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Catastrophic Health Expenditure during Healthcare Financing Reform: Evidence from Kazakhstan

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Abstract

Unequal access to healthcare and inadequate financing have highlighted the need for healthcare reform to increase efficiency while ensuring equity in healthcare financing worldwide. Our study evaluates the capacity of Kazakhstan's healthcare system reform, transitioning from a tax-financed system to compulsory social health insurance (CSHI), to address equity in healthcare financing. Using quarterly Household Budget Surveys from 2017-Q1 to 2020-Q4 in a staggered difference-in-difference estimation technique, we analyze the impact of the transition on the incidence and intensity of catastrophic health expenditure (CHE) and impoverishment. Our findings show that while the transition from a tax-financed to a CSHI system in the short run lowers both the incidence and intensity of catastrophic health expenditure, it does not alleviate impoverishment. In particular, the reform predominantly benefits wealthier households, with no effect on the relatively poor population. We speculate that the positive outcomes observed from the reform in the short run are largely attributed to the exceptionally high insurance coverage during the transition period. The success of the transition from a tax-based to an insurance-based system is heavily dependent on the rate of insurance coverage of the population, as well as the quality of healthcare services and available finances.

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*Data provided by the Bureau of National Statistics, Republic of Kazakhstan.

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1 Introduction

The focal point of equity in healthcare financing and utilization has been the subject of considerable research, to ensure accessible medical services based on individuals' financial abilities, which should consequently protect households from experiencing catastrophic health expenditures (hereafter CHE) (Quintal and Lopes, 2016). The financing strategies used in the health sector play a crucial role in the formation of equity, as the adoption of effective redistributive mechanisms is essential to achieve affordable access to healthcare services (Wagstaff and van Doorslaer, 2000). In general, ensuring financial protection against the economic consequences associated with illness is one of the fundamental functions of health systems (WHO, 2018).

In pursuit of universal health coverage, countries around the world adopt various health financing policies (Kutzin, 2013). On this wave, the implementation of social health insurance system has gained momentum worldwide[1], to improve healthcare system efficiency and sustainability (Wagstaff, 2009; WHO, 2018). However, the impact of transitioning to social health insurance systems on equity in healthcare utilization remains uncertain, with various factors contributing to its success, such as financing methods (Rostampour and Nosratnejad, 2020), institutional structures and the role of the state (Putsch and Pololi, 2004; Arinah et al., 2016), distribution of resources, treatment probabilities and coverage (Musgrove, 1986) and willingness by the self-employed and out-of-labor force to pay for the insurance (Kaonga et al., 2022). The shift in financing mechanisms can impact healthcare utilization patterns. Insurance systems may offer a different financial environment, affecting factors such as out-of-pocket expenses, coverage limits, and the overall financial burden on individuals during significant health events, consequently affecting individuals' healthcare-seeking behavior. One of the methods of evaluating equity in healthcare utilization focuses on catastrophic health expenditures, where the poor conditions of low-income households negatively affect their health, which in turn causes increased healthcare spending (Wagstaff and van Doorslaer, 2000).

This research aims to contribute to this ongoing debate by examining the ability of

[1]For example, post-Soviet bloc countries, Turkey, Thailand, and Iran

the reformed healthcare system in Kazakhstan — a typical, representative example of an emerging market — to address equity in healthcare financing during the transition from tax-financed to compulsory social health insurance systems. The study analyzes the impact of the transition on the incidence and intensity of catastrophic health expenditure, key indicators of the effectiveness of healthcare financing systems (Yazdi-Feyzabadi, 2019). In addition, we assess the differential experiences of various socioeconomic groups of the transition. Considering the co-occurrence time frame of the COVID-19 pandemic, the study controls the simultaneous impact of the reform and the pandemic on CHE and impoverishment.

The findings of this research contribute to the literature by providing empirical evidence on the equity implications of transitioning from tax-funded to social health insurance systems . The study may help policymakers identify challenges and opportunities to improve equity in healthcare financing and improve access to affordable healthcare services . Ultimately, this research aims to contribute to the formulation and implementation of evidence-based policies for the development and further improvement of social health insurance systems.

Previous studies have suggested that the effectiveness of social health insurance may be limited in countries with a large informal employment sector (Wagstaff, 2009) and high informal payments for health care, which are common for countries in Eastern Europe and Central Asia (Kaitelidou et al., 2013; Lewis, 2000; Maresso et al., 2015). Therefore, studying the transition in Kazakhstan as a representative upper-middle-income country with a significant informal employment sector (Yazbeck et al., 2020) is of particular interest, providing additional evidence to support the claim.

Using quarterly Household Budget Surveys from 2017Q1 to 2020Q4, we measure the incidence and intensity of catastrophic health expenditure and impoverishment and use them as measures of healthcare inequality. Using a staggered difference-in-difference estimation technique, we assess the impact of the reform of the transition from tax-financed to compulsory social health insurance (hereafter, CSHI) systems on inequality in healthcare utilization[2]. The reform was aimed at sharing the burden of healthcare provision with the government, enhancing the quality of healthcare services, and increasing financial protection. We find that the CSHI system reduces the incidence and intensity of catastrophic health expenditures, but does not have an impact on impoverishment. The reform primarily benefited wealthier households and did not affect the relatively poor population. The findings contribute to the ongoing global discussion on the effectiveness of social health insurance (SHI) systems, opening up a discussion on the potential unequal impact and poor performance in countries characterized by large informal employment.

The rest of the paper is organized as follows. Section 2 describes the reform focusing on its characteristics and time frame. Section 3 focuses on the measures of CHE and impoverishment from Wagstaff and Doorslaer (2003), and describes the difference-in-difference model. Section 4 details the data. Empirical results are presented in section 5. The section 6 addresses the limitations of the study and provides suggestive evidence on the behavior changes of households in using healthcare services. Section 7 provides some concluding remarks.

2 Institutional setup

Kazakhstan has a GDP per capita on par with countries such as Bulgaria, Montenegro, and Turkey, however, the improvements in health outcomes are substantially lower (World Bank, 2018). The healthcare system in Kazakhstan was financed primarily by the government (using funds collected from the population through general taxes) and out-of-pocket payments of service recipients. The share of healthcare expenditures relative to GDP in Kazakhstan on average was around 3% (see Table 7 for a summary of the socioeconomic indicators of Kazakhstan). The 2010 World Health Report (Evans and Etienne, 2010) indicates that if public spending on health reaches around 6% of GDP, out-of-pocket expenses will be reduced to a level where the risk of financial catastrophe becomes minimal. Therefore, the tax-financed healthcare system was underfunded and

[2]Before full transition in the 1st January 2020, the reform was tested in the Karaganda region from September to December 2019.

generated high costs for the government.

The share of public financing decreased gradually from 71 percent in 2011 to 59.93 percent in 2019, whilst the share of out-of-pocket (hereafter OOP) expenditure increased from 24.59 percent to 33.86 percent in the same period.[3] For comparison, in OECD countries, public spending, on average, represents 70 percent of total health expenditure (OECD, 2018). In addition, more than 30 percent of OOP health expenditure is far above the criterion of the World Health Organisation for adequate financial protection of below 20 percent (OECD, 2018). The existing literature suggests that the high level of OOP payments could be due to the lack of information about the benefits to which patients are entitled (Blank and Card, 1991), the lack of medical information of patients (Johnson and Rehavi, 2016; Frakes et al., 2019) or unclear boundaries between free and payable health services (Rechel et al., 2013).

In pursuit of universal health coverage and an increase in financial protection, the government of Kazakhstan started a transition from a tax-financed system to a compulsory health insurance scheme. CSHI is based on the joint responsibility of the state, the employer, and each person. The provision of medical services under CSHI does not depend on the number of contributions and deductions. This means that patients contributing to the CSHI fund have equal access to medical services under the CSHI system and will receive full medical care. The state contributes to the economically inactive and vulnerable population.[4] Employers contribute 1,5 percent of their employees' salaries, while employees also contribute 1 percent of their income. Self-employed and out-of-labor force citizens have to pay 5 percent of the minimum wage in the country (approximately 2125KZT[5] in 2020). The insurance payment amount has increased over the years.

The government started preparations for health reform in 2017 by establishing the Social Health Insurance Fund (SHIF). To have enough funding for the first months under the social insurance system, the government has decided to partially redirect the social

[3]Source: Bureau of Statistics of the Republic of Kazakhstan.

[4]The government pays insurance for 15 preferential categories of citizens amounting to more than 10 million beneficiaries. The preferential category includes children, unemployed, pregnant women, disabled, students, and others.

[5]The average exchange rate in 2020 was 382.52 KZT for 1 USD

tax contributions made by employers to SHIF.[6] The creation of the fund did not change the provision of healthcare services before 2020, its sole purpose was to ensure that the system would be ready for the transition.

Before the CSHI reform, the guaranteed volume of free medical care included emergency medical care, primary health care; consultative and diagnostic assistance in referring a primary health care specialist and specialized specialists; inpatient care; provision of blood products and its components for medical reasons; rehabilitation and medical rehabilitation of tuberculosis patients and survivors; palliative care and nursing care for certain categories of the population; preventive medical examinations and vaccination.[7]

The CSHI reform implied an increase in the number of services provided free of charge for the insured population. There are two packages under the CSHI. The first is the basic package that is available for everyone and funded 100% by the government covers emergency medical care and primary health care. The second package applies only to those who are insured and provides the following services: emergency medical care, primary health care; consultative and diagnostic assistance; provision of medicines and medical devices within the guaranteed volume of free medical care and (or) in the system of compulsory social medical insurance; receiving medical care outside the Republic of Kazakhstan at the expense of budgetary funds if there are indications in the manner determined by the authorized body; the use of modern and effective health services and means of treating diseases and restoring health (such as MRI, CT); preventive medical examinations, various rehabilitation services, and vaccination.

CSHI has three main characteristics: 1) pooling funds from general and payroll taxes; 2) expansion of the package of service provision to all insured; 3) establishment of the Social Health Insurance fund for the separate financing and provision, which is 100% owned by the government. CSHI works with private and government clinics and hospitals,

[6]Social tax is used to finance social and medical assistance, financing of state programs, ensuring state security, as well as pension benefits (basic and solidarity parts of pensions). Social tax contributions are made by the companies and go directly to the state budget from where they are redistributed among various public sector services. After the CSHI reform the social tax contributions stayed unchanged. Additional contributions to the CSHI were mandated by employers and employees.

[7]*Source:* the Decree of the Government of the Republic of Kazakhstan No. 2136 of December 15, 2009 "On Approval of the List of Guaranteed Volume of Free Medical Care".

once insured a patient can register in any of the listed clinics and be assigned to a certain general practitioner (GP). Should there be a need for an MRI or any other service, the GP or specialist can refer a patient to any other clinic that is registered with the Social Health Insurance Fund.

To test the CSHI system, in July 2019, the government announced the Karaganda region as a pilot region where the performance of CSHI was tested. The two reasons for choosing the Karaganda region as stated by the government were (i) because it is the largest land region in the country and (ii) because it had completed an implementation of the integrated medical information system (IMIS). The IMIS implementation meant that patients' personal information was stored in one data storage and could be easily retrieved by a medical representative for treatment purposes. The pilot program in Karaganda took place from September to December 2019. Residents of the Karaganda region were unconditionally insured, which means that all residents of the Karaganda region were entitled to services in both packages of the healthcare system specified above.

The Ministry of Health announced that the Karaganda experiment was a success and reported an increase in the average monthly number of rehabilitation services from 642 during the first 8 months of 2019 to 1109 in pilot mode; hospital services provision increased from 7,460 services before the pilot, to 8,466 services during the pilot period; consulting and diagnostic services increased 1.5 times (from 485,416 to 690,190 services), computed imaging/magnetic resonance services increased by 2.8 times (from 1265 services during the 8 months of 2019 to 3518 services during the pilot period). The numbers show that the CSHI system significantly increased healthcare utilization during the Karaganda experiment.

From January 1, 2020, the healthcare system in Kazakhstan has fully transitioned to the CSHI. To propagate the benefits of the CSHI system, the government announced that until April 1, all residents and citizens of the Republic of Kazakhstan were considered conditionally insured, regardless of whether they contributed to the Medical Insurance Fund prior to the transition or not. The government extended the insured status of all residents and citizens for the second quarter of 2020 due to the COVID-19 outbreak.

According to the Social Health Insurance Fund, in 2020 more than 85 percent of citizens had health insurance, of which 54 percent or 10 million people belonged to preferential categories of citizens, and spending on health care has increased from 1.03 trillion KZT in 2019 to 2.6 trillion KZT in 2024. The Bureau of Statistics reported that out-of-pocket expenditures on healthcare in Kazakhstan have decreased from 34% in 2005 to 25% in 2021. Although the data show a decrease in OOP expenditure and GDP per capita increase in health care expenditure, according to the Minister of Health - Akmaral Alnazarova - as of 2024, the system does have the following problems: "limited access of insured people to free medical care, the substitution of state-guaranteed free services with paid services, a high share of "out-of-pocket expenditure". Insufficient quality of medical services, the fact that 3.6 million people are outside the system of planned medical care, and the measures taken to involve them do not bring the desired effect" [8].

3 Methodology

3.1 Baseline Model specification

To assess the impact of the transition from a tax-based system to CSHI on CHE and impoverishment, we implement a staggered difference-in-difference analysis because of the staged roll-out of the reform (experiment and complete transition). The traditional (static) empirical model is then determined by the following two-way fixed effects (TWFE) specification:

$$y_{irtq} = \alpha_0 + \delta CSHI_{rtq} + X_{itq}\gamma + \alpha_1 Z_{rtq} \times t \times q + \alpha_2 COVID_{tq} + \mu_r + \eta_t + \theta_q + \varepsilon_{irtq}, \quad (1)$$

where y_{irtq} is the inequality measured by the CHE incidence or intensity, or impoverishment for household i in the region r in year t, quarter q.[9] $CSHI_{rtq}$ is a binary variable equal to 1 if region r in year t and quarter q was under CSHI and 0 otherwise.[10] X_{itq} is

[8] *Source:* https://orda.kz/v-minzdrave-kazahstana-priznali-bolshie-problemy-sistemy-osms-382906/

[9] Details on the CHE incidence, intensity and impoverishment calculations are left to Section 3.3.

[10] The variable, hence, is equal to one for Karaganda region in 2019Q4 and 2020 and all regions in 2020.

a vector of household characteristics. Z_{rtq} are regional characteristics[11] $COVID_{tq}$ controls for the COVID-19 period (2020Q2-2020Q4).[12] μ_r, η_t, and θ_q are region, year, and quarter-fixed effects, respectively. ε_{irtq} is i.i.d. error term. Household characteristics such as household income, the age of the head of the household, gender, employment and marital status, the number of children, and the number of household members are control variables - X. In addition, we include reports on whether the household has a retired family member, receives any social assistance, has a member in a bad health condition, lives in the urban area, and has completed at least a high school education.

The coefficient on the interaction term - δ - is the coefficient of interest, which indicates the impact of policy change on the CHE and the impoverishment of households. The positive coefficient indicates that moving from a tax-financed system to CSHI increased the likelihood of CHE incidence, the intensity of CHE (out-of-pocket expenditure), and the impoverishing effects of health care costs. Contrary, a negative δ coefficient will indicate the success of the transition in decreasing the out-of-pocket payment and the impoverishing effects of health spending. Given the nature of the dependent variables of interest — CHE incidence and impoverishment —, we will use probit regression as our main analysis technique. For the CHE intensity as a dependent variable, we will utilize the fixed-effect linear regression approach.

The staggered Difference-in-Difference (DiD) method, like the traditional DiD approach, but involving multiple periods and groups, relies on crucial assumptions. The primary one is the exogeneity assumption, meaning that the rollout occurs randomly over time and is not tied to factors influencing the outcome. In our case, this means that the choice of the Karaganda region to implement the experiment was exogenous from the factors that affect CHE and impoverishment. Differences in regional characteristics that influence the choice of experiment could result in spurious correlation. Although, according to official sources, Karaganda was chosen solely because of the unified digital system

[11] The variables in Z include the log of the population in the region; the log of the average income of the region; number of doctors in the region.

[12] The first COVID-19 case in Kazakhstan was confirmed on 13 March 2020. The government introduced a lockdown on March 16. In 2020, there were a total of 154,720 cases with 2,262 lethal outcomes. Since the effect of COVID-19 in the first two weeks was not as significant as in the later periods, we treat the first quarter of 2020 as the period without COVID.

of population present in the region and the size of the region, to control for possible confounders, we include linear-time trends interacted with regional characteristics that might have an impact on the success of the experiment (and depending on data availability). Moreover, given the diversity across the country and its regions, the samples from households in the Karaganda region and the rest of Kazakhstan are not necessarily comparable. Therefore, for the analysis described above, we use weighted regressions, where weights are the propensity scores of the logit model with the binary variable of the treatment group as a dependent variable and the vector of household characteristics in eq. (1).

Another key assumption in the staggered DID design is the no-anticipation assumption stating that the potential outcome of a unit depends only on its treatment assignment, and is independent of the treatment of another unit or its own treatments in the future. We argue that because health shocks that lead to catastrophic health expenditures are often unpredictable and households typically do not know in advance when they will need expensive medical treatment, it is difficult for them to strategically adjust their behavior in anticipation of a future policy change. In addition, when a health shock hits, people tend to seek treatment immediately, irrespective of any future health-related policy changes. This is because health needs that require substantial finances are often urgent, and cannot be postponed. Therefore, catastrophic health expenditures are likely driven by immediate needs rather than strategic considerations about future insurance coverage. Although we do believe that the no-anticipation assumption is not violated, we perform an event-study approach and look into pre-treatment effects to formally test the validity as well.

3.2 Alternative DID estimator

Recent developments in econometric theory highlight significant issues with DID estimators when treatment is staggered in adoption and varies with time (Borusyak and Jaravel, 2018; De Chaisemartin and d'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2021), despite the validity of the random assignment of treatment assumption. This issue arises because these estimates, derived from two-way fixed effects (TWFE) DiD regressions, are variance-weighted averages of multiple DiDs, leading to problematic "bad comparisons" groups. In these cases, already-treated units may serve as control units, introducing bias. This bias becomes especially pronounced when treatment effects are dynamic, potentially even reversing the sign of the true Average Treatment Effect on the Treated (ATT). Furthermore, the bias is not resolved by event-study estimators, which are often used to account for dynamic effects. Research by Sun and Abraham (2021) shows that in the presence of staggered treatment timing and treatment effect heterogeneity, TWFE dynamic effect estimates are contaminated by the effects of other relative time periods, leading to further inaccuracies. Moreover, the standard staggered DID estimates are likely to be biased if the implicit assumption of constant treatment effects between groups and over-time does not hold (Roth et al., 2023; De Chaisemartin and d'Haultfoeuille, 2024).

Econometric literature suggested various alternative DiD estimation approaches to overcome these issues.[13] Therefore, as robustness to our baseline estimation, we adopt the Gardner et al. (2024) two-stage DiD. The parameter of interest from eq. (1) - δ - would become the group-time-average treatment effect. The two-stage DiD technique is intuitive, easily expandable to event-study estimates for dynamic treatment, does not require bootstrapping to calculate standard errors, and allows for time-varying covariates. It also suggests an informal test of parallel trends (built-in) and allows for k anticipation effects by estimating the first-stage using observations that are at least k periods away from treatment. We refer the reader to the original paper for theoretical details and implementation, but in a nutshell, the technique estimates group- and period- fixed effects in untreated sample to determine the treatment effect in the full sample.

[13]Describing each of those estimators and discussing their relative pros and cons are out of the scope of this paper. We refer the interested reader to Baker et al. (2022); Wing et al. (2024) for a brief overview of the issues and alternative estimation techniques developed in the field. (See, for example, De Chaisemartin and d'Haultfoeuille, 2020; Callaway and Sant'Anna, 2021; Sun and Abraham, 2021, among others.)

3.3 Measuring the incidence and intensity of CHE and impoverishment

Catastrophic health expenditure is estimated as the out-of-pocket payment of health care services divided by the total non-food expenditure that exceeds a certain threshold (Van Doorslaer et al., 2007; Wagstaff and Doorslaer, 2003). The OOP expenditure is the sum of inpatient, outpatient, dental services, medical equipment and apparatuses, informal payments (in-kind or cash), and pharmaceutical expenditures. It excludes payments to a third party for private health insurance purposes. Those are the payments that households make directly to health providers at the time of service. There is no single acceptable threshold for the estimation of CHE. We use 10% of the total non-food expenditure that was proposed by the World Bank and World Health Organisation (Wagstaff et al., 2007) as a threshold above which the ratio of health expenditure over non-food expenditure is considered catastrophic. For our indicators of CHE incidence and intensity, and impoverishment, we use the definitions proposed by Wagstaff and Doorslaer (2003), which are standard in the literature.[14]

The catastrophic payment headcount[15], which represents the incidence of CHE is calculated as

$$H = \frac{1}{N}\sum_{i=1}^{N} E_i, \tag{2}$$

where N is the sample size and E_i is the binary variable and takes a value of 1 if the household whose OOP health spending as a proportion of their non-food expenditure exceeds a 10% threshold.

Next, we measure the average CHE overshoot to estimate the intensity of CHE:

$$O = \frac{1}{N}\sum_{i=1}^{N} O_i, \tag{3}$$

where $O_i = ((\frac{T_i}{\chi_i}) - z)$, and T_i is the OOP payments on health, χ_i is the total non-food

[14]The familiar reader can skip to section 4 directly.

[15]Note that although the standard terminology used in the literature is 'headcount', the unit of measurement of H is the share (percent).

expenditure of the household, and z is a threshold. The mean positive gap is then:

$$MPG = \frac{\sum_{i=1}^{N} O_i}{\sum_{i=1}^{N} E_i}. \tag{4}$$

Following Wagstaff and Doorslaer (2003), to obtain the CHE distribution associated with household expenditure, first, we measure the concentration indices C_E for E_i and C_O for O_i. The range of these indicators is from -1 to +1. If C_E is positive, the wealthier household is more likely to exceed the selected payout threshold. In contrast, if C_E is negative, the poorer household is more likely to exceed the selected payment threshold. Similarly, when $C_O > 0$, the CHE overshoot is concentrated in the better-off households. Then, the weighted head count and overshoot are estimated as follows:

$$\begin{aligned} W_E &= H.(1 - C_E) \\ W_O &= O.(1 - C_O). \end{aligned} \tag{5}$$

The measures are similar to the baseline headcount and overshoot indicators but give more weight to the poor.

Catastrophic health payments do not fully indicate the hardships health expenditure brings to households. In this regard, we rely on calculations for the impoverishing effects of healthcare costs. The fraction of households living below the poverty line is called the poverty headcount and is estimated as follows:

$$H^{pre} = \frac{\sum_{i=1}^{N} s_i p_i^{pre}}{\sum_{i=1}^{N} s_i}, \tag{6}$$

where N is the sample size and s_i is the household size, p_i^{pre} is the binary variable indicating 1 if the household income per person (m_i) is less than the poverty line (PL) and zero otherwise. Similarly to Aji et al. (2017), we implement the poverty line equal to 2.15 USD per person per day. To convert the poverty cut-off in Kazakh tenge in 2019, we utilize the purchasing power parity exchange rate and get 26,461KZT per quarter per person as the poverty line cutoff - PL.

Next, we estimate the shortage of the average amount of resources relative to the poverty line, which is called the mean poverty gap, which is defined as:

$$G^{pre} = \frac{\sum_{i=1}^{N} s_i g_i^{pre}}{\sum_{i=1}^{N} s_i}, \tag{7}$$

where g_i^{pre} is called the prepayment poverty gap and is equal to $g_i^{pre} = p_i^{pre}(PL - m_i)$.

Furthermore, we normalize the measure of the poverty gap to be comparable throughout the periods and samples (eg, regions and countries):

$$NG^{pre} = \frac{G^{pre}}{PL}. \tag{8}$$

.

Similarly, we calculate the post-payment indicators of headcount and gap, denoted as H^{post} and G^{post}, respectively. Compared to its 'pre-' counterparts, we use household income per person after the health expenditure is deducted from the household income. Using pre- and post-indicators, we calculate the effect of OOP on poverty or impoverishment head count as:

$$\begin{aligned} PI^H &= H^{post} - H^{pre} \\ PI^G &= G^{post} - G^{pre}, \end{aligned} \tag{9}$$

respectively.

4 Data

For this research, we use Household Budget Surveys (HBS) from 2017Q1 to 2020Q4 collected by the Bureau of National Statistics of the Republic of Kazakhstan quarterly, which is confidential rotational-panel data. The sample population of households is formed by the method of two-stage random sampling using stratification and random selection procedures at each of the stages of sampling formation. The stratification procedure aims to form a representative sample of households that adequately reflects the territorial characteristics of the population stratification. The sampling process is carried out in two stages. In the first stage, the general population is stratified on a territorial basis, including distribution in urban and rural areas. Thus, 37 strata are formed - these are selected urban and rural areas in seventeen regions of the country (a total of 37 strata, taking into account that there are no rural areas in the cities of Astana, Almaty, and Shymkent). 400 territorial units are selected as primary sample units (hereafter referred to as the PSU), which represent urban and rural areas. In the second stage of sampling, 30 households are randomly selected in each PSU. The basis for sampling in the second stage is a list of individual residential premises in the PSU. The cluster (or clusters) of dwellings to be visited in the course of the survey are equally likely to be selected from among suitable dwellings in the PSU.

The Kazakhstan Household Budget Survey combines information on labor market conditions, wages and other income, and household consumption. One-third of households leave the sample each year and new households are added. Each year, 12,000 households across the country are surveyed, with personal characteristics being collected once a year, while data on consumption and income are collected quarterly. We use unweighted HBS data.

We estimate the outcome variables of interest based on the households' total non-food and health expenditures. Control variables include household income, the gender of the head of the household, marital status, education level, age, employment status, number of children in the household, the number of elderly in the household, region, social assistance, and household size. The main determinant of health expenditure is income aggregate, which includes wage and non-wage income; wage income comprises earnings from dependent activities, and non-wage income includes all other income including subsistence farming and livestock production, self(informal)-employment earnings, and transfer income. In addition, income from other sources, such as social transfers and pensions, is controlled by the dummy variable of state assistance. The spatial differences in cost of living between urban and rural areas can also be large; therefore, the urban control variable was used. Self-reported responses on health status are collected annually together with other general time-invariant questions.

From eqs. (2) to (9), we calculate the incidence (headcount) and intensity (gap) of catastrophic health expenditures and impoverishing healthcare costs. We sample households by pre-CSHI, experiment, and CSHI periods. Table 1 provides summary statistics of the calculations. Panel (a) of the table focuses on the statistics for the CHE, while panel (b) reports statistics on impoverishing health costs. Table 1 shows that, for instance, under a tax-financed system 19% of the sample of the households recorded out-of-pocket payments over 10% of total expenditure. The share decreases somewhat over time, eg, 15% of the households in 2020Q1. Interestingly, both the incidence and intensity of CHE are more concentrated among the poor ($C_E < 0$ and $C_O < 0$). The concentration index hints at the most affected group of the population. In our case, the concentration index is based on the income distribution of the sampling population. The negative value means that changes affecting the CHE have a more pronounced impact on the poor. Combined with the declining trend in CHE intensity, results in a higher weighted CHE headcount measure, which captures the impact on the most vulnerable stratum of the population.

Panel (b) of table 1 focuses on the impoverishing effects of health care costs. It shows that out-of-pocket payments only slightly increase the headcount ratio, for example, by 0.07% for the Karaganda region and 0.04% for the rest of the country in 2019Q4. Normalized poverty gaps are more representative when comparing samples between groups and periods. Interestingly, out-of-pocket payments increase the normalized gap by 0.14% before CSHI and by 0.1% (on average) post-CSHI. This means that the impact of out-of-pocket expenditure on impoverished households has decreased, although the decline seems to be driven by COVID-19. Given these observations, it becomes less clear what the impact of the transition to CSHI on healthcare expenditures is.

While table 1 focused on the dependent variables and their characteristics[16], we provide summary statistics for the control variables (X) in Table 2. The average income per household in the Karaganda region is slightly higher than in the rest of the country

[16]Note that the measures in the table are shares of the population by time frame. While, for the analysis, we utilize the binary variables of having expenditure above the threshold — E_i in eq. (2) — for the CHE incidence; average CHE overshoot — O_i in eq. (3) — for CHE intensity; and the binary variable indicating household income per person below the poverty line — p_i^{post} from *post* equivalent in eq. (6) — for impoverishment.

Table 1: CHE and Impoverishment incidence (headcount) and intensity (gap)

	pre-CSHI	experiment		post-CSHI	
	2017Q1-2019Q3	2019Q4		2020Q1	2020Q2-2020Q4
		Karaganda	ROK	no-COVID	COVID
a) Catastrophic health expenditure					
Headcount measures					
$H, (\%)$	18.88	19.69	17.16	15.0	8.01
C_E	-0.008***	-0.034***	-0.015***	-0.018***	0.002**
$W_E, (\%)$	19.04	20.36	17.41	15.27	8.0
Gap measures					
$O, (\%)$	1.92	2.41	1.73	1.62	0.98
$MPG, (\%)$	10.17	12.26	10.11	10.81	12.28
C_0	-0.001***	-0.007***	-0.002***	-0.002***	0.001***
$W_0, (\%)$	1.92	2.43	1.74	1.63	0.98
b) Impoverishment					
Headcount measures					
$H^{pre}, (\%)$	0.33	0.47	0.19	0.06	0.16
$H^{post}, (\%)$	0.46	0.54	0.23	0.28	0.08
$PI^H, (\%)$	0.13	0.07	0.04	0.13	0.01
Gap measures					
G^{pre}	29.99	34.52	16.28	12.0	5.29
G^{post}	65.57	97.11	36.21	51.72	8.37
PI^G	35.58	62.59	19.92	39.72	3.09
Normalized measures					
$NG^{pre}, (\%)$	0.11	0.13	0.06	0.05	0.02
$NG^{post}, (\%)$	0.24	0.37	0.14	0.20	0.03
$PI^{NG}, (\%)$	0.13	0.24	0.08	0.15	0.01
N	124,613	843	10,008	11,489	34,467

throughout the study period and consists of around 3 people — 1 child, with a higher probability of larger families outside of the Karaganda region. The level of urbanization is higher in Karaganda than in the rest of Kazakhstan, which is not surprising. Karaganda is the largest region of the country with 6 towns and 2 districts identified as urban areas. Around a third of all households in treatment and control groups receive some social assistance (transfers) from the government. The probability of having social assistance increases with time, and even more so for households in the Karaganda region. The average household head is 50-year-old male, employed, and married before and during the intervention for both groups.

Table 2: Summary Statistics on household characteristics

	pre-CSHI 2017Q1-2019Q3		experiment 2019Q4		post-CSHI 2020Q1-2020Q4	
	Karaganda	ROK	Karaganda	ROK	Karaganda	ROK
Control variables						
HH income, log	13.21	13.15	13.35	13.22	13.26	13.13
HH size	3.18	3.36	3.15	3.25	2.89	2.94
Urban	0.73	0.61	0.73	0.62	0.70	0.65
Social assistance	0.47	0.32	0.41	0.38	0.48	0.43
Bad health members	0.48	0.35	0.48	0.43	0.26	0.43
No of children	1.15	1.09	0.99	1.05	0.87	0.86
No of elderly	0.38	0.40	0.41	0.44	0.48	0.52
Gender (HH head)	0.70	0.63	0.69	0.61	0.59	0.52
Age (HH head)	48.4	49.1	49.5	50.0	50.5	50.4
Employment status (HH head)	0.88	0.84	0.83	0.79	0.79	0.78
Marital status (HH head)	1.39	1.43	1.39	1.47	2.0	1.91
High School (HH head)	0.21	0.25	0.20	0.25	0.23	0.27
Observations	9,661	114,952	843	10,008	3,444	42,512

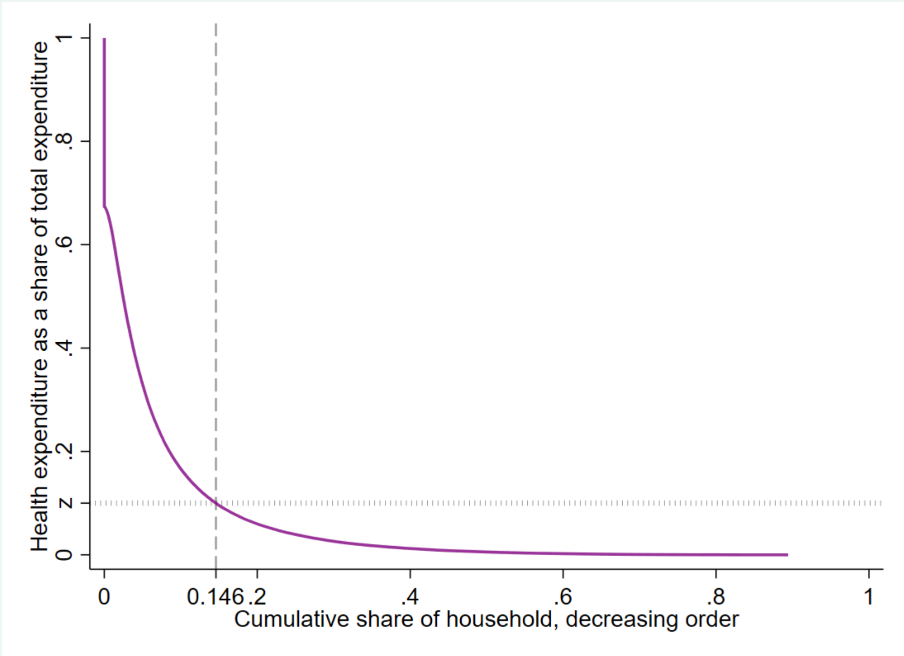
The values are weighted averages, where weights are the propensity scores.

5 Empirical Results

We start the analysis by plotting the cumulative distribution (decreasing order) of the share of health expenditures by households. The plot is useful in identifying households that are exposed to catastrophic healthcare expenditures. For the pooled sample, at the threshold of 10%, almost 15% of the sample has expenditures on health as a proportion of their non-food expenditures above the threshold (fig. 1).

The empirical approach to address the research question is the staggered difference-in-difference technique. Our identification strategy relies on the assumption that there are no underlying trends affecting the choice of policy implementation. Since our setting is based on one period (2019Q4) and one region (Karaganda) experiment and a complete system transfer after the experiment period (i.e. RoK from 2020Q1), we can think of it as the 'parallel trends' assumption, i.e. key characteristics of the control and treatment groups for the experiment should be similar (follow similar trends) before the reform. We verify the assumption in fixed-effect regression analysis (in the spirit of an event study approach). We perform a probit regression of CHE (from eq. (2)) on time ($year \times quarter$) and region-group dummies (Karaganda and RoK) and plot the regression coefficients in

Figure 1: **CDF**



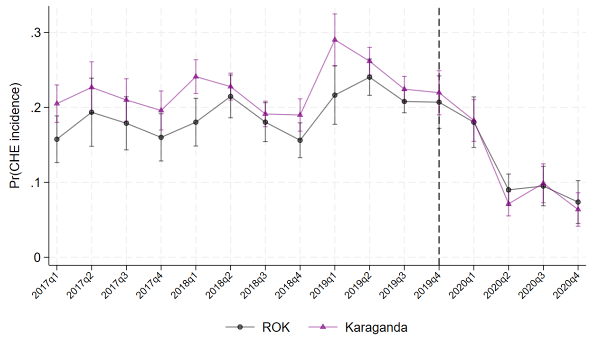
The figure plots the catastrophic out-of-pocket health expenditures as a share of total non-food expenditure, by cumulative percent of the pooled population. The dotted line represents the threshold cutoff of the CHE - 10%. The dashed line is at the intersection point of the CDF and the threshold, representing the proportion exceeding the threshold.

fig. 2 panel (a). We repeat the analysis with CHE intensity (from eq. (3)) as the dependent variable (panel b). Recall that the Karaganda experiment took place in 2019-Q4, and from 2020-Q1 households in the rest of Kazakhstan moved to the CSHI system. 2020-Q2 marks the beginning of COVID-19 and all related lockdown measures. In fig. 2, we observe that the incidence and intensity of CHE in the Karaganda region follow the same trend as in the rest of the country during the tax-based system (not statistically different). Under CSHI, we see a clear declining trend. Interestingly, we observe a discontinuity starting from 2020-Q1 to 2020-Q2 in the probability of CHE incidence, corresponding to COVID-19 times.

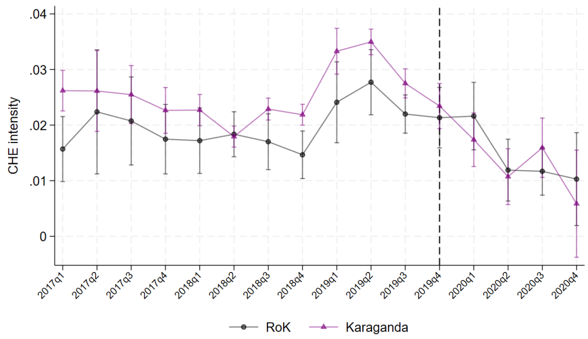
Baseline results

We formally examine the impact of transitioning from a tax-financed system to a compulsory social health insurance (CSHI) system on the incidence and intensity of catastrophic health expenditures, as well as on the resulting impoverishment, following the model outlined in eq. (1). Our analysis includes estimates for both the full sample pop-

Figure 2: **'Common trends' assumption**



(a) CHE incidence



(b) CHE intensity

The figure plots the coefficients from regressions of CHE (a) incidence and (b) intensity on time (*year* × *quarter*) and region-group dummies. The vertical dashed lines mark the time of the Karaganda experiment. During the period prior to the line, the Kazakhstani healthcare system was tax-based, while the period after the dashed line is when the country switched to the CSHI system.

ulation and a sub-sample consisting solely of employed households, where all members are employed. It is important to note that we do not observe the insurance status[17] of households, which introduces an omitted variable bias.[18] By focusing on the sub-sample of employed households, we control for the insurance status implicitly — employed households are covered by insurance, thus minimizing this bias and potentially yielding more robust results. Additionally, this sub-sample helps us mitigate concerns about behavioral changes in household healthcare access, as their access to healthcare services remains consistent.

The results are presented in Table 3. Columns (1), (4), and (7) are baseline regression results in the full sample of households with CHE incidence, CHE intensity, and impov-

[17]However, according to SHIF, 85 percent of the population was insured in 2020.

[18]The direction of the bias depends on the correlation between the omitted variable (insurance status) and both the dependent variables (CHE incidence, intensity, or impoverishment) and the independent variable of interest (CSHI). Insurance coverage generally reduces the incidence and intensity of CHE and impoverishment. Thus, there is likely a negative correlation between insurance status and the dependent variables, $corr(y_{irtq}, insurance_{irtq}) < 0$. The correlation between CSHI and insurance status is ambiguous. If the introduction of CSHI increases the likelihood that a household is insured, there will be a positive correlation between CSHI and insurance status, $corr(CSHI_{rtq}, insurance_{irtq}) > 0$. Since the omission of insurance status leads to an overestimation of the negative impact of CSHI on CHE and impoverishment, and CSHI is positively correlated with insurance coverage, the estimate of δ could be positively biased. This means that the actual effect of CSHI on reducing CHE and impoverishment could be underestimated because the model does not account for the reduction in CHE and impoverishment due to increased insurance coverage. The logic is reversed if insurance coverage is not complete under CSHI.

Table 3: Regression Results

	Incidence			Intensity			Impoverishment	
	All		Employed	All		Employed	All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CSHI	-0.062**	-0.024***	-0.130***	-0.002*	-0.003*	-0.005***	0.730	0.002***
	(0.029)	(0.008)	(0.024)	(0.001)	(0.001)	(0.001)	(0.444)	(0.001)
COVID	-0.438	-0.068***	-1.001	-0.151**	-0.006***	-0.149	-18.171	0.000
	(4.725)	(0.013)	(3.856)	(0.058)	(0.002)	(0.112)	(27.671)	(0.001)
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region vars X time	Yes		Yes	Yes		Yes	Yes	
year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region vars.		Yes			Yes			Yes
Obs.	181420	181420	141734	181420	181420	141734	181420	181420
R^2	0.088		0.058	0.066		0.043	0.630	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

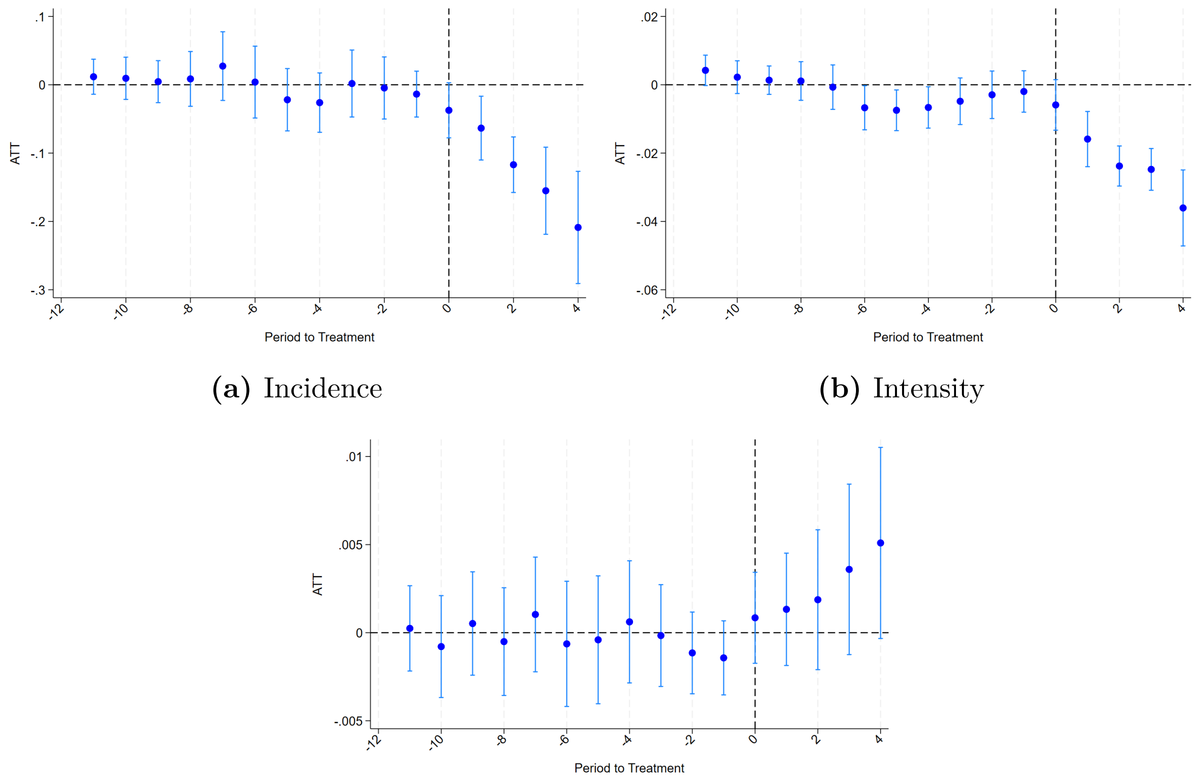
Columns (1), (3), (4), (6) and (7) present the results from estimations of eq. (1). Columns (2), (5), and (8) are two-stage DiD estimates of Gardner et al. (2024). CHE incidence, intensity, and impoverishment are dependent variables. Estimation samples include a complete sample of households and households with all employed members. Demographic controls include such household characteristics as household income, the age of the head of the household, gender, employment and marital status, the number of children and the number of household members, reports on whether the household has a retired family member, receives any social assistance, has a member in a bad health condition, lives in the urban area, and has completed at least high-school education. Region variables include population (log), average income (log), and number of doctors. Estimates are weighted using the propensity score matching weights. Robust standard errors in parentheses are clustered at the region level.

erishment as dependent variables, respectively. The coefficient on CSHI is of interest. We observe a negative and significant impact of transitioning from a tax-based system to CSHI on CHE incidence, i.e. CSHI resulted in a decline in the predicted probability of CHE incidence by 6.2 percentage points; and CHE intensity — on average, the amount of overshoot expenditures declined slightly (2 KZT) post-CSHI. We did not find an impact on the incidence of impoverishment.

Columns (3) and (6) show the impact of transitioning to CSHI, conditional on the fact that the entire population has insurance coverage from the TWFE specification. Given the negative correlation between insurance status and CHE, the impact of CSHI on incidence and intensity is more pronounced — a decline in the predicted probability of CHE incidence by 13 percentage points and a decline in overshoot expenditure by 5 KZT.

Columns (2), (5), and (8) present estimates from the two-stage DiD estimation technique used as an alternative that corrects for potentially present biases in TWFE. The results are robust to alternative specifications. Interestingly enough, we observe a positive and statistically significant effect on impoverishment, though the magnitude is practically insignificant. We also perform a dynamic approach (event study setting), in which we verify that the no-anticipation assumption holds and observe that the impact of the policy increases over time (Figure 3).

Figure 3: **Event study**



(a) Incidence

(b) Intensity

(c) Impoverishment

The figure plots period coefficients of the event study two-stage DiD estimation by Gardner et al. (2024). The model includes all controls specified in the baseline regression.

Overall, we find some supporting evidence that the transition was successful in the short run. However, we acknowledge the fact that CHE and impoverishment are only some of the many possible assessment criteria and the positive implications of the CSHI system are dependent on the insurance coverage of the population and determined by the quality of health care services and available funds in the long run. Our results also suggest that the benefits of the CSHI system may not have reached the population equally.

Who benefited the most?

The shift to the CSHI system was intended to reduce financial barriers to healthcare access and mitigate the risk of catastrophic health expenditures for populations at risk. To further test the claim, we repeat the analysis of eq. (1) for samples divided according to household income (quartiles). The results are presented in Table 4. Columns (1)-(4) present the results for sub-samples by household income in (0,25), (25,50), (50,75), and (75,100) percentile ranges, respectively, with CHE incidence as the dependent variable. Columns (5)-(8) present the estimates for a model with CHE intensity as the dependent variable.

The results suggest that the policy decreased the probability of CHE intensity and incidence of wealthier households (3rd and 4th quartiles of income distribution) while having no impact on the relatively poor population. Our study supports the findings of Yazbeck et al. (2020); Wagstaff (2010) which claim that under the SHI the resources are redistributed to the wealthy, and not the poor. Hence, moving from a tax-financed to a social health insurance system does not provide a proper redistributive mechanism that is vital for achieving equity and improving financial protection. On the other hand, not observing any impact on the poor could potentially reflect that vulnerable and eligible households were more likely to be fully covered by the government pre- and post-intervention periods, hence the system change had no impact on the CHE within this population sample. Another explanation could be that, both before and after the intervention, poor households may not have used health care services due to lack of knowledge about the benefits to which they are entitled, lack of medical knowledge on the part of patients, or lack of clarity regarding the distinction between free and paid health services.

Unfortunately, given the limitations of the data, we are unable to differentiate and test whether households decided to use fewer or more health services because we do not observe the number of visits. This potentially makes it hard to differentiate between reporting zero health care expenditure, which can mean zero visits or full coverage. However, the results seem to support the recent debate of developing and underdeveloped countries staying under the tax-financed health care system, and CSHI being overused and benefiting the relatively rich while leaving the most vulnerable population worse off.

Placebo test

Table 4: Regression Results: Income quartiles

	Incidence				Intensity			
	Low income		High income		Low income		High income	
	(0p,25p)	(25p,50p)	(50p,75p)	(75p,100p)	(0p,25p)	(25p,50p)	(50p,75p)	(75p,100p)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CSHI	0.128	-0.095	-0.012	-0.120**	0.009	0.002	-0.004*	-0.005**
	(0.122)	(0.058)	(0.044)	(0.058)	(0.008)	(0.002)	(0.002)	(0.002)
COVID	8.303	-2.863	3.858	-9.178**	-0.054	-0.102	0.167	-0.278
	(6.305)	(4.479)	(8.584)	(4.273)	(0.099)	(0.066)	(0.140)	(0.178)
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region vars X time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	45330	45329	45363	45345	45359	45351	45363	45347
R^2	0.133	0.095	0.086	0.072	0.102	0.076	0.070	0.055

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The table presents the results from estimations of eq. (1) by sub-samples based on income quartiles. CHE incidence and intensity are dependent variables. Estimation samples include sample of households with household income in the (0-25); (25,50); (50,75); (75,100) percentile ranges. Demographic controls include such household characteristics as household income, the age of the head of the household, gender, employment and marital status, the number of children and the number of household members, reports on whether the household has a retired family member, receives any social assistance, has a member in a bad health condition, lives in the urban area, and has completed at least high-school education. Region variables include population (log), average income (log), and number of doctors. Estimates are weighted using the propensity score matching weights. Robust standard errors in parentheses are clustered at the region level.

To ensure that our baseline results are attributable to the reform studied and not other potential changes occurring simultaneously, we conduct a placebo test. In this test, we assume the system change happened in 2018, i.e. $CSHI_{rtq}$ in eq. (1) is equal to 1 for all quarters and regions in 2018, and additionally for the Karaganda region in 2017Q4; and 0 otherwise. With this setup, we expect the coefficient on the CSHI to be insignificant. The results, shown in Table 5, confirm that the observed decrease in the probability of incidence and intensity of CHE is indeed attributable to the system transition.

Robustness check

To test the robustness of our results to different methodologies, we divided the program rollout into the experimental period and the full transition period, analyzing each separately. First, we focus on the experiment period, using data up to 2019Q4 and excluding data for 2020. In this analysis, we apply the standard difference-in-difference approach, treating the Karaganda region as the treatment group and the rest of Kazakhstan as the control group.

Focusing solely on the experiment sample allows us to explore the foundation for deciding to reform the system. The results, presented in columns (1)-(2) of Table 6, suggest

Table 5: Placebo test

	Incidence (1)	Intensity (2)	Impoverishment (3)
CSHI	0.776	-0.027	-8.300
	(1.438)	(0.032)	(9.429)
COVID	-0.475	-0.151**	-17.860
	(4.731)	(0.058)	(27.815)
Demographics	Yes	Yes	Yes
Region vars X time	Yes	Yes	Yes
year FE	Yes	Yes	Yes
quarter FE	Yes	Yes	Yes
region FE	Yes	Yes	Yes
Obs.	181420	181420	181420
R^2	0.088	0.064	0.629

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The table presents the results of the estimations of eq. (1) where CSHI is assumed to occur in 2018. Columns (1) and (3) are from probit, while column (2) is from OLS regression analyses. CHE incidence, intensity, and impoverishment are dependent variables. The estimation sample includes a full sample of households. Demographic controls include such household characteristics as household income, the age of the head of the household, gender, employment, and marital status, the number of children, and the number of household members, reports on whether the household has a retired family member, receives any social assistance, has a member in a bad health condition, lives in the urban area, and has completed at least high school education. Region variables include population (log), average income (log), and number of doctors. Estimates are weighted using propensity score matching weights. Robust standard errors in parentheses are clustered at the region level.

Table 6: Robustness test

	Experiment		CSHI	
	Incidence	Intensity	Incidence	Intensity
	(1)	(2)	(3)	(4)
CSHI	-0.093***	-0.003*	-0.572	-0.032
	(0.026)	(0.001)	(3.568)	(0.052)
COVID			-0.310	-0.160**
			(4.661)	(0.059)
Demographics	Yes	Yes	Yes	Yes
Region vars X time	Yes	Yes	Yes	Yes
year FE	Yes	Yes	Yes	Yes
quarter FE	Yes	Yes	Yes	Yes
region FE	Yes	Yes	Yes	Yes
Obs.	135464	135464	167472	167472
R^2	0.085	0.077	0.087	0.066

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Demographic controls include such household characteristics as household income, the age of the head of the household, gender, employment and marital status, the number of children and the number of household members, reports on whether the household has a retired family member, receives any social assistance, has a member in a bad health condition, lives in the urban area, and has completed at least high-school education. Region variables include population (log), average income (log), and number of doctors. Estimates are weighted using the propensity score matching. Standard errors in parentheses are clustered at the region level.

that the Karaganda experiment was successful, showing a decline in CHE incidence and intensity in the Karaganda region under CSHI compared to the rest of Kazakhstan. We acknowledge the fact that the short post-period limits our ability to draw definitive and strong conclusions. Nevertheless, these findings demonstrate that our baseline results are robust. Moreover, the success of the Karaganda experiment was reported by the authorities and justified further transition to CSHI of the rest of the country in January 2020. Our analysis provides some supporting evidence for this claim.

Next, we consider the impact of the reform in a (relatively) longer horizon. To this end, we examine the period when the RoK transitioned to CSHI. Specifically, we focus on all regions excluding the Karaganda region, with the CSHI period then spanning from 2020Q1 to 2020Q4, and the base period being the tax-financed system for the 2017Q1-2019Q4 period. We perform a standard panel regression with a CSHI period dummy and the full set of controls specified in eq. (1). The results are presented in columns (3)-(4) of Table 6. We do not observe any significant impact of the complete transition to the CSHI system on the incidence or intensity of CHE, as the coefficients on the CSHI are negative but statistically insignificant.

We speculate that the positive impact of the system change in the Karaganda experiment is largely driven by the fact that all individuals were treated as fully insured during the experiment. This further supports our concerns that the success of the transition from a tax-based to an insurance-based system is heavily dependent on the insurance coverage of the population, as well as the quality of healthcare services and available finances.

6 Limitations and Discussion

One limitation of our study is that due to the data structure, we do not observe the frequency of healthcare service utilization. Although the issue is common in the literature[19], it remains a significant concern. The impact on CHE can be overestimated if individuals without insurance decide not to use health care services at all due to limited

[19] Contrary to studies that are based on supply side (clinics/hospital) data, for example, Hackmann et al. (2012), most studies that rely on HBS or other type of survey data, normally report only expenditures

resources. This scenario then undermines the entire purpose of transitioning to a CSHI system.

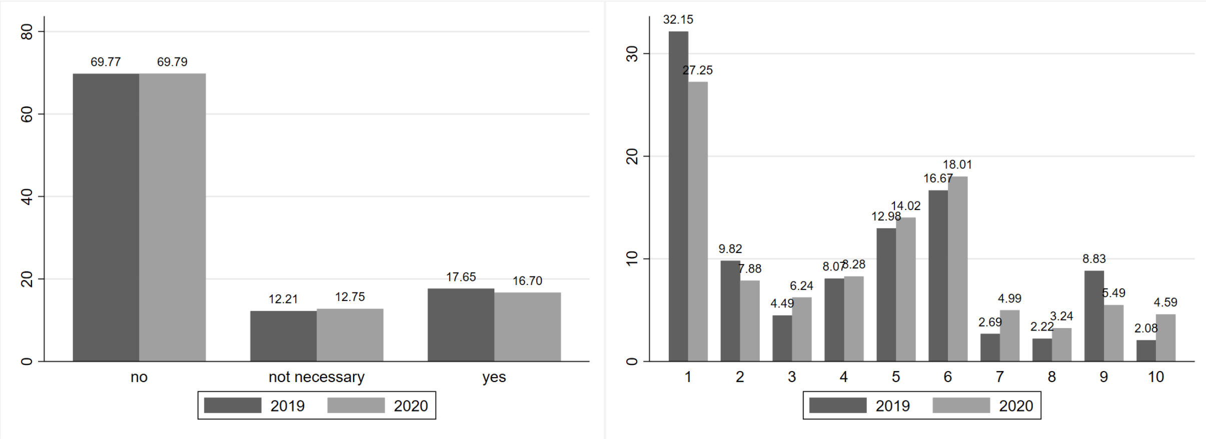
A supplementary questionnaire to the main one collected annually asks if a household had encountered any barriers in accessing health services within the represented year and if 'yes, what was the reason[20]. A simple comparison of the responses for 2019 and 2020, can shed some light on potential differences in household behavior in response to the system change. Figure 4 graphs the percentage of households by year and their response. From panel (a) of the figure, we do not observe any significant difference between the responses on access to healthcare services in general. Although one would expect a higher share of households experiencing some difficulties accessing the treatments due to the lockdown measures, this does not seem to be the case, only 17-18% of the households had any troubles in 2020 and 2019, respectively. Panel (b) of the figure plots the percentage of households by reason for limited access (or refusal to visit) for respondents that answered 'yes' to the previous question (around 8000-8500 respondents per year).

Self-treatment is the most common reason for people to avoid going to the healthcare specialists in both 2019 and 2020: together with 'go away by itself' it sums up to 42% and 35% of the answers, respectively. In 2020, more households were affected by the shortage of supply, reflected in long waiting lines, the absence of specialists, or / and the shortage of medicine. 6.2% of the households reported higher prices for services as the main reason in 2020, almost 2 percentage points higher than in 2019. Fewer people expressed distrust in the services provided, a decrease from 8.83% to 5.49% of the respondents. Overall, although fewer people resort to self-medication and express more trust in the treatment, the shortage of specialists and medications is still a big concern. The summary of responses does not provide causal inference; it offers valuable insight into the behavioral and perceptual changes in healthcare utilization in the short term.

Unfortunately, the data also do not cover the insurance status of individuals. Accord-

[20] The questionnaire differentiates between 10 potential reasons behind the limited access or refusal to visit a hospital. The provided options are as follows: 1 - self-treatment; 2 - figured that it will go away by itself; 3 - prices of the services are too high; 4 - high prices of the medicine; 5 - long queues; 6 - no specialist; 7 - hospital/polyclinic is too far / no means to get to the place; 8 - no medicine; 9 - bad treatment/services / have no trust; 10 - any other.

Figure 4: **Access to healthcare services**



(a) Have you encountered any barriers to accessing health services?

(b) If yes, what were the reasons?

Panel (a) depicts the share of households by their response to the question on access to healthcare services. Panel (b) plots the share of households by the reason for the limited access to healthcare out of the sample that responded 'yes' to the question in panel (a). The options for potential reasons are: 1 - self-treatment; 2 - figured that it will go away by itself; 3 - prices of the services are too high; 4 - high prices of the medicine; 5 - long queues; 6 - no specialist; 7 - hospital/polyclinic is too far / no means to get to the place; 8 - no medicine; 9 - bad treatment/services / have no trust; 10 - any other.

ing to the CSHI design, students, children, retired people, and other vulnerable people who are part of the 15 preferential categories of citizens are automatically covered by insurance. Officially employed citizens are insured as well. However, self-employed and people out of the labor force have the choice of buying insurance or not. Therefore, it is not possible to identify the insurance status of each adult member of the household in our data (for 18.75% of our sample in 2020). According to Wagstaff (2010), in the case of voluntary insurance under SHI, people who are outside the formal sector of employment or not part of the preferential category (vulnerable group) could be less inclined to acquire health insurance for various reasons. In 2020, 85%[21] of the total population of Kazakhstan was insured, which is higher than the average for the upper middle-income countries (Hooley et al., 2022). Nevertheless, the reliance of the CSHI system on contributions to the fund from the population (guaranteed by employed and voluntarily by the unemployed) coupled with the large informal sector, raises concerns about the sustainability of the system in the long run.

[21] 54% of which belongs to the preferential group of citizens, i.e. covered by the government.

Our study covers a short time span post-intervention, compounded by the COVID-19 pandemic, which coincided with the system change. Controlling for the lockdown months partly addresses this concern, but the long-term success of the CSHI system remains dependent on available financial resources, insurance coverage, and the quality of healthcare services. More research is needed to understand the full impact of the transition from a tax-based to an insurance-based system.

7 Conclusion

Equity in healthcare financing is a critical aspect of healthcare systems, with the aim of ensuring affordable access to medical services based on individuals' ability to pay. Proper redistributive mechanisms are essential for achieving equity and improving the financial protection provided by health systems. The financing of the health sector plays a crucial role in influencing equity, as it can either exacerbate or reduce health and income inequalities. One of the fundamental goals of health systems around the world is to improve the ability of households to cope with the financial burdens associated with illness.

This research examined the reform of the healthcare system in Kazakhstan, a typical example of an emerging market, to evaluate its ability to address equity in healthcare financing during the transition from a tax-financed system to compulsory social health insurance (CSHI). Specifically, we analyzed the impact of this transition on the incidence and intensity of catastrophic health expenditure (CHE) and impoverishment.

To do this, we used Household Budget Surveys (HBS) from 2017-Q1 to 2020-Q4 collected by the Bureau of National Statistics of the Republic of Kazakhstan every quarter. We performed a staggered difference-in-difference analysis technique, due to the staged rollout of the policy. Before the complete transition to the CSHI system in 2020, the policy was implemented in the Karaganda region from September to December 2019, as a pilot program.

Our baseline findings suggested a negative and significant impact of transitioning from a tax-based system to CSHI on the incidence and intensity of CHE. However, we did not observe any impact of the policy on the impoverishment incidence. Conditional on full insurance coverage of the population sample, we reported more pronounced results. We speculate that the positive impact of the system change is largely driven by the fact that during that period the insurance rate was very high. This supports our concerns that the success of the transition from a tax-based to an insurance-based system is heavily dependent on the rate of insurance coverage of the population, as well as the quality of healthcare services and available finances.

In addition to the TWFE we implemented the two-stage DiD method by Gardner et al. (2024). The results are robust to alternative specifications for CHE incidence and intensity. We find a positive and statistically significant effect on impoverishment, although the effect size is practically negligible. Additionally, using a dynamic approach (event-study setting), we confirm that the no-anticipation assumption is valid and observe that the policy's impact grows over time.

Although the results suggested the success of the transition, they also hinted at the fact that the positive impact of the reform did not affect all the population equally. The policy had an impact on wealthier households while having a limited impact on the relatively poor population. Our study supports the findings of Yazbeck et al. (2020); Wagstaff (2010) which claim that under the SHI resources are redistributed to the rich and not to the poor in developing countries. Hence, moving from a tax-financed system to a social health insurance system does not provide a proper redistributive mechanism that is vital for achieving equity and improving financial protection.

It is important to stress that we primarily observed the effect of the CSHI reform in the short-run, when the population was almost entirely insured. In 2020, on average 85 percent of the population was covered by health insurance in Kazakhstan. Due to data limitations, we do not observe the health insurance status of each member of the household. However, we expect the effect of the reform to have a lesser impact as the number of insured people may decline in the country due to 25 percent of the total labor force being engaged in informal employment, so funding the CSHI through payroll contributions may prove problematic (OECD, 2018; Savedoff, 2004). It can cause greater inequality with non-contributors being worse off. The implementation of CSHI in Kazakhstan can cause exclusion from the coverage of non-contributors and decreased access to medical services.

Understanding catastrophic healthcare expenditure is critical for ensuring that healthcare systems provide financial protection to individuals and families. This knowledge can be used to design health insurance policies that offer coverage to those who need it the most. Our study therefore helps identify disparities in healthcare access and affordability between different population groups, which can assist policymakers in re-examining and developing the current reform.

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Appendix

Table 7: Main socio-economic indicators of the Republic of Kazakhstan.

	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
GDP per capita, USD	13,890.6	12,807.3	10,510.8	7,714.8	9,247.8	9,812.6	9,812.6	9,121.6
Population (millions)	17.035	17.288	17.542	17.794	18.037	18.276	18.513	18755
Current Expenditure on Health per person, USD	363.2	374.4	314.3	259.8	278	272.6	270	341.5
Health Expenditure Relative to GDP, percent	2.66	2.97	3.04	3.42	3.05	2.81	2.78	3.78
Out-of-pocket expenditure per capita (USD)	25.95%	23.8%	32.09%	35.67%	33.14%	33.47%	33.86%	27.48%
Domestic general government health expenditure[a]	69.36%	71.71%	63.14%	59.61%	62.01%	60.83%	59.93%	66.15%
HH health expenditure greater than 10% of HH budget	1.8%	1.9%	2.5%		2.8%	2.6%	2.9%	3.4%
Life expectancy (years):								
Men	65.91	66.9	67.49	67.99	68.72	68.84	68.82	67.09
Women	75.23	75.82	76.26	76.61	76.92	77.19	77.3	75.5
Labour Statistics								
Labour force (millions)	8.913	8.968	9019	9.066	9.113	9.164	9.226	9.183
Gross Average salary, KZT	137,043	104,654	126,000	142,900	150,800	163,725	191,000	233,136
Gross Average salary, USD	909	679	690	420	452	492	497	609
Employed (thousands)	8433.3	8,553.4	8,585.2	8,695	8,780.8	8,695	8,780.8	8,732
Wage-earners(thousands)	6,294.9	6,342.8	6,485.9	6,612.5	6,681.6	6,612.5	6,681.6	6,686.6
Self-employed (thousands)	2,138.4	2,210.5	2,099.2	2,082.5	2,099.2	2,082.5	2,099.2	2,045.3
Unemployed	454.2	445.5	442.3	443.6	440.7	443.6	440.7	448.8
General								
Inflation. Consumer prices (annual %)	5.84	6.71	6.66	14.54	7.44	6.02	5.24	6.77
Gini Index	27.1	27	26.8	27.2	27.5	27.8		
UHC service coverage index			77		79		82	80[b]
USD/KZT	150.7	154.06	182.35	340	332.29	332.33	384.2	382.59

Source: Bureau of Statistics of the Republic of Kazakhstan, World Bank, Forbes Kazakhstan, Freedom Finance.

[a] % of current health expenditure

[b] As of the year 2021

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