care or reduced necessary follow-up visits and medication adherence due to high cost-sharing burdens. After implementation, the reduction in effective prices released previously constrained but medically reasonable demand, which was subsequently translated into actual healthcare utilization [21,22]. The simultaneous decrease in per-visit costs and moderate increase in visit frequency and treatment adherence jointly resulted in a relatively limited decline in total out-of-pocket expenditure. Therefore, the smaller-than-expected reduction in total expenditure does not indicate policy ineffectiveness, but rather reflects the rational release of suppressed healthcare demand under price effects.

From a long-term health system perspective, such a moderate release of outpatient demand is likely to generate positive health outcomes. Improved affordability of outpatient services enables earlier diagnosis and timely standardized treatment, which helps to control the progression of chronic diseases and reduce the incidence of complications. In the long run, this may decrease the probability of emergency department visits or hospital admissions caused by disease exacerbation, thereby achieving a substitution effect of outpatient care for inpatient services.

While the outpatient pooling reform effectively reduces individual financial burden, it inevitably leads to the release of a portion of legitimate healthcare demand, which may increase short-term pressure on the pooled fund. It is recommended that health insurance authorities establish a systematic monitoring mechanism for outpatient visit frequency and per-visit fund expenditure based on the demand-release patterns identified in this study, and accurately assess fund sustainability under population aging, ensuring both patient financial relief and long-term financial risk control.

Second, it is necessary to deepen reforms in outpatient payment methods to guide rational healthcare provision. To prevent demand expansion from evolving into supplier-induced overutilization, it is recommended to accelerate the transition from fee-for-service payment toward a mixed payment system combining capitation and diagnosis-related group (DRG)-based outpatient payments. By transmitting cost-control incentives to providers, healthcare institutions can be encouraged to standardize prescribing behavior, ensuring that reductions in patient cost-sharing are not offset by increases in unnecessary services.

Finally, the implementation of a strengthened primary care and hierarchical diagnosis-and-treatment system should be accelerated. As the study sample is drawn from a large tertiary hospital, the observed increase in revisit rates may intensify outpatient pressure and resource congestion in higher-level medical institutions. It is therefore recommended to widen the reimbursement differential across facility levels and leverage stronger price incentives to redirect released basic outpatient demand toward primary healthcare institutions.

4.2 Stronger Financial Relief Effects of the Outpatient Pooling Reform among Chronic Disease and Elderly Populations

The empirical results indicate that the financial burden-reducing effects of the outpatient pooling reform

exhibit significant heterogeneity across population groups, with chronic disease patients and elderly individuals experiencing more pronounced reductions in medical expenditures. The decline in out-of-pocket spending among chronic disease patients is substantially greater than that of general outpatient users, while their number of visits does not increase correspondingly. Similarly, individuals aged 60 and above show a more pronounced reduction in financial burden compared with non-elderly groups. This finding is consistent with existing literature, which suggests that patients with chronic conditions, due to long-term medication dependence and continuous treatment needs, exhibit relatively inelastic healthcare expenditures and therefore benefit more directly from improvements in outpatient insurance coverage[6,21,23].

The stronger financial relief observed among chronic disease and elderly populations is closely associated with their low price elasticity of healthcare demand. Due to prolonged disease duration or physiological deterioration, healthcare utilization among these groups is primarily characterized by long-term medication adherence and continuous follow-up care, reflecting highly inelastic demand. When the outpatient pooling reform reduces the effective price of healthcare services, these patients are unlikely to exhibit excessive or irrational increases in utilization. Instead, the policy benefits are primarily translated into a direct reduction in financial burden. The findings of this study show that while both groups experience substantial declines in out-of-pocket expenditures, their utilization frequency remains relatively stable or even slightly decreases, suggesting that the reduction in expenditure is mainly driven by changes in reimbursement structure rather than expansion of unnecessary healthcare consumption.

From the perspective of health equity, the more pronounced financial relief among priority groups reflects a strengthening of the redistributive function of the health insurance system. Health equity theory emphasizes that healthcare resources should be allocated toward populations with higher health risks and greater financial burdens, so as to reduce structural inequalities in health opportunities[24]. The outpatient pooling reform, through adjustments in the scope of pooled fund reimbursement and complementary policies such as higher reimbursement rates for retirees and expanded chronic disease benefit coverage, effectively lowers barriers to healthcare access for high-risk populations. Elderly individuals, who typically bear a higher disease burden, benefit more significantly from such expanded coverage, consistent with the institutional logic of strengthening risk pooling and vertical equity in social health insurance. This differentiated effect demonstrates that the reform not only provides universal coverage but also enhances targeted protection.

The stability of healthcare utilization among high-need populations is also consistent with the broader synergistic effects of recent health system reforms. The outpatient pooling reform interacts with complementary policies such as centralized drug procurement, standardized chronic disease management, and the implementation of extended prescription policies. These measures jointly reduce patients' non-medical costs on the demand side while constraining induced demand on the supply side through payment reform, thereby ensuring that policy gains are primarily reflected in reduced financial burden rather than uncontrolled growth in healthcare expenditure.

Given that chronic disease and elderly populations respond to price incentives primarily through financial relief rather than utilization expansion, it is recommended that differentiated benefit schemes for these groups be further explored within the fiscal capacity of the health insurance fund. For instance, reimbursement rates for commonly used medications for chronic diseases may be appropriately increased, or lower deductible thresholds may be introduced for elderly enrollees, so as to better enhance the precision of risk protection and redistribution within the insurance system, ensuring that policy benefits are more effectively targeted toward populations with the highest health risks and financial burdens.

Furthermore, the integration of outpatient pooling with chronic disease management programs and long-term care insurance should be strengthened. The observed reduction in financial burden provides a financial foundation for improving long-term health outcomes. It is recommended that health and insurance authorities coordinate to leverage the financial incentives of the outpatient pooling system to encourage chronic disease patients and elderly individuals to enroll in family doctor contracting services and standardized management pathways. Through sustained financial relief, patients may develop more stable care-seeking behaviors and improved medication adherence, thereby translating short-term financial gains into long-term improvements in health outcomes and life expectancy, ultimately enhancing the overall efficiency of the healthcare system.

In addition, it is necessary to improve the convenience of insurance reimbursement services for key populations. Considering the varying levels of digital literacy among elderly individuals, the implementation of the outpatient pooling reform should be accompanied by optimized point-of-service settlement systems in hospitals and pharmacies. Simplifying chronic disease eligibility verification procedures and expanding mobile-assisted payment options can reduce administrative barriers for vulnerable populations, ensuring that the equity-enhancing effects of the policy are effectively realized in practice.

4.3 Stability and Dynamic Evolution of the Outpatient Pooling Reform Effect

This study employs an ITS approach and finds that the burden-reducing effect of the outpatient pooling reform on patient financial expenditures emerges immediately upon policy implementation and remains relatively stable throughout the subsequent observation period. This dynamic pattern suggests that the observed reduction is not a short-term fluctuation in the data, but rather a persistent change driven by structural adjustments in the insurance payment system.

The immediate realization of policy effects is closely linked to the reimbursement mechanism of the outpatient pooling system. Under the reform, eligible outpatient expenses are directly reimbursed at a predetermined rate through the pooled fund, allowing patients to immediately experience a reduction in out-of-pocket payments at the point of settlement. Consequently, the reduction in financial burden is rapidly reflected in administrative billing data following policy implementation. During the observation period, the self-payment ratio remains at a persistently lower level without evident rebound, indicating a high degree of short-term stability.

The stability of insurance coverage levels also has important implications for patient healthcare behavior.

When individuals perceive outpatient cost reduction as a long-term institutional arrangement rather than a temporary policy intervention, their healthcare utilization patterns tend to become more regularized. Irregular behaviors such as delayed care-seeking or medication stockpiling are correspondingly reduced, which contributes to maintaining the overall stability of fund operations. The estimated trend coefficients in this study further indicate that the burden-reducing effect is not significantly attenuated by potential compensatory behaviors from healthcare providers.

In health system reform practice, there is often a concern that policy effects may decay over time, particularly if providers adjust service structures or introduce non-reimbursable items to offset reductions in patient cost-sharing. The findings of this study suggest that such risk is currently well contained, which may be attributed to the coordinated implementation of outpatient pooling reform alongside complementary policies such as separation of prescription and dispensing and centralized volume-based drug procurement. These reforms collectively help to mitigate provider-induced cost shifting and reinforce the stability of insurance benefits.

While the short-term effects of the policy appear stable, healthcare utilization behavior often exhibits lagged responses, and long-term trajectories require continued monitoring. It is therefore recommended that health insurance authorities establish a cross-year evaluation framework for policy effects, with a focus on tracking expenditure dynamics over a 3–5 year horizon. This would allow for the early identification of potential utilization rebound or structural shifts, and provide room for timely parameter adjustments based on dynamic evidence derived from insurance claims data.

In addition, greater coordination between outpatient pooling benefits and the reform of individual medical savings accounts should be further promoted. As the protective role of pooled financing continues to strengthen, the function of individual accounts in outpatient coverage is likely to become less central. Accordingly, consideration may be given to expanding the scope of pooled use of individual accounts, including allowing intra-family sharing of balances. This would enable individual accounts to play a complementary role in supporting household-level risk sharing, while maintaining the dominant role of pooled financing in providing primary protection and consolidating the achieved burden-reduction gains.

5. Limitations

Several limitations of this study warrant acknowledgment. The universal implementation of the reform across Chongqing precluded the construction of a concurrent control group, meaning that unobserved time-varying confounders coinciding with the policy—such as concurrent drug pricing adjustments or shifts in care-seeking behavior—cannot be entirely ruled out, despite the reassurance provided by placebo testing.

The use of data from a single tertiary hospital also constrains the external validity of the findings. Given that tertiary institutions tend to serve patients with greater clinical complexity and higher baseline expenditures, the estimated effects may not be directly transferable to primary or secondary care settings,

where the composition of outpatient demand differs substantially.

At the individual level, the two-way fixed effects model, while controlling for time-invariant heterogeneity, cannot fully account for time-varying confounders such as changes in health status or household income that may independently influence outpatient expenditure over the study period. Furthermore, the 24-month observation window limits inference to short- and medium-term dynamics, and whether the documented burden-reduction effects persist over a longer horizon remains to be established through extended follow-up.

Finally, the analysis is confined to financial burden outcomes and does not address downstream clinical results. Whether the observed reductions in out-of-pocket expenditure translate into measurable improvements in chronic disease control or reductions in avoidable hospitalization remains an open question for future research integrating claims data with longitudinal clinical records.

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