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Zeen He and Luu D.T. Huynh

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Wealth, Medical Spending, and Health: Evidence from a Housing Reform*

Zeen He†
Lancaster University

Luu Duc Toan Huynh‡
Queen Mary University of London

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Abstract

This paper leverages China's 2006 housing reform and a non-parametric Regression Discontinuity Design (RDD) to identify the causal impact of housing wealth on health and healthcare spending across age groups. We document a rich series of findings. A positive housing wealth shock leads to an increase in out-of-pocket medical expenses of the elderly and children, at both the extensive and intensive margins, thereby improving their health. These effects differ across age cohorts, highlighting how positive wealth shocks are translated into health improvements through both direct spending and private insurance uptake. In contrast, these health effects are not evident among young adults. Overall, these results indicate that wealth shock reduces health inequality within vulnerable households. The underlying mechanisms also differ by age group: a pure wealth effect for the elderly, precautionary savings incentives for younger adults, and inter-generational investments for children.

JEL classification: G51; I11; I14

Keywords: Housing wealth; Medical expenditure; Health; China; Age differences

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†Management School, Lancaster University, United Kingdom. Email: z.he10@lancaster.ac.uk

‡School of Business and Management, Queen Mary University of London, United Kingdom. Email: t.huynh@qmul.ac.uk

1 Introduction

Housing is the most important household asset in developed countries (Badarinza and Ramadorai, 2018; Lovenheim and Yun, 2025). In these economies, housing wealth plays a crucial role in shaping household behaviour and spending patterns (Daysal et al., 2021; Lovenheim, 2011; Lovenheim and Mumford, 2013). Similarly, in China, the largest developing country, real estate constitutes the dominant component of national wealth (Lei et al., 2025), and housing accounts for more than two-thirds of total household assets for most Chinese families[1]. Therefore, housing wealth may exert stronger effects on household spending in China.

In addition, China's healthcare system remains relatively underdeveloped. By 2022, out-of-pocket medical expenses represent about 35 percent of total health spending, compared with a global average of roughly 20[2], although this ratio has been declining over the last few decades. These patterns reflect that Chinese households still shoulder a considerable fraction of healthcare costs, highlighting the importance of private wealth in financing healthcare. As the most dominant component of total household assets, housing wealth serves as a particularly informative measure to examine how wealth shapes healthcare expenditures and health outcomes in China.

This paper aims to address several questions: First, how does housing wealth affect the health and healthcare spending of adults and children? Second, any age-cohort differences in these effects? Third, what are the underlying mechanisms for these effects in these groups? These questions are important for several reasons. Children and the elderly are generally more vulnerable to health problems and have a higher demand for healthcare services than young adults. In addition, children are not covered by the generous public health insurance available to adult employees through Urban Employee Medical Insurance. Instead, they may enrol in the non-employment-based Urban and Rural Residents Medical Insurance (URRMI). Parents may choose to pay out-of-pocket medical expenses or purchase private health insurance for their children's treatment.

For adults, the consumption behaviour of young individuals differs substantially from that of the elderly due to variations in income sources, family structure, wealth endowment, and credit constraints. These age-related differences imply that the effects and transmission channels of housing wealth on health and healthcare spending may vary significantly

[1]Residential assets accounted for approximately 70% of total urban household assets in China. Data source: a survey by the People's Bank of China on the balance sheet of the Chinese household sector; the China Household Finance Survey (CHFS).

[2]Source: World Health Organisation Global Health Expenditure database

between age groups.

Our paper makes three main contributions. First, exploiting a non-parametric regression discontinuity design, it credibly identifies the causal impact of a housing wealth shock driven by the 2006 housing policy on individual health status and healthcare spending, and quantifies the associated wealth elasticities using a parametric fuzzy RDD. Existing studies have primarily exploited regional variations in housing or land prices to examine health implications (Fichera and Gathergood, 2016; Atalay et al., 2017; Xu and Wang, 2022; Shi, 2022). However, these approaches have certain limitations in addressing endogeneity. Regional variations in housing prices are closely correlated with socio-economic factors, such as economic prosperity, regional income levels, and healthcare quality, that directly influence individual health status. Similar to recent studies that use housing-policy thresholds to identify wealth effects (Ang et al., 2024; Fan and Zhou, 2025), this design offers a particularly compelling setting for causal identification. More importantly, because the underlying source of variation is an actual policy tool, the setting strengthens not only internal validity but also offers the externally relevant evidence on how policy-induced housing wealth shocks shape health and healthcare demand.

Second, this paper provides evidence for the impacts of housing wealth on healthcare spending in a developing context. Existing empirical focus is limited to the healthcare market in developed economies, particularly the United States, examining healthcare utilisation among elderly Americans (Tran et al., 2023) and responses to healthcare spending (Lovenheim and Yun, 2025). However, the U.S. setting differs from China in the healthcare system, intra-household asset distribution, and consumption patterns. In China, housing plays a far more important role in household portfolios. The average wealth-to-income ratio in China is around three to four times higher than in the US when housing is included in wealth (Cooper and Zhu, 2017). Moreover, Chinese households face much higher out-of-pocket healthcare expenditures (approximately 35%) compared to about 10% in the US[3]. These differences suggest that private wealth may produce a stronger effect on healthcare spending, with downstream implications for health in China. Our analysis provides informative evidence for other developing economies in which housing is the primary asset held by households, highlighting the role of home equity as a form of self-insurance that supports health-related expenditures.

Third, our paper examines the health implications of housing wealth separately by age group, children, young adults, and the elderly. Young households are more likely to face liquidity constraints and to hold mortgage debt, making them particularly susceptible

[3]Source: World Health Organisation Global Health Expenditure database. https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=CN.

to the borrowing-collateral effect, whereby an increase in home value enhances borrowing capacity. For these households, a rise in housing value represents both relaxation of the credit budget and appreciation of wealth, which increases lifetime resources and reduces the need for precautionary savings. In contrast, old households typically own their homes outright, have fewer financial dependents, and face weaker credit constraints. Consequently, we assume that the effects of housing wealth among older households are primarily driven by the pure wealth effect, rather than by changes in borrowing constraints. This heterogeneity in financial constraints results in differing impacts of housing wealth on health and healthcare spending between age groups.

Using an non-parametric regression discontinuity design (RDD) approach and China Family Panel Survey (CFPS) data, this paper estimates the impact of a housing wealth shock that occurred in 2006 on health and medical expenditures of people at different ages, especially for children (0-16), younger adults (25-59) and elderly group (60 and over). Our findings show that older people's self-reported health deteriorates as housing wealth increases, while no health effects are pronounced among children and younger adults. This is not a real deterioration in health, but an increase in healthcare detection and associated medical diagnosis. Furthermore, the positive housing wealth shock increases 1,770.2 RMB of annual out-of-pocket (OOP) medical expenditure and 1,059.7 RMB of outpatient expenses of elderly people. In addition, appreciation in housing wealth increases total healthcare OOP spending of children by 1,041.6 RMB and outpatient spending by 349.97 RMB, respectively. Furthermore, we find that the 2006 housing wealth shock increases PHI coverage by 24 percentage points for children.

In addition, we document substantial heterogeneity within the group in the health effects of housing wealth. The health effects are only significant among older people in an earlier stage (60-70), while no effects are pronounced among older people (over 70). In terms of children, the effects of wealth on healthcare utilisation are pronounced among younger children (0-10). However, younger households focus more on preventive care for older children (11-16), especially for their PHI coverage. Moreover, we find urban–rural differences and health inequality across the spending distribution.

Finally, the channels through which housing wealth affects behaviour differ among younger adults, the elderly, and children. For older adults, the impact of housing wealth is primarily driven by the pure wealth effect rather than the collateral effect. In contrast, among younger adults without loans, no significant wealth effect is observed: their consumption remains unchanged as housing wealth increases, while their savings rise instead. This pattern suggests that the effect of wealth on housing for young adults operates through a different mechanism, the precautionary saving channel, which offsets the wealth effect.

It should also be noted that the collateral effect is evident only among young adults with loans. The health effects on children are driven by intergenerational transmission from their parents.

Our robustness checks, using a parametric approach, yield results consistent with the baseline estimates. A further sensitivity analysis using alternative bandwidths and polynomial orders and falsification tests also yields consistent estimates. This confirms the robustness of our findings. The remainder of the paper is organised as follows. Sections 2 and 3 provide an institutional background on China's healthcare system and housing reform, as well as a brief review of the related literature. Sections 4-6 describe the data, theoretical set-up, and the empirical framework. Section 7 presents the main results, while Sections 8 and 9 report the robustness checks and conclusions, respectively.

2 Institutional Background

2.1 The Healthcare System in China

Public health insurance coverage is nearly universal in China, with an enrolment rate of approximately 95%. Individuals are eligible for Urban Employee Basic Medical Insurance (UEBMI) or Urban and Rural Residents Medical Insurance (URRMI), depending on their occupation and hukou status. Generally, employees who work in public institutions, government, or enterprises participate in UEBMI, while those who are not eligible for UEBMI can enrol in URRMI. As the following table shows, around 337 million people (about 25% of the Chinese population) are covered by UEBMI, and approximately 71% of people have URRMI[4].

Despite its high coverage, the public healthcare system faces some challenges in financing medical expenses. Specifically, the reimbursement rate for China's universal social health insurance (both UEBMI and URRMI) is not sufficiently generous to cover a large share of medical expenses. Although China has made significant efforts to reduce out-of-pocket (OOP) healthcare expenditures, bringing them down from 60% in 2000 to approximately 34% in 2021[5], as illustrated in Figure 1, China's out-of-pocket (OOP) healthcare expenditure ratio remains significantly higher than that of developed countries, where OOP

[4]Sources: Ministry of Human Resources and Social Security, official statistics; The State Council of the People's Republic of China, official release.

[5]World Health Organisation Global Health Expenditure database. https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=CN.

spending is generally below 20% in Europe and the world, and even below 10% in the United States. Furthermore, out-of-pocket (OOP) healthcare expenditure remains particularly high for families with children. In 2018, families covered 60.44% of children's medical treatment expenses, while only 22.63% were reimbursed under URRMI[6].

These patterns indicate that public insurance provides only limited financial protection for healthcare utilisation. Households' healthcare treatment still relies on self-funding, such as private health insurance and private wealth. The private healthcare market remains underdeveloped in China. Private health insurance is relatively uncommon, covering only about 10% of households[7], below 3% for the middle-aged and elderly Chinese population[8]. Therefore, household assets, especially wealth, play an important role in shaping healthcare utilisation.

[Figure 1 here]

2.2 2006 Housing Reform

In the early 2000s, China experienced a rapid housing boom, with property prices soaring, particularly in first-tier cities. As a result, housing affordability declined, and many families struggled to finance mortgage payments. To address these challenges and incentivize home-ownership while mitigating financial strain, the Chinese government introduced a series of policy measures aimed at stabilizing housing prices and meeting the housing demand of middle-income households. In May 2006, the State Council issued the "Suggestions on Adjusting the Housing Supply Structure to Stabilize Housing Prices." A key component of this reform was the introduction of the "90/70 housing policy", which mandated that at least 70% of the total floor space in new residential developments be allocated to housing units of 90 m^2 or smaller. Additionally, the government implemented tax incentives and mortgage subsidies to further encourage home purchases: Down payment requirements for self-occupied housing units below 90 m^2 were reduced to 20%. For other property purchases, the minimum down payment remained at 30%, effective from June 2006. Figure 2 demonstrates that the smaller house prices significantly increased after the policy had become ineffective.

[Figure 2 here]

[6]Official website of the United Nations International Children's Emergency Fund. Accessed at https://www.unicef.cn/media/25331/file/BASIC in September 2025.

[7]The 2012 wave for China Family Panel Survey (CFPS)

[8]China Health and Retirement Longitudinal Study (CHARLS): 2011, 2013, 2015, and 2018 waves.

In November 2008, the Ministry of Finance and the State Administration of Taxation introduced additional tax reductions for first-time buyers of housing units below 90 m^2. Concurrently, mortgage interest rates were lowered to stimulate demand and support homeownership. These policies significantly increased demand for housing units below 90 m^2, leading to faster price appreciation for smaller homes in the subsequent decades. The 90 m^2 threshold thus represents an exogenous discontinuity, providing a unique opportunity to estimate the impact of housing policies on housing wealth accumulation.

Figure 3 illustrates trends in average residential housing price and health spending Per Capita. It is obvious that annual health spending per capita rises steadily over the period 2006–2018 and closely tracks the evolution of average residential housing prices for both new and existing units. This pattern suggests a strong positive association between housing prices and health spending in China.

[Figure 3 here]

3 Literature Review

Many studies have primarily investigated the causal effect of housing wealth on the outcomes of the labour market (Disney and Gathergood, 2018; Zhao and Burge, 2017; Li et al., 2020; Johnson, 2014; Fu et al., 2016). These studies suggest that appreciation of housing wealth has negative effects on labour participation and labour supply. Some other studies focus on the causal impact of housing wealth on household decisions, especially fertility (Lovenheim and Mumford, 2013; Liu et al., 2023; Yu and Li, 2024; Dettling and Kearney, 2014; Daysal et al., 2021; Ang et al., 2024). However, they have an argument regarding the impact of housing prices. Specifically, positive wealth shock driven by housing boom significantly increases the fertility rate of home owners (Lovenheim and Mumford, 2013; Ang et al., 2024; Daysal et al., 2021), with no effects among renters (Lovenheim and Mumford, 2013) or negative effect on non-owners (Dettling and Kearney, 2014). Other researchers demonstrate that an increase in housing prices negatively affects the likelihood of giving birth to a baby due to credit loan pressure, especially underdeveloped credit markets (Liu et al., 2023) and the crowding-out effect of the cost of marriage (Yu and Li, 2024).

The papers mentioned above are baseline references for two reasons: first, they explained which impact channel of housing wealth (collateral effect or wealth effect) works in household decisions. In detail, an increase in house prices improves the collateral value of hous-

ing and relaxes credit constraints, thereby influencing household borrowing and consumption behavior(Cooper, 2013; Lustig and Van Nieuwerburgh, 2005; Aladangady, 2017). In addition, appreciation in housing prices makes homeowners feel wealthier, prompting them to reduce precautionary savings and increase consumption. The healthcare service is a normal good in our study. Therefore, while investigating the impact of housing wealth on health outcomes and healthcare spending, it is important to determine which mechanism (collateral channel or wealth effect) plays a dominant role. Furthermore, three papers used a natural housing experiment in 2006 to identify the causal effect of housing wealth in the context of China (Zhao and Burge, 2017; Li et al., 2020; Ang et al., 2024), which is the main identification strategy, a regression discontinuity design based on an exogenous cutoff of 90 m^2 of housing size in this housing reform.

A small number of papers are closely relevant to our study in terms of the causal impact of housing wealth on health outcomes (Ang et al., 2024; Yilmazer et al., 2015; Shi, 2022; Fan and Zhou, 2025), Some find that appreciation of housing wealth has positive effects on mental health (Li et al., 2025; Yilmazer et al., 2015), while others find negative effects on physical health due to the reduction of healthy activities (Shi, 2022; Fan and Zhou, 2025). Specifically, using a sharp regression discontinuity design approach and China using data from the China Health and Retirement Longitudinal Study(CHARLS) with the 2006 Housing Reform in China, Fan and Zhou (2025) estimate the effect of housing wealth shock on objective biomarker indicators of health, only pointing to a negative effect on lung functionality and a null effect on other diseases. Similarly, using the same methodology and housing policy, Li et al. (2025) conclude that positive housing wealth shocks significantly decrease depression and improve the life satisfaction of Chinese urban residents. These studies explain the effect of housing wealth shock in the short run instead of exploring the causal effect of a change in housing wealth on health outcomes. To fill this gap, using the fuzzy RDD approach with the 2006/2008 Housing policy, our paper explores how much change in housing wealth can affect health.

Furthermore, only two papers discussed the relationship between housing wealth and healthcare use (Tran et al., 2023) and out-of-pocket medical expenditure (Lovenheim and Yun, 2025). They focus on the housing market of the U.S and estimate the effect of housing wealth on healthcare utilisation and out-of-pocket medical expenditure of old people. Both papers merge county-level housing prices with the Health and Retirement Study (HRS) and use variation in housing prices as an instrument of housing wealth. Tran et al. (2019) find that a decrease of 16% of housing wealth on average leads to decreases in prescription drug utilisation by 0.4%, outpatient services by 0.5%, dental care by 0.6%, and the number of doctor visits by 0.5 visits. However, Lovenheim and Yun (2025) find no evidence that housing wealth impacts out-of-pocket medical spending of

elderly homeowners, even if in different medical expenditure quantiles. In the US market, the healthcare system requires substantial out-of-pocket payments by most consumers. By 2023, most of the US population (65.4%) will rely on private health insurance to finance their use of healthcare or medical treatment, while medical expenses of the low-income group (36.3%) are normally covered by public health insurance (Medicaid or Medicare)[9]. However, China has a totally different healthcare system from that of the United States, with about 95% of Chinese people covered by public health insurance. Nevertheless, public health insurance has low reimbursement and unrestricted treatment coverage. This makes Chinese people, especially those in poor health, have to pay out-of-pocket for medical treatment. Our paper fills the existing literature by estimating the causal effect of housing wealth on healthcare spending and the corresponding wealth elasticities using Chinese datasets.

A large body of literature has examined whether healthcare is a necessity or a luxury good by estimating the income elasticity of health expenditure. Using World Bank data on 167 countries during the period 1995–2012, Baltagi et al. (2017) estimates the income elasticities for healthcare expenditure at the macroeconomic level. They find that, on average, healthcare spending is a necessity worldwide, with a global income elasticity of 0.84, while poorer countries exhibit higher elasticities. In particular, Murthy and Okunade (2009) reports values above one in African countries, suggesting luxury characteristics. Similar evidence on income elasticities is mixed, with long-term estimates indicating that healthcare is a necessity in the United States (Moscone and Tosetti, 2010), 0.32-0.91 in Thailand according to the household income quantile(Okunade et al., 2010), neither necessity nor luxury with an elasticity of near zero or greater than 1 according to insurance status (Getzen, 2000), and 0.098-0.521 in rural China according to the type of medical visit (outpatient/ hospital utilisation) (Zhou et al., 2011), and 0.3 for medical care spending in urban China (Mocan et al., 2004). These results are comparable to ours, even though they focus on income elasticities.

However, these studies mainly reflect short-term responses to income changes. In contrast, wealth elasticity shows how healthcare spending reacts to long-term changes in assets. Wealth, as an asset stock, represents permanent income, financial stability, and credit access, which together affect health spending decisions. Therefore, wealth elasticity complements income elasticity by showing how greater wealth influences healthcare demand over time. To estimate this elasticity, the study employs housing wealth, the dominant component of household assets, as the main measure of wealth.

The relationship between housing wealth and consumption in different cohorts has been

[9]Source: https://www.census.gov/library/publications/2024/demo/p60-284.html

examined in the literature (Campbell and Cocco, 2007; Lim and Zeng, 2016; Windsor et al., 2015). Incorporating age, time, and cohort effects, Lim and Zeng (2016) develops a model to estimate consumption elasticity with respect to housing wealth and finds that this elasticity follows a hump-shaped pattern throughout the life cycle. Their results highlight the role of risk attitudes and intertemporal preferences that vary systematically with age and cohort. Similarly, Campbell and Cocco (2007) estimates the elasticity of consumption out of housing wealth separately for elderly homeowners and young renters, reporting a large positive elasticity for the former and an elasticity close to zero for the latter, which they attribute to borrowing constraints among younger households. In general, these studies suggest that age and cohort heterogeneity play an important role in shaping wealth–consumption dynamics. Motivated by these findings, our analysis proceeds in two steps. First, we estimate the effects separately for younger adults (18–59), older adults (60 and above) and children (0–16). Second, to identify which cohorts are most affected by housing wealth, we further divide the sample into five-year birth cohorts and compare the estimated effects between these groups.

4 Data

The China Family Panel Survey (CFPS) is a nationally representative, biennial longitudinal survey of Chinese communities, families, and individuals launched in 2010 by the Peking University Institute of Social Sciences Survey (ISSS). The studies focus on both the economic and non-economic well-being of the Chinese population, providing a wealth of information on topics such as economic activities, education outcomes, family dynamics and relationships, migration, and health. In particular, the CFPS records information about houses of families, such as house size, house cost, market price of houses, year of house built/purchase, property ownership, etc. We use these indicators to explore the effects of housing wealth on healthcare spending and the health of adults and children separately.

Currently, the CFPS consists of seven waves: 2010 (baseline), 2012, 2014, 2016, 2018, 2020, and 2022. The survey is very comprehensive and collects information on approximately 40,000 individuals and approximately 20,000 households in each wave. In this paper, we restrict the sample to the 2014, 2016, and 2018 waves for two reasons. First, we begin in 2014 because a national hukou reform implemented that year relaxed hukou restrictions in small and medium cities (with urban populations below 5 million). Induced rural-to-urban migration may have stimulated local housing markets and increased housing wealth, potentially affecting the validity of our 2006 housing reform setting. Second,

we exclude data after 2018 because the COVID-19 pandemic, which began in late 2019, may have introduced measurement errors and structural changes in healthcare utilisation and expenditure, thus biasing the analysis.

For our analysis, we focus exclusively on adults aged 25 and older and children aged between 0 and 16, resulting in a sample of 28,381 individual observations for adults and 5,716 individual observations for children. This subsample includes people whose homes were purchased or built before 2006, with a floor area between 30 and 300 square metres. We categorize respondents into a younger group (ages 25–59) and an older group (ages 60 and above), because age 60 is widely used as an ageing threshold and corresponds to key institutional thresholds in China, such as retirement and pension eligibility. We retain both urban and rural residents because exposure to the housing reform is not fully captured by current residence. Some rural residents own urban housing directly affected by the 90 m^2 cutoff, and housing wealth shocks may also propagate within families through intra-household resource allocation and intergenerational transmission. An urban-only sample would therefore impose a narrower exposure definition and may understate the overall effect of the reform on health and healthcare outcomes. With a sufficiently large sample, the full-sample specification allows us to estimate this broader reduced-form effect. In the baseline specification, we control for urban residence, and we further report separate estimates for urban and rural subsamples to capture heterogeneity in exposure and ensure that the full-sample results are not driven by one group alone.

In the CFPS questionnaire, the questions for healthcare spending and health outcomes are rich and clear. Regarding healthcare spending, key variables include questions such as: How much were your out-of-pocket medical expenses in the past 12 months? How much did your child/you spend on outpatient medical expenses in the last 12 months? How much did your child/you spend in total due to injuries in the last 12 months? questions about the health status of adults include: self-reported health status (1-very good, 2-good, 3-fair, 4-poor, 5-very poor), observed health by the interviewer (1-7); how often do you feel depressed (1-almost everyday, 2-usually, 3-half of time, 4-sometimes, 5-never); Have you had a chronic illness diagnosed by a doctor in the last six months? Health indicators for children include: current height; health observed by interviewer (1-7); BMI.

Other variables include: In the past 12 months, your family's expenditure on commercial health insurance? How much did your family pay directly for medical expenses in the past 12 months? How much did your family consume in the last 12 months? How much did your family consume in food in the last 12 months? In the last 12 months, has the family purchased commercial medical insurance for the child? For these household-level dependent variables, we construct per capita measures within households. The summary

statistics of the key variables are listed in Table 1. All continuous variables, such as wealth, spending (healthcare and non-healthcare), and savings. are winorized at the 5% level to mitigate the influence of outliers.

TABLE 1: Summary Statistics, CFPS 2014-2018

Full Sample	Treatment	Control		Full Sample	Treatment	Control
2.266	2.099	2.410	Total healthcare OOP	1,759.973	1,861.689	1,671.46
(1.588)	(1.659)	(1.510)		(3,212.917)	(3,334.288)	(3,100.837)
0.075	0.081	0.071	Outpatient OOP	1,048.98	1,107.134	999.301
(0.081)	(0.088)	(0.075)		(1,647.856)	(1,702.488)	(1,598.122)
91.641	63.807	115.507	HH Medical OOP percapita	1,111.582	1,171.698	1,060.029
(31.079)	(15.011)	(19.158)		(1,572.109)	(1,621.226)	(1,526.896)
0.450	0.499	0.409	SRH	3.203	3.247	3.166
(0.497)	(0.500)	(0.491)		(1.222)	(1.203)	(1.236)
48.815	49.938	47.851	Depression times	2.673	2.686	2.662
(17.501)	(17.607)	(17.352)		(1.494)	(1.503)	(1.485)
0.897	0.879	0.912	Observed Health	5.523	5.511	5.533
(0.304)	(0.325)	(0.283)		(1.263)	(1.270)	(1.256)
0.178	0.175	0.182	Life Satisfaction	3.793	3.765	3.817
(0.383)	(0.380)	(0.385)		(1.044)	(1.062)	(1.028)
0.067	0.064	0.069	Happiness	7.544	7.565	7.526
(0.250)	(0.245)	(0.254)		(2.178)	(2.199)	(2.161)
4.265	3.899	4.579	Total HH Exps pp(in log)	9.279	9.319	9.245
(2.018)	(1.902)	(2.060)		(0.826)	(0.845)	(0.807)
7.479	7.676	7.308	HH Food Exps pp(in log)	5.495	5.592	5.411
(4.811)	(4.828)	(4.789)		(0.974)	(1.017)	(0.927)
0.937	0.927	0.945	CMI Exps	230.315	197.497	258.555
(0.242)	(0.260)	(0.226)		(561.020)	(529.585)	(585.268)
e 0.185	0.181	0.176				
(0.388)	(0.384)	(0.381)				
28,381	13,106	15,275		28,381	13,106	15,275

es in levels are computed across 28,381 adults (over 18) in China for CFPS 2014-2018. "HH size", "HH Medical OOP per p", "CMI exps" represent the size of the household, household's medical out-of-pocket expenses per capita, "self-reported xpenditure per capita", and "expenditure on commercial medical insurance" respectively.

5 Theoretical Model Setup

To explain the relationship between housing wealth and health theoretically, we present a simple model under the standard assumptions of life-cycle theory and check how health, medical spending, and housing wealth drive lifetime utility. Considering that housing is either an investment good or a consumption good, we established a utility function tied to consumption, including housing consumption and non-housing consumption (e.g., healthcare spending). Following Iacoviello (2011), the household maximizes its lifetime utility given by:

$$\max_{\{c_t, m_t, a_{t+1}\}_{t\geq 0}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \Big[u(c_t) + \nu_t(h_t)\Big], \quad 0 < \beta < 1,\ u' > 0, u'' < 0,\ \nu_t' > 0, \nu_t'' < 0, \quad (1)$$

Where, c_t is non-durable consumption at time t. m_t is medical spending at time t. a_t represents financial assets at time t. β is a household discount factor ($0 < \beta < 1$). $u(\cdot)$ represents utility function for consumption, with $u' > 0$, $u'' < 0$. h_t is the stock of health at time t. $\nu_t(\cdot)$ is utility function for health at time/age t; $\nu_t' > 0$, $\nu_t'' < 0$. Furthermore, the utility function is subject to health accumulation according to the health capital theory (Grossman, 1972), which is given by:

$$h_{t+1} = (1 - \delta_t)h_t + g_t(m_t) + \varepsilon_{t+1}, \qquad g_t' > 0,\ g_t'' \leq 0, \quad (2)$$

where, h_t is the stock of health in the $\mathbf{t}$th time period. m_t is medical care. δ_t is the rates of depreciation, which is assumed to be exogenous and vary with the age of the individual. $g_t(\cdot)$ is health production from medical spending at time t, $g_t' > 0$, $g_t'' \leq 0$. ε_{t+1} is health shock realized at $t+1$ ($\mathbb{E}[\varepsilon_t] = 0$). The above utility function is also subject to the budget/borrowing system:

$$c_t + p_{m,t}m_t + a_{t+1} \leq y_t + (1 + r_t)a_t + \chi_t(H_t), \quad (3)$$

$$a_{t+1} \geq -B_t(H_t), \qquad B_t'(H_t) > 0, \quad (4)$$

$$\lim_{T\to\infty} \mathbb{E}_0\big[\beta^T \lambda_T a_{T+1}\big] = 0. \quad \text{(transversality)}$$

Here, $p_{m,t}$ is the monetary price of one unit of medical spending at time t. y_t is Exogenous income at t (e.g., labor income). It is noteworthy that $y_t = y_t^P + \varepsilon_t^T$, y_t^P and ε_t^T represent permanent income and temporary shock, respectively. Under the permanent income theory, housing wealth is also a part of permanent income; an increase in housing wealth

leads to an increase in income and thereby consumption. r_t is real interest rate between t and $t+1$ (gross return $1+r_t$). H_t represents housing wealth (market value of the housing asset) at time t. $\chi_t(H_t)$ is the *liquid/accessible* component of housing wealth; $B_t(H_t)$ is the collateral-based borrowing limit (age- -dependent), increasing in H_t.

Let λ_t be the multiplier on (3) and $\mu_t \geq 0$ on (4). First-order conditions:

$$u'(c_t) = \lambda_t, \tag{5}$$

$$p_{m,t}\lambda_t = \beta\, \mathbb{E}_t\big[\nu'_{t+1}(h_{t+1})\, g'_t(m_t)\big], \tag{6}$$

$$-\lambda_t + \beta(1+r_{t+1})\mathbb{E}_t[\lambda_{t+1}] + \mu_t = 0 \;\Rightarrow\; u'(c_t) \;\geq\; \beta(1+r_{t+1})\, \mathbb{E}_t[u'(c_{t+1})]\,. \tag{7}$$

Equality in (7) holds if the borrowing constraint is slack ($\mu_t = 0$).

Medical spending optimality ratio. Combining (5) and (6):

$$\frac{\beta\, \mathbb{E}_t\big[\nu'_{t+1}(h_{t+1})\, g'_t(m_t)\big]}{u'(c_t)} \;=\; p_{m,t}. \tag{8}$$

In this paper, we aim to disentangle three channels: the pure wealth effect, the collateral effect, and preventive saving incentives. The pure wealth effect influences health through equation (8), whereas the collateral effect and preventive saving incentives operate through equation (7). Overall, Age plays a role in shaping health status and credit budget. Considering the importance of age, we summarize the potential channel for the impact of housing wealth on health and healthcare spending as follows. As for the elderly group, they normally have high ν', high δ, and often larger χ_t. Therefore, *pure wealth* response dominant which leads to increases in m_t, h_{t+1}, and c_t. However, among younger individuals, the effect is heterogeneous and varies depending on debt status. For a young group with debt (often $\mu_t > 0$), *collateral effect* dominates upon constraint release, thereby increasing c_t and m_t sharply at the margin. For young adults without debt (illiquid housing, high risk), *precautionary saving incentives* dominate, which results in an increase in a_{t+1} and muted contemporaneous c_t, m_t.

Moreover, to interpret the relationship between housing wealth and children's health outcomes, we introduce a simple intra-household allocation model. Following Becker and Tomes (1986), we assume that household utility includes both parents' and children's utility, and that parents' utility depends on children's utility, which implies altruistic preferences within the household. Under this structure, the weighted marginal utility of additional health investment is higher for children than for parents. Consequently, when

households face a positive housing wealth shock, we predict that children's healthcare spending will increase, while parents' healthcare spending will show little or no response. The detailed model setup and proofs are provided in Appendix B.

6 Empirical Framework

6.1 Identification Strategy

To evaluate the causal impact of the policy change on individual health and medical spending, we implement a non-parametric Regression Discontinuity Design (RDD) framework. As displayed in Figure A1, there was a divergence between the growth rate of households' wealth and housing wealth (in logs) with houses below 90 m^2 and over 90 m^2, after the central government issued the *National Article Six* policy in 2006. Therefore, we identify a treatment group as those with house sizes below 90 m^2, and a control group as other types of individuals or families. To determine the appropriate bandwidth for the kernel function, we adopt a data-driven approach as proposed by Calonico et al. (2014, 2017). The fundamental equation guiding our analysis is as follows:

$$\tau_{\text{SRD}} = \lim_{x \downarrow c} \mathbb{E}[\, HDV_{it} \mid HS_{it} = x \,] - \lim_{x \uparrow c} \mathbb{E}[\, HDV_{it} \mid HS_{it} = x \,], \; c = 90 \text{ m}^2.$$

Where, in our main analyses, HS_{it} is the normalized housing size. HDV_{it} represents various variables that define health outcome (physical/mental health), healthcare spending (out-of-pocket/total expenses), health-related variables such as PHI coverage, household expenditure per capita, food expenditure per capita, the housing wealth (in logs), or housing wealth growth rate. τ_{SRD} is the local average treatment effect (LATE), the effect on compliers at the cutoff point.

The possible issue may challenge our identification strategy if the assumption that there is no mean shift but the distribution shifts in the continuous treatment variable (Dong et al., 2023). In our analysis, although housing wealth is a continuous variable, the 2006 housing reform created a discontinuity in housing values around the 90 m^2 threshold. We treat this discontinuity as an exogenous source of variation in housing wealth (in logs) and conduct a two-stage least squares (TSLS) approach for our research questions. The specification is as follows:

$$Y_{it} = \beta_0' + \beta_1' \times f(HouseSize_{it}) + \beta_2' \times HousingWealth_{it} + \lambda K_{it} + \delta X_{it} + \gamma_t + \varepsilon_{it} \quad (9)$$

$$HousingWealth_{it} = \beta_0'' + \beta_1'' \times f(HouseSize_{it}) + \lambda K_{it} + \delta X_{it} + \gamma_t + \varepsilon_{it} \quad (10)$$

Observations are indexed by individual (i) and year (t), and Y_{it} represents the outcome variable. $HousingWealth_{it}$ is the market value of housing wealth (in logs). $f(HouseSize_{it})$ is a flexible functional transformation of house size. K_{it} is a deterministic function of house size, indicating whether a respondent's housing size exceeds the threshold (i.e., 90 m^2). The control variables X_{it} include individual-level and household-level characteristics. Again, β_1' is the coefficient of interest. capturing the causal local treatment effect (LTE) at the house size discontinuity.

6.2 Some Threats

We consider two main identification threats: manipulation of housing size and selective house moving. The first concern is that households might prefer to purchase units just below 90 m^2 if they already knew about the policy. However, the introduction of National Article Six in May 2006 was unexpected and initiated by the central government. This makes it difficult for buyers to intentionally choose a housing size that falls precisely below the 90 m^2 threshold.To further assess potential manipulation, we estimate the density discontinuity around the 90 m^2 cutoff following (McCrary, 2008). Figure A14 reports the estimated densities for units purchased before 2006. We do not find a density spike or a significant discontinuity at the threshold, which supports the assumption that the assignment variable is not precisely manipulated.

Second, post-2006 house moving may threaten identification if households changed their residence after the policy was introduced. To address this concern, our sample is restricted to individuals who did not change their current residence between 2014 and 2018. Moreover, because we observe the age of houses, we are able to confirm that all sampled households purchased their current homes at least eight years before 2014. This ensures that the housing choices in our sample were made well before the reform and are not influenced by post-policy relocation.

Furthermore, larger dwellings may be associated with better health in general. However, this does not threaten our RDD identification because any size–health relationship should vary smoothly around the 90 m^2 threshold. Units just below and just above the cutoff

are highly comparable in size and quality, and therefore cannot generate a discontinuous jump in health outcomes. The observed discontinuities can thus be attributed to the reform-induced wealth shock rather than housing-size differences.

7 Main Estimates

7.1 House Size and Annual Housing Wealth

To assess the impact of housing wealth on healthcare utilization, it is essential first to examine whether housing prices for smaller units appreciate more rapidly than those for larger units following the housing policy. To do so, we estimate the policy's effect on housing price growth using a household-level sample, which includes information on house size, purchase/construction year, housing cost at the time of acquisition, current market price, and other housing-related characteristics. This study employs two measures of housing price: the natural logarithm of housing price and the annualized growth rate. Specifically, the annualized growth rate is computed using the following formula: $r_1 = \left(\frac{\text{housingWealth}_t}{\text{housingWealth}_0}\right)^{1/t} - 1$, where housingWealth_t and housingWealth_0 represent the current self-reported market price and housing price at the time of purchase. t represents the housing age.

Figure A1 depicts the annual growth rate of housing prices and the log of housing prices, around the 90 m^2 floor area threshold. The visual evidence clearly indicates a significant decline in both housing wealth growth rate and logarithm of housing price when unit size exceeds 90 m^2, suggesting a discontinuous drop in housing price appreciation for larger units. This housing wealth shock also displays on our dependent variables, health and healthcare. Similar discontinuities are also observed for our outcome variables related to health and healthcare. As shown in Figures A2-A4, there are noticeable discontinuities between smaller units (below 90 m^2) and larger units.

Our estimates align closely with the patterns observed in these graphs, further confirming the significant decline in housing wealth growth rate and logarithm of housing price for units exceeding 90 m^2. Table 2 presents the impact of the 2006 housing reform, a housing wealth shock, on housing price growth as well as the logarithm of housing price, employing a non-parametric regression discontinuity design (RDD) approach. The results indicate that the growth rate of housing prices for smaller units (below 90 m^2) is approximately 4 percentage points higher than that of larger units (above 90 m^2), highlighting a signif-

icant differential effect of the reform on housing wealth accumulation across unit sizes. Furthermore, Table A1 reports the effects of housing wealth shocks on renters. We find that the positive housing wealth shock increases rents for smaller houses (below 90 m^2). This supports our main estimates for homeowners.

TABLE 2: The Effect of Housing Size on Housing Wealth

Dep Var	log(HousingWealth)		Housing Wealth Growth Rate	
	Conventional	Robust	Conventional	Robust
$\mathbb{I}$(HousingSize $\leq$ 90)	0.361***	0.278**	0.039***	0.041***
	(0.128)	(0.140)	(0.008)	(0.010)
Covariates	Yes	Yes	Yes	Yes
Mean of Y (in levels)	326,539.1	326,539.1	0.075	0.075
N of Observations	3,532	3,532	3,634	3,634

Notes: The table presents the effect of housing size on housing wealth (unit) and growth rate using non-parametric RDD. We restrict the sample to those who are house owners and their houses (30-300m^2) were purchased before 2006. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using bias-corrected coefficient estimators and robust variance estimators. Covariates include age, age squared, other housing, loan of housing, urban area, size of household, marital status, year of education, public health insurance access, province dummy, and year dummy. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size.Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: CFPS data, 2014, 2016, and 2018 waves.

7.2 Housing Wealth and Health Outcome

7.2.1 Effects of Housing Wealth Shock on Elderly Adults

Using a non-parametric RDD approach and controlling for individual characteristics, housing features, region, and year dummies, we first estimate the effect of housing wealth on health outcomes of elderly people (60 and over group). Tables 3 and 4 present the effects of housing wealth on health indicators and healthcare spending, respectively. Specifically, our results show that an increase in housing wealth significantly improves actual health (observed by the interviewer) and mental health. However, appreciation of housing wealth leads to deterioration of self-reported health status. This seems contradictory but still explainable as we also find that appreciation in housing wealth significantly increases the likelihood of being diagnosed with a chronic disease by 33.5%. This is because people are more likely to get treatment in a hospital and use healthcare services as housing wealth

increases. Thus, the diagnosed diseases make them rate their health worse.

It is noteworthy that one of our health indicators, "observed health", depends on the interviewer's subjective assessment. This may mislead interviwer's assessment if some people dress more neatly or maintain better grooming. We still report this indicator for reference to self-reported health. To explore how housing wealth shock shapes actual health, using functional health as a proxy for actual health, we replicate the health effect of housing wealth shock using the RDD approach with micro census data by age cohort (see Figure A9). The results suggest that the elderly are in better health when they are exposed to a positive housing wealth shock.

Moreover, the appreciation of housing wealth significantly increases healthcare spending among the elderly. Specifically, we find that the 2006 housing wealth shock increases the treatment group's total healthcare out-of-pocket expenses by 1,770.2 RMB (roughly 248 USD) and outpatient OOP expenses by 1,059.7 RMB (roughly 148.5 USD). These results verify why the likelihood of diagnosis of chronic diseases increases and how self-reported health is underrated. Similarly, we also find that household healthcare OOP expenses per capita increase by 1,640.6 RMB (roughly 236.9 USD) with an increase in housing wealth of smaller house owners. However, we do not find any pronounced health effects among younger adults aged 25-59. This means appreciation of housing wealth does not affect their health status and healthcare spending like elderly people.

The increase in healthcare spending among the elderly may come from greater utilization (extensive margin) or more intensive treatment per visit (intensive margin). We report effects on the probability of any healthcare spending (see Table A18), as well as on log healthcare spending conditional on positive spending (see Panel C, Table 4). All effects are positive and significant among the elderly (60 and over), suggesting that the housing wealth shock operates through both the extensive and intensive margins for the elderly. Whereas, effects are insignificant among the young.

7.2.2 Effects of Housing Wealth Shock on Young Adults

Similar to Section 7.2.1 and using the same methodologies, Tables 3 and 4 report the effect of housing wealth on health and healthcare spending of young adults (25-59). Overall, no effects on healthcare spending are found among younger groups. This means that the appreciation of housing wealth does not impact health status and medical consumption. This may be attributed to the consumption patterns and preferences of young adults. For example, young people have the responsibility of caring for their parents and children within families, with stronger credit constraints. Moreover, young adults are normally

healthier than the elderly; healthcare is not necessarily good for them.

In addition, we find that an increase in housing wealth leads to worse self-reported health status among younger adults, while no effects are significant on other health indicators. In fact, appreciation of housing wealth represents an increase in housing price; they will pay higher housing consumption costs if they want to replace a bigger house due to an increasing household size.

TABLE 3: The Effect of Housing Wealth on Health Outcomes of Adults

	Self-reported health		Observed health		Diagnosed disease		Mental health	
	Conventional	Robust	Conventional	Robust	Conventional	Robust	Conventional	Robust
Panel A: Age 60 and above								
HousingSize $\leq$ 90	0.652***	0.714***	0.639***	0.711***	0.309***	0.335***	0.291**	0.348**
	(0.168)	(0.184)	(0.225)	(0.257)	(0.079)	(0.087)	(0.145)	(0.163)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	3.362	3.362	5.057	5.057	0.303	0.303	2.583	2.583
Observations	3,114	3,114	2,922	2,922	2,841	2,841	3,046	3,046
Panel B: Age 25–59								
HousingSize $\leq$ 90	0.258**	0.283**	-0.095	-0.083	-0.002	-0.001	0.002	0.032
	(0.106)	(0.119)	(0.114)	(0.131)	(0.028)	(0.032)	(0.090)	(0.105)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	3.147	3.147	5.683	5.683	0.140	0.140	2.689	2.689
Observations	8,588	8,588	6,081	6,081	8,339	8,339	7,741	7,741

Notes: The table presents the effect of housing wealth shock on the health outcomes of the senior group (over 60) and the young group (25-59) using RDD. We restrict the sample to those who are house owners and their houses (30-300m^2) were purchased before 2006. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using bias-corrected coefficient estimators and robust variance estimators. Covariates include the size of household, marital status, year of education, public health insurance access, province dummy, and year dummy. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: CFPS data, 2014, 2016, and 2018 waves.

TABLE 4: The Effect of Housing Wealth on Healthcare Spending of Adults

	Outpatient OOP		Total healthcare OOP		HH Healthcare PPC	
	Conventional	Robust	Conventional	Robust	Conventional	Robust
Panel A: Age 60 and above (Dependent var in levels)						
HousingSize $\leq$ 90	976.25***	1059.7***	1672.1***	1770.2***	1509.7***	1640.6***
	(326.47)	(362.64)	(562.27)	(636.15)	(416.29)	(442.58)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	1512.338	1512.338	2831.365	2831.365	1402.446	1402.446
Observations	2,752	2,752	3,963	3,963	2,724	2,724
Panel B: Age 25–59 (Dependent var in levels)						
HousingSize $\leq$ 90	-51.123	-30.053	163.67	210.74	172.61	189.1
	(143.20)	(168.96)	(230.59)	(259.57)	(124.68)	(142.77)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	856.573	856.573	1383.371	1383.371	958.457	958.457
Observations	6,695	6,695	10,662	10,662	8,553	8,553
Panel C: Age 60 and above (Dependent var in logs)						
HousingSize $\leq$ 90	0.466**	0.513**	0.486***	0.540***	1.23***	1.313***
	(0.208)	(0.238)	(0.167)	(0.197)	(0.217)	(0.232)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	1512.338	1512.338	2831.365	2831.365	1402.446	1402.446
Observations	2,026	2,026	4,129	4,129	2,591	2,591
Panel D: Age 25–59 (Dependent var in logs)						
HousingSize $\leq$ 90	-0.026	0.010	-0.105	-0.140	0.291**	0.337**
	(0.160)	(0.190)	(0.185)	(0.213)	(0.125)	(0.137)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	856.573	856.573	1383.371	1383.371	958.457	958.457
Observations	4,279	4,279	5,235	5,235	6,890	6,890

Notes: The table presents the effect of housing wealth on the healthcare spending of over 60 people using fuzzy RDD. We restrict the sample to those who are house owners and their houses (30-300m^2) were purchased before 2006. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using bias-corrected coefficient estimators and robust variance estimators. Covariates include age, age squared, other housing, loan of housing, urban area, size of household, marital status, year of education, public health insurance access, province dummy, and year dummy. "HH Healthcare PPC" represents household healthcare expenditure per capita. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size. All continuous variables are winsorized at the 5% level. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: CFPS data, 2014, 2016, and 2018 waves.

7.2.3 Effects of Housing Wealth Shock on Children

Controlling for characteristics of children, such as age, age squared, other house, loan of housing, urban area, size of household, sibling, age of head, province dummy, and year dummy, using a non-parametric sharp RDD approach, Table 5 reports the estimates for the effects of housing wealth on health indicators and healthcare expenses.

Specifically, as for health outcomes, we find that the positive housing wealth shock in 2006 significantly increases the height of children by 5.5 cm, with a corresponding negative

effect on their BMI. Furthermore, this housing wealth shock leads to an increase in PHI coverage by 24 percentage points. Second, an increase in housing wealth positively affects the healthcare expenses of children. In detail, as housing wealth increases, annual out-of-pocket healthcare expenses and outpatient healthcare expenses for children increase by 1,041.6 RMB and 576.9 RMB (roughly 150.4 USD and 83.3 USD, respectively). Overall, our results show improvements in children's health following the housing wealth shock, alongside increases in healthcare utilization and private health insurance purchases.

TABLE 5: The Effect of Housing Wealth on Health and Healthcare of Children

	Height		BMI		Observed health		PHI coverage	
	Conv.	Robust	Conv.	Robust	Conv.	Robust	Conv.	Robust
Panel A: Health Outcomes of Children								
HousingSize $\leq$ 90	5.513***	5.601**	-2.021***	-2.022***	0.070	-0.043	0.216***	0.240***
	(1.653)	(2.003)	(0.567)	(0.677)	(0.196)	(0.243)	(0.077)	(0.086)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	118.962	118.962	18.242	18.242	5.730	5.730	0.122	0.122
Observations	2,943	2,943	2,906	2,906	2,302	2,302	2,372	2,372
	Total Healthcare Spending		Healthcare OOP		Outpatient Spending		HH Healthcare OOP PPC	
	Conv.	Robust	Conv.	Robust	Conv.	Robust	Conv.	Robust
Panel B: Healthcare Expenditures of Children (Dependent var in levels)								
HousingSize $\leq$ 90	691.95***	766.89***	963.56***	1041.6***	545.76***	576.9***	1133.1***	1249.1***
	(236.68)	(267.83)	(267.03)	(296.78)	(164.29)	(189.05)	(443.38)	(496.08)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	763.383	763.383	854.143	854.143	495.994	495.994	914.759	914.759
Observations	3,115	3,115	2,551	2,551	1,552	1,552	2,219	2,219
Panel C: Healthcare Expenditures of Children (Dependent var in logs)								
HousingSize $\leq$ 90	0.988***	1.028***	0.831***	0.927***	0.841***	0.905***	1.855***	1.976***
	(0.258)	(0.295)	(0.247)	(0.284)	(0.271)	(0.318)	(0.307)	(0.339)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	763.383	763.383	854.143	854.143	495.994	495.994	914.759	914.759
Observations	2,393	2,393	2,423	2,423	1,451	1,451	1,978	1,978

Notes: Panel A reports the effect of housing wealth on health outcomes of children, estimated using a non-parametric RDD with treatment defined by housing size exceeding 90 m^2. Panel B reports the effect of housing wealth shock on the healthcare expenditures of children. Samples are restricted to children whose parents are homeowners and whose houses were purchased before 2006 and are between 30–300 m^2. Covariates include child age, age squared, other housing, housing loans, urban area, household size, number of siblings, head characteristics, province dummies, and year dummies. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size. Columns labelled "Conv." use conventional coefficient and variance estimators; columns labelled "Robust" use bias-corrected RD estimators with robust standard errors. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. "HH Healthcare OOP PPC" represents household out-of-pocket healthcare expenditure per capita.
Source: CFPS data, 2014, 2016, and 2018 waves.

7.2.4 Wealth-Healthcare Elasticity

Furthermore, using the fuzzy RDD approach, we also estimate the elasticity of housing wealth on healthcare spending of both adults and children. Table 6 reports the elasticities

of housing wealth to total healthcare expenses and corresponding total out-of-pocket spending. Specifically, the wealth-demand elasticities for these healthcare expenses are 0.847 and 0.612 among the elderly group, with a zero elasticity for young adults. This means elderly people are more elastic to increase their healthcare utilisation, while they are less elastic to pay out-of-pocket expenses when housing wealth appreciates. However, young adults are less likely to increase healthcare use when they receive windfall wealth.

For children, healthcare expenditure exhibits a much higher elasticity with respect to household wealth than for adults, suggesting that healthcare services behave more like a luxury good for households with children. However, these wealth–demand elasticities should be interpreted with caution.

In our fuzzy RDD with a continuous treatment, the estimates are interpreted as local Wald ratios and could be biased if the standard identifying assumptions fail. In our setting, the first-stage jump in housing wealth at the cutoff is large and precisely estimated, and the associated mean shift is clearly visible. To further assess the robustness of our results, we conduct two additional analyses. First, we implement a parametric IV-2SLS approach in Table A5. Second, as reported in Table A15, we use a two-step procedure that estimates the effect of the housing wealth shock on housing wealth (in logs) in the first stage and on healthcare spending (in logs) in the reduced form, and we compute standard errors using the delta method. The results from both exercises are broadly consistent with the RDD evidence.

TABLE 6: Elasticity of Housing Wealth on Healthcare Spending of Adults and Children

	Total Healthcare (log)		Total Healthcare OOP (log)		HH Healthcare PPC (log)	
	Conventional	Robust	Conventional	Robust	Conventional	Robust
Panel A: Age 60 and above						
log(HousingWealth)	0.664***	0.847***	0.508*	0.612*	0.582***	0.605***
	(0.217)	(0.270)	(0.285)	(0.334)	(0.144)	(0.167)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
N of observations	2,694	2,694	2,148	2,148	3,608	3,608
Panel B: Age 25–59						
log(HousingWealth)	-0.174	-0.226	-0.040	-0.084	0.491*	0.458
	(0.484)	(0.541)	(0.421)	(0.482)	(0.269)	(0.301)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
N of observations	3,996	3,996	4,033	4,033	5,459	5,459
Panel C: Children						
log(HousingWealth)	2.093**	2.777**	1.498**	1.829**	2.858**	3.590**
	(0.998)	(1.279)	(0.581)	(0.706)	(1.431)	(1.743)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
N of observations	1,763	1,763	2,234	2,234	1,997	1,997

Notes: The table presents the elasticities of housing wealth on spending of adults and children using fuzzy RDD. We restrict the sample to those who are house owners and their houses (30-300m^2) were purchased before 2006. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using bias-corrected coefficient estimators and robust variance estimators. Covariates include age, age squared, other housing, loan of housing, urban area, size of household, marital status, year of education, public health insurance access, province dummy, and year dummy. Covariates for children include the age of children, age squared, other housing, loan of housing, urban area, size of household, sibling, of head, province dummy, and year dummy. "HH Healthcare PPC" represents household healthcare expenditure per capita. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: CFPS data, 2014, 2016, and 2018 waves.

7.2.5 Distributional Effects and Inequality

Our baseline RD estimates indicate that the 2006 housing-wealth shock has meaningful health and healthcare consequences for below-90 m^2 households. In particular, the shock raises healthcare utilization and out-of-pocket spending among older adults, and it increases children's health-related investments and improves child health outcomes. These average effects suggest that the housing-wealth shock may mitigate health disadvantages among groups whose health is more sensitive, especially the elderly and children. Households with smaller houses (below 90 m^2) are normally poorer than those with bigger houses. In reality, richer households invest more in health and report healthier status among family members.Therefore, our results implicitly support that the positive wealth shock in the 2006 Housing Reform reduces health inequality compared to richer households (over 90 m^2).

Meanwhile, average effects can conceal important distributional heterogeneity. Households differ in baseline healthcare needs and in their propensity to seek and finance medical care. To assess whether the housing-wealth shock changes the distribution of healthcare spending, an "input-side" dimension of inequality, we estimate quantile regressions at the 0.25, 0.50, and 0.75 quantiles. Tables A6–A7 show that the spending response is concentrated in the upper tail: when perceived housing wealth rises, healthcare spending increases for elderly individuals and children at the upper quantile (0.75), while spending at the median and lower quantiles (0.25 and 0.50) remains unchanged. This pattern implies that the shock primarily affects "heavy users" of healthcare, expanding the right tail of the spending distribution.

Interpreting this distributional pattern requires distinguishing inequality in medical inputs from inequality in health outcomes. An upper-tail response does not imply a worsening equality. If higher baseline spending in the upper tail largely reflects greater underlying medical need (e.g., chronic conditions among the elderly or acute health shocks among children), then the significant effects at the 0.75 quantile are consistent with the housing-wealth shock allowing more intensive or more timely care among those whose healthcare needs are greatest. This mechanism can be translated to narrowing health disparities even if spending becomes more dispersed. Another possible explanation is: if higher baseline spending proxies for greater ability to pay, the same pattern could widen inequality in access to medical utilisation by disproportionately increasing consumption among healthier households. However, considering the health improvements we document for the elderly and children, our evidence is more consistent with a needs-based interpretation: housing wealth facilitates additional healthcare use and spending primarily among those at the upper end of the spending distribution, where medical needs are likely to be higher, while leaving younger adults' average spending largely unchanged. In this case, the housing-wealth shock reduces health inequality by easing constraints on medical care for vulnerable groups with higher healthcare needs.

7.3 Age Cohort Effects

7.3.1 Housing wealth effects on Health Outcomes of Adults

Individuals' Consumption patterns differ by their ages due to differences in characteristics (i.e, income, health status, marital status, employment status). To capture this age heterogeneity, this section estimates the causal effect of housing wealth on a series of health outcomes of several age groups: the 18-30 group, the 31-40 group, the 41-50 group,

the 51-60 group, the 61-70 group, and the over-70 group.

Specifically, Figure A5 plots RDD coefficients for the effect of housing wealth on self-reported health, the frequency of feeling depressed, the likelihood of being diagnosed with a disease, and BMI, respectively. Overall, we find that these health effects are pronounced among the younger old group (61-70), while effects are insignificant among all young groups (below 60) and the older group (above 70). This means that a 1% appreciation in housing wealth significantly worsens the self-reported health of the 61-70 group and increases their likelihood of being diagnosed with a disease by almost 50%. Moreover, appreciation of housing wealth significantly improves mental health, as observed with a decrease in the frequency of being depressed. However, we do not find any effects on BMI among all adults.

Following estimates for the impact on physical health, Figure A8 illustrates the effects of housing wealth on well-being, especially life satisfaction and happiness, by age cohorts. Specifically, the estimates show that appreciation of housing wealth improves the life satisfaction and happiness of the old group (over 60).

Moreover, to verify the actual health effect of housing wealth effects, using the 2010 and 2015 1% Micro Census, Figure A9 shows the RD coefficients for these. However, Micro Census datasets only record the actual health status of the over-60 group and housing size; the RD coefficients represent intention-to-treat effects rather than the effect of housing wealth. Overall, using a sharp RDD approach, the plots of RD estimates show that the housing wealth shock in 2006 improves the actual health of the 61-70 group.

7.3.2 Housing Wealth Effects on Healthcare Outcomes of Adults

With a difference in health outcomes, medical demand may differ by age cohorts. Considering these age differences, this section reports RDD estimates for the effects of housing wealth on all kinds of healthcare expenses of adults by age. Figure A6 shows RDD estimates for the effects of housing wealth on outpatient out-of-pocket expenses, total OOP expenses, and household healthcare out-of-pocket expenses per capita, respectively. As illustrated in previous estimates for health outcomes, we also find that 1% appreciation of housing wealth only significantly increases the medical spending of the 61-70 group, with an increase in outpatient OOP expenses by approximately 1,500 RMB (around 216.6 USD), in total OOP expenses by 4,700 RMB (around 678.8 USD), and in household healthcare OOP expenses per capita by 4,800 RMB (around 693 USD), respectively. These findings show that an increase in housing wealth indeed significantly increases healthcare utilization and corresponding spending. This is consistent with estimates for

the effects of housing wealth on self-reported health and the likelihood of being diagnosed with a disease. This implies that appreciation in housing wealth leads to more healthcare visits, with a higher likelihood of being informed of a disease and thereby triggering their anxiety and lower self-assessed health status.

7.3.3 Housing Wealth Effects on Health/Healthcare Outcomes of Children

Similar to adults, children at different ages have heterogeneous health statuses and medical demands due to their vulnerability to diseases. This section, Figures A10 and A11 disentangle the age effects by estimating the effects of housing wealth on actual health (observed by interviewers) and height, total healthcare expenses, outpatient healthcare expenses, and out-of-pocket expenses of three groups: 0-5 children, 6-10 children, and 11-16 children, respectively.

Specifically, it is observed that the appreciation of housing wealth due to the 2006 housing policy significantly improves the actual health of younger children (0-5 group and 6-10 group), and increases the height of middle-aged children (6-10 group). Furthermore, as for healthcare spending, we find that all healthcare spending of the 6-10 children increases as the housing wealth of their living houses appreciates.

7.3.4 Housing Wealth Effects on Household Expenditures

To further capture consumption patterns, Figure A7 reports the effects of housing wealth on household expenditure per capita, household commercial medical insurance expenditure per capita, and household food expenditure per capita by age cohort, respectively.

In more detail, we have some findings: first, the household expenditure per capita for the over 60 group significantly increases as housing wealth increases; second, household commercial medical insurance expenditure per capita for young group (18-30 group and 31-40 group) increases; third, household food expenditure per capita exhibits positive effects among both young group (18-30) and old group (61-70).

From these results, we find that the housing wealth effect on household consumption is consistent with estimates for healthcare consumption, especially for the younger old group (61-70). This means appreciation of housing wealth primarily raises healthcare utilization, with an increase in medical expenses. However, no effects are pronounced among young people. This means that the wealth effect driven by housing wealth shock does not play a role in shaping consumption patterns among young people. Furthermore, we see a significant increase in the commercial medical insurance expenditure per capita and food expenditure per capita of the young group (18-30), with an appreciation of housing wealth.

This implicitly demonstrates that housing wealth appreciation has positive wealth effects on their children, especially private health insurance coverage and food consumption, rather than on themselves. This is consistent with previous estimates regarding the impact of housing wealth on PHI coverage for children and improvement in their health.

7.4 Urban-rural Heterogeneous Effects

Urban–rural duality is common in China. Specifically, public services and social security, including the pension system and the healthcare system, are segmented between urban areas and rural areas. Considering this heterogeneity, we re-estimate our baseline specifications separately for urban and rural residents. Tables A8 and A9 show the effects of the shock of housing wealth on health outcomes and healthcare spending among the old group (60 and over) living in urban and rural areas, respectively.

To sum up, our results suggest that the 2006 housing wealth shock significantly improved the physical and mental health of elderly residents in urban areas, while its impact on rural seniors is insignificant. Moreover, the estimates for healthcare spending are broadly consistent with these health effects: the positive housing wealth shock in 2006 led both urban and rural residents to use more healthcare services and spend more on healthcare, but this effect is again more pronounced among urban residents.

Furthermore, Tables A10 and A11 report the effects of the housing-wealth shock on health outcomes and healthcare spending among children in urban and rural areas, respectively, using a non-parametric sharp RDD approach. Our estimates for children mirror the patterns observed among adults. Then, the 2006 housing-wealth shock increased healthcare spending only for urban children, with no detectable effects for rural children.

In general, urban–rural differences have two main drivers. First, urban residents typically purchase houses, while most rural residents build their own homes. The 2006 housing reform primarily affected the housing market through changes in taxes and down-payment ratios, which are more relevant for purchased housing than for self-built housing. Second, the asset structure of urban and rural households differs: rural households hold a higher share of their wealth in housing, whereas wealth sources are more diversified in urban households. In addition, urban residents tend to use more healthcare services and start with a better health status. In general, these factors lead to more pronounced wealth effects among urban residents.

7.5 Mechanisms

The theoretical framework underlying our analysis is the simple Life Cycle - Permanent Income (LC-PIH) theory. Based on this theory, appreciation of housing wealth is either a permanent increase in households' income or an increase in living costs. This is because housing is not only an asset but a consumption good (Miles, 1992; Iacoviello, 2004; Campbell and Cocco, 2007). In general, housing property is one of the household assets for homeowners, no matter whether they have mortgage loans, while it represents a consumption service for renters.

The conventional theory suggests that housing wealth affects consumption through two channels: pure wealth effects and collateral effects. The first channel is that homeowners consume more or less as they feel richer or poorer when house prices appreciate or depreciate. Second, housing wealth serves as collateral for borrowing, and rising house prices relax credit constraints, providing households with additional borrowing capacity and increasing their current consumption. The dominating role depends on the credit constraints of the homeowners. Normally, as for those who are not credit-constrained, an increase in housing prices is an appreciation of household wealth, which leads to an increase in the permanent income of homeowners. This is a pure wealth effect. Regarding credit-constrained households, housing is a good collateral tool when prices rise, which improves the borrowing capacity of homeowners with loans.

Individuals smooth their consumption as their households' wealth changes. More importantly, age is highly related to credit constraints. Specifically, the impacts of housing wealth on individuals' consumption behaviours at different age cohorts may vary by their characteristics, especially accumulated assets and debts. Therefore, young people and old people can be affected by housing wealth through different channels. To capture this difference, this section discusses the impact mechanisms of housing wealth among young adults and older adults separately.

7.5.1 Wealth Effects

In China, older people (over 60) usually retire with a pension, while they basically have at least a house without a mortgage loan. Hence, they are less credit-constrained. This means that the appreciation of housing wealth is a bonus or extra gain for them. When housing prices increase, they feel richer with a perception of appreciation of household wealth. Then they would consume more, especially on healthcare products. Therefore, housing wealth impacts elderly people through the effect of pure wealth. In order to verify this assumption, we remove those with housing loans and other house property and

re-estimate the effect of housing wealth on healthcare spending and consumption, even though this group is small in our sample. As Table 7 presents, the results are highly consistent and close to those of the baseline estimates.

A key question is why our results show that healthcare spending rises among older adults when housing wealth is not easily liquidated. Our interpretation is that housing wealth generates a pure wealth effect by strengthening perceived lifetime resources and providing implicit insurance against late-life health risks. Given higher baseline medical needs in older age, a relaxation of precautionary motives can lead to more care financed through current income rather than explicit housing liquidation. Furthermore, we assume that the 2006 housing wealth shock brings an increase in permanent income. In this sense, the housing asset functions as a financial buffer that increases willingness to pay for healthcare even without being monetized.

Moreover, Table 4 shows that a positive housing-wealth shock is associated with higher out-of-pocket healthcare spending among the elderly along both the extensive and intensive margins. This pattern is consistent with the interpretation that, apart from increasing the likelihood of seeking care, wealth shocks may also raise spending conditional on care use; however, we cannot separately identify whether this reflects higher treatment intensity, higher prices, or improved quality of care. To further shed light on the increase in healthcare spending, we examine the effect of housing-wealth shocks on commercial medical insurance (Table A19) and healthcare provider choice (Table A20). Results show that housing price appreciation is associated with greater purchases of private health insurance and the likelihood of seeking care in a better hospital. Overall, these findings suggest that home equity may serve as a form of self-insurance and may also facilitate private insurance uptake, which could in turn support higher medical spending.

Another possible channel needs to be discussed: reduced labor supply increases time available for health investment or family care, thereby affecting the health outcomes of household members. This channel is particularly relevant for the 25–59 working-age population, for whom housing wealth may influence labor supply decisions (Li et al., 2020). If labor supply responds to housing wealth, this could confound the estimated health and healthcare spending effects. To rule out the pure wealth effect from this potential channel, we estimate the impact of housing wealth shock on the probability of caring for parents(father/mother) and the corresponding caring frequencies. As Table A17 reports, we do not find significant effects on the probability of caring for parents and the frequency of caring when exposed to the 2006 housing wealth shock. Therefore, the labor-induced channel does not affect our main results.

TABLE 7: The Effect of Housing Wealth Shock on Healthcare Spending of Elderly Adults

	Outpatient (OOP)		Total healthcare (OOP)		HH Healthcare OOP (Per capita)	
	Conventional	Robust	Conventional	Robust	Conventional	Robust
Panel A: Dependent var (in levels)						
HousingSize $\leq$ 90	1082.5***	1188.7***	2008.2***	2158.9***	1584.5***	1729.1***
	(384.03)	(428.88)	(652.32)	(733.37)	(476.14)	(512.56)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	1480.334	1480.334	2783.336	2783.336	1404.04	1404.04
N of Observations	2,110	2,110	2,291	2,291	3,129	3,129
Panel B: Dependent var (in logs)						
HousingSize $\leq$ 90	0.589**	0.652**	0.650***	0.706***	1.082***	1.189***
	(0.256)	(0.291)	(0.224)	(0.253)	(0.230)	(0.254)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	856.573	856.573	1383.371	1383.371	958.457	958.457
Observations	1,331	1,331	2,488	2,488	2,302	2,302

Notes: The table presents the effect of housing wealth on the healthcare spending of over 60 people using RDD. We restrict the sample to those who are house owners without housing loans and other houses, and their houses (30-300m^2) were purchased before 2006. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using bias-corrected coefficient estimators and robust variance estimators. Covariates include age, age squared, urban area, size of household, marital status, year of education, public health insurance access, province dummy, and year dummy. All continuous variables are winsorized at the 5% level. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: CFPS data, 2014, 2016, and 2018 waves.

7.5.2 Collateral and Preventive Effects

Apart from the wealth effect, the collateral effect may affect the consumption pattern of young adults. Increasing house prices raises homeowners' borrowing ability and relaxes their credit constraints. As Table 8 shows, we do not find any effects of housing wealth on consumption among young adults. Specifically, to check if there is heterogeneity among those with different credit constraints, this section estimates the housing wealth effects on household consumption per capita (in logs) of those with loans and without loans, respectively. Using a non-parametric sharp RDD approach, our results show that the appreciation of housing wealth significantly increases household consumption among young adults with loans by approximately 39.6 percent, while no effect is observed among those without loans. This means the wealth effect does not play a role in the impact of housing wealth on consumption. In contrast, collateral effect is an important channel to stimulate the consumption of young adults with loans. However, since the younger cohort is predominantly composed of individuals without mortgages, the preventive channel is to be the primary mechanism, rather than the collateral (borrowing-constraint) channel.

In addition, non-housing wealth, such as financial assets, could, in principle, mediate the effect of housing wealth shocks through liquidity constraints. In our setting, however,

financial asset ownership is uncommon, particularly among households clustered around the 90 m^2 cutoff. Only about 5.57% of the target sample reports holding financial assets. This low prevalence limits the scope for financial assets to confound our estimated housing-wealth effects and leaves little statistical power to detect heterogeneity along this margin.

Moreover, our estimates show that savings per capita increase by 79 percent as young adults are exposed to the housing wealth shock. In other words, young adults would not consume more; instead, they have more preventive savings. This demonstrates that the wealth effect is offset by preventive savings. Other analyses in terms of the positive effect of housing wealth on medical consumption and private health insurance coverage on children further verify this point. Different from old people, young people regard appreciation of housing wealth as an increasing living cost rather than a wealth effect.

TABLE 8: The Effect of Housing Wealth on Household Consumption and Saving of Young Adults

	All		With Loans		Without Loans	
	Conventional	Robust	Conventional	Robust	Conventional	Robust
Panel A: Household Consumption Per Capita (in logs)						
HousingSize $\leq$ 90	0.062	0.060	0.361***	0.396***	0.009	-0.017
	(0.055)	(0.064)	(0.108)	(0.125)	(0.062)	(0.073)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	15183.19	15183.19	20358.8	20358.8	14281.76	14281.76
N of observations	8,396	8,396	1,196	1,196	7,066	7,066
Panel B: Household Consumption Per Capita (in levels)						
HousingSize $\leq$ 90	1867.6*	2241.6*	7377.9**	7764.5**	741.01	1015.9
	(1104.7)	(1262.9)	(3093.5)	(3613.1)	(1089.5)	(1246.6)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	15183.19	15183.19	20358.8	20358.8	14281.76	14281.76
N of observations	8,444	8,444	1,196	1,196	7,357	7,357
Panel C: Household Saving Per Capita (in logs)						
HousingSize $\leq$ 90	0.674***	0.790***	0.975***	1.167**	0.565**	0.699***
	(0.216)	(0.236)	(0.299)	(0.325)	(0.245)	(0.268)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	8972.809	8972.809	6482.828	6482.828	9406.672	9406.672
N of observations	3,522	3,522	590	590	3,104	3,104
Panel D: Household Saving Per Capita (in levels)						
HousingSize $\leq$ 90	8617***	9501.2***	15446**	17039**	6146.3**	7016.4**
	(2923.7)	(3115.9)	(6599.7)	(7317.6)	(2943.2)	(3135.6)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	8972.809	8972.809	6482.828	6482.828	9406.672	9406.672
N of observations	5,570	5,570	953	953	5,057	5,057

Notes: The table presents the effect of housing wealth shock on the household consumption per capita (in logs) and saving per capita (in logs) of all young adults, young adults with loans, and those without loans, respectively, using sharp RDD. We restrict the sample to 25-59 people those who are house owners and whose houses (30-300m^2) were purchased before 2006. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using bias-corrected coefficient estimators and robust variance estimators. Covariates include the size of household, marital status, year of education, public health insurance access, province dummy, and year dummy. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: *Source*: CFPS data, 2014, 2016, and 2018 waves.

7.5.3 Inter-generational Investment

Our results show that the 2006 housing wealth shock significantly increased children's healthcare spending, with no effects on young adults (aged 25–59). This pattern suggests that when young parents receive a positive wealth shock, they may increase health-related spending on their children rather than on themselves, consistent with an intra-household reallocation of health resources. We assess this interpretation in two ways. First, to separate wealth and collateral channels, we re-estimate the effects of the housing wealth shock for households with and without outstanding loans. Second, to examine whether healthcare resources are reallocated between parents and children, we split the sample into younger and older households based on the age of the household head and estimate the effect of the shock on children's medical spending share of total family medical spending.

It is noteworthy that housing wealth shocks may affect fertility (Ang et al., 2024), we report results at both the household level (total child healthcare spending) and the individual level (spending per child). Overall, the positive effects at the individual level indicate that our findings are not driven solely by changes in family size, but also reflect a higher intensity of health investment in children.

Specifically, as Table 9 shows, we find that households with a younger head who were more exposed to the 2006 shock exhibit higher total and outpatient healthcare spending for children. We also observe higher ratios of children's total and outpatient medical spending to overall household healthcare spending. These results are consistent across both individual-level and household-level data. Prior estimates suggest that young adults do not increase their own healthcare spending in response to a positive housing wealth shock. Instead, the evidence indicates that they may invest more in their children's health through greater healthcare utilization. This pattern is consistent with an intergenerational reallocation of healthcare resources within younger households.

To disentangle whether the pure wealth effect or the collateral effect is the dominant channel, we split children into households with loans and those without loans. Table A16 reports the effects of the housing wealth shock on children's healthcare spending at both the individual and household levels. Overall, the increases in healthcare spending driven by the 2006 housing wealth shock are significant only among households without loans. This pattern suggests that the pure wealth effect is the main driver of higher healthcare spending for children.

TABLE 9: The Effect of Housing Wealth on Healthcare Allocation in Households

	Individual-level				Household-level			
	Below 40		40-59		Below 40		40-59	
	Conventional	Robust	Conventional	Robust	Conventional	Robust	Conventional	Robust
Panel A: Total Healthcare (in levels)								
HousingSize $\leq$ 90	1168.1***	1278.8***	449.54*	498.08*	2123.2**	2296.3**	671.17*	811.12*
	(358.95)	(402.56)	(256.38)	(296.19)	(860.98)	(966.22)	(398.05)	(473.02)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	767.567	767.567	761.642	761.642	1399.865	1399.865	1255.252	1255.252
N of observations	869	869	2,326	2,326	624	624	2,035	2,035
Panel B: Outpatient Healthcare (in levels)								
HousingSize $\leq$ 90	920.55***	1018.9***	125.56	148.19	1264.9***	1357.1***	293.91	297.36
	(209.24)	(237.44)	(198.22)	(238.31)	(361.14)	(401.77)	(229.23)	(264.13)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	502.341	502.341	493.431	493.431	556.705	556.705	502.679	502.679
N of observations	508	508	1,409	1,409	621	621	1,494	1,494
Panel C: Medical Spending Share (children)								
HousingSize $\leq$ 90	0.181**	0.204**	-0.105	-0.129	0.201**	0.215**	-0.069	-0.069
	(0.076)	(0.085)	(0.080)	(0.098)	(0.089)	(0.099)	(0.086)	(0.101)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	0.233	0.233	0.199	0.199	0.309	0.309	0.246	0.246
N of observations	708	708	1,475	1,475	423	423	1,195	1,195
Panel D: Outpatient Medical Spending Share (children)								
HousingSize $\leq$ 90	0.203***	0.204***	-0.112	-0.150	0.249***	0.221***	-0.055	-0.071
	(0.060)	(0.065)	(0.096)	(0.118)	(0.075)	(0.084)	(0.062)	(0.072)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y (in levels)	0.208	0.208	0.187	0.187	0.161	0.161	0.137	0.137
N of observations	458	458	967	967	478	478	1,258	1,258

Notes: The table presents the effect of housing wealth shock on the healthcare spending of children, among households with loans, and those without loans, respectively, using sharp RDD. We restrict the sample to households that are house owners and whose houses (30-300m^2) were purchased before 2006. "Medical Spending Share (children)" and "Outpatient Medical Spending Share (children)" represent children's medical spending (total and outpatient) share of total family medical spending, respectively."Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using bias-corrected coefficient estimators and robust variance estimators. Covariates include child age, age squared, other housing, housing loans, urban area, household size, number of siblings, head characteristics, province dummies, and year dummies. "Observations" refer to the effective sample size within the bandwidth around the cutoff used in the RDD estimation, not the total subsample size. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: CFPS data, 2014, 2016, and 2018 waves.

8 Robustness Checks

8.1 Sensitivity Analysis

Before conducting the sensitivity analyses, we examine the continuity of key covariates around the 90 m^2 housing-size cutoff. As Table A15 presents the corresponding RD plots, most variables are smooth, but household size, years of education, and the urban-residence dummy show very modest discontinuities. These patterns are consistent with socioeconomic sorting: larger and more educated households, as well as urban residents, are more likely to purchase or occupy larger dwellings above the threshold.

To address this issue, we include these variables as controls in a covariate-adjusted RDD specification following Calonico et al. (2019). The estimated effects remain stable and statistically significant, indicating that these imbalances do not drive the main results. Overall, the observed discontinuities appear to reflect structural differences in housing demand rather than manipulation of the running variable, supporting the credibility of our identification strategy. Moreover, when we use alternative bandwidths to estimate the effects of housing wealth across different groups, as Figures A12-A13 illustrate, the results remain robust.

In addition, we also re-estimate our baseline effects using nonparametric RDD with different polynomial orders (first- and third-order). As Tables A12, A13, and A14 present, all results are consistent with our basic estimates for both adults and children. Because housing size may be heaped or misreported around the 90 m^2 cutoff, we use two strategies to mitigate the influence of heaping. First, we do a falsification test by randomly reassigning, for all observations reporting a floor space of 90 m^2, a housing size between 89 and 91 m^2, and re-estimating the baseline regressions. Second, we perform a donut-hole RDD that drops observations with housing size in [89, 91] m^2. The results in Tables A21 and A22 (adults and children, respectively) are very close to our baseline estimates, indicating that our findings are not driven by heaping at the threshold. These tests further verify the robustness of our baseline estimates.

8.2 Parametric Analysis

To further verify the robustness of our findings, as Tables A2-A3 report, we also do parametric estimates for the impact of housing wealth shock on healthcare spending and health

outcomes among adults and children, respectively. These estimates are highly consistent with those using the non-parametric sharp RDD method. Therefore, our baseline results are robust.

Furthermore, to estimate wealth-healthcare elasticity for adults and children, we employ an instrumental variable two-stage least squares (IV–2SLS) approach to obtain parametric estimates of the causal effects of housing wealth on healthcare spending (in logs) and health outcomes. In this specification, the sample is restricted to homeowners whose primary residence (70–110 m^2) was purchased before 2006. The instrumental variable is an indicator for whether the dwelling's size is below 90 m^2. The first-stage F-statistics are well above the conventional threshold of 10, confirming the strength and validity of the instrument.

Tables A4-A5 report the results for adults and children separately. After controlling for age, age squared, additional housing ownership, housing loans, household size, marital status, years of education, public health insurance coverage, an urban indicator, as well as province and year fixed effects, the parametric IV estimates remain consistent with the baseline results, thereby reinforcing the robustness of our conclusions.

9 Conclusion

Using a non-parametric regression discontinuity design (RDD) approach and the 2006 Housing Reform, this study estimates the causal impact of housing wealth on healthcare spending and health outcomes of young adults, elderly adults, and children, respectively. Then we explain which channel plays a role in the housing wealth effect for each group. Our results have a series of findings. Overall, the appreciation of housing wealth has heterogeneous effects on healthcare spending and the health of these three groups.

Specifically, housing wealth shock significantly improves the health of older adults while increasing total spending and corresponding out-of-pocket medical expenses by 1,770.2 RMB (roughly 249 USD), with corresponding wealth elasticities of 0.61, and the elasticity for total spending is 0.85. However, these health effects are not pronounced among young adults. Furthermore, appreciation of housing wealth also benefits younger children, increasing their healthcare spending by 766.9 RMB (elasticity: 2.7), while older children experience higher rates of private health insurance coverage. These effects differ across age cohorts. In more detail, an increase in housing wealth improves the health and healthcare spending of the younger old group (61-70).

The mechanisms underlying housing wealth effects differ for young adults and older adults. First, the positive health effect of housing wealth shock on the elderly derives from the "pure wealth effect". However, for young adults, the effects of housing wealth are attributed to the preventive saving incentive rather than the collateral effect channel. Finally, health improvements among children are due to increased healthcare investments and purchases in private health insurance, suggesting an intergenerational transmission mechanism through parental resources.

Furthermore, we uncover substantial urban–rural differences and inequalities in consumption responses to housing wealth. Overall, the positive housing-wealth shock generated by the 2006 Housing Reform significantly increases healthcare spending only among urban older adults and urban children, and also improves their health status. Moreover, this wealth effect is pronounced at the upper end of the distribution (0.75 percentile), with no impact on lower- or middle-percentile groups (0.25 and 0.5 percentiles). These patterns suggest that short-term housing-wealth windfalls reduce health inequality among vulnerable households as wealth shocks allow healthcare to be allocated to those with higher care needs.

To sum up, our results indicate that housing-wealth shocks constitute a double-edged instrument for improving health. While the 2006 Housing Reform generated sizable gains in healthcare utilization and health status for urban older adults and children, these benefits are largely absent for young adults, low-spending groups, and rural households. These findings underscore the need to design housing reforms in tandem with health and social policy, such as more generous public health insurance, improved access to quality care in rural areas, and prudential but inclusive credit arrangements, to ensure that capital gains from housing are translated into broad-based welfare improvements. Future research could examine longer-run and general-equilibrium effects of housing-wealth shocks, as well as their intergenerational implications.

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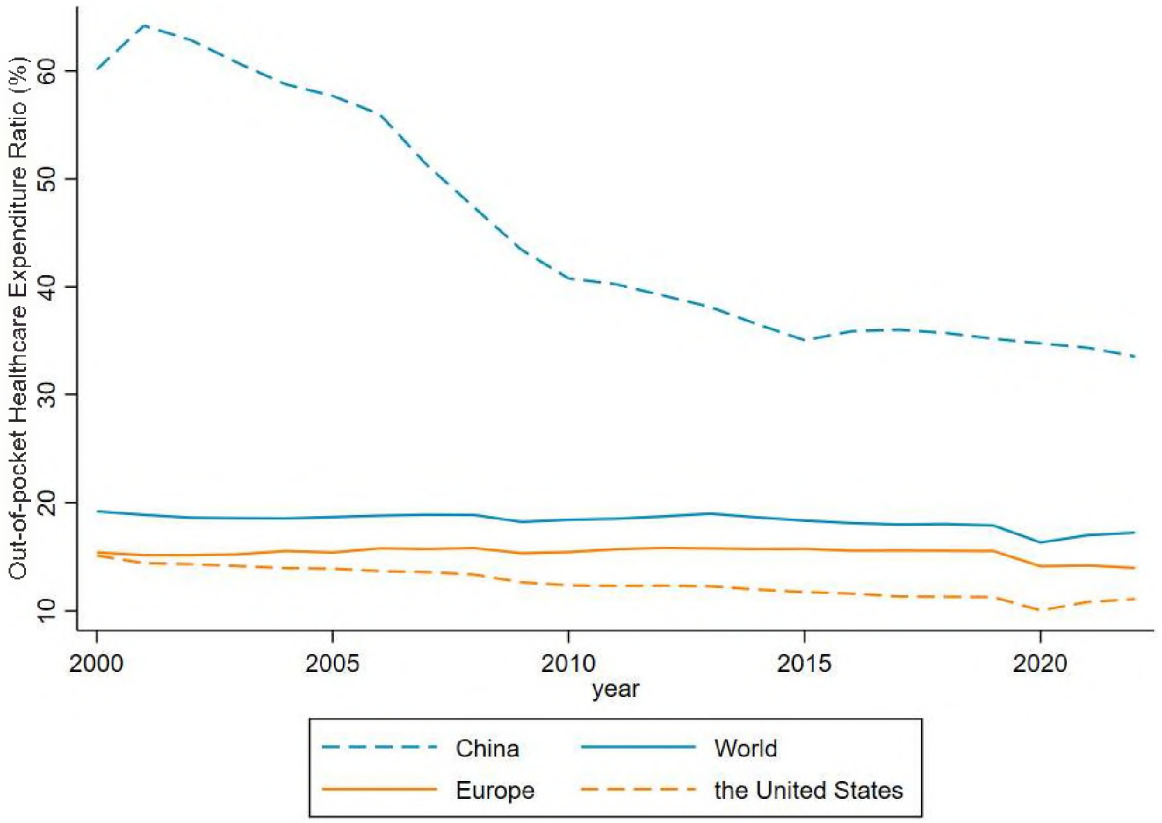
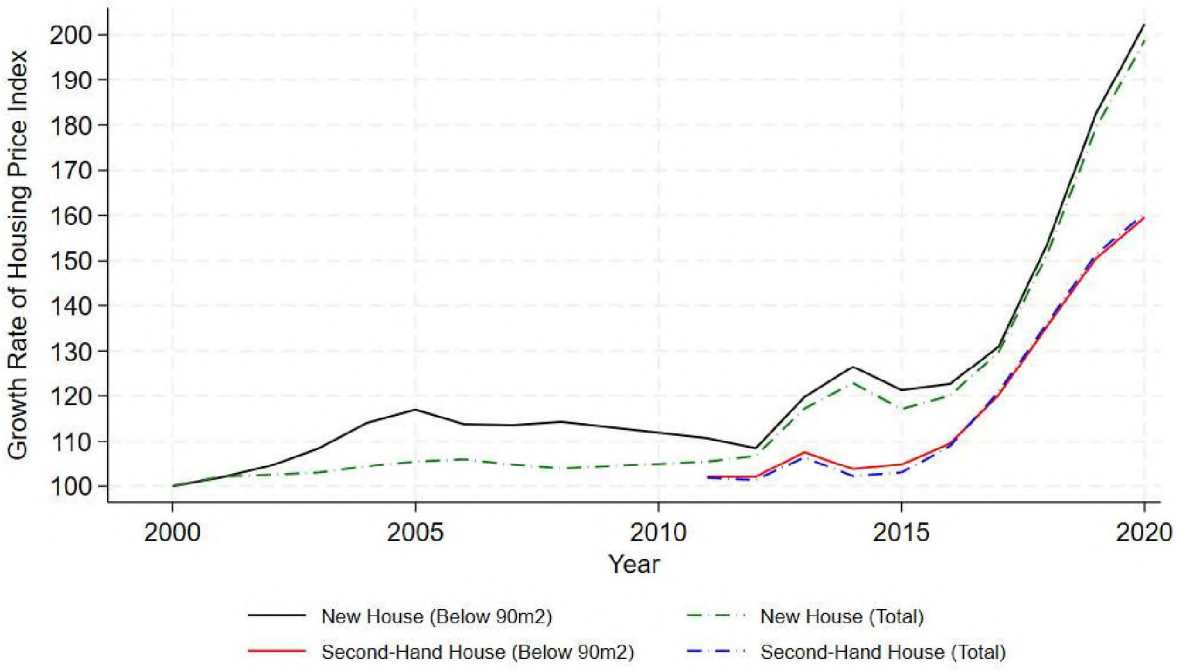
FIGURE 1: Out-of-pocket Healthcare Expenditure Ratio, 2000-2022



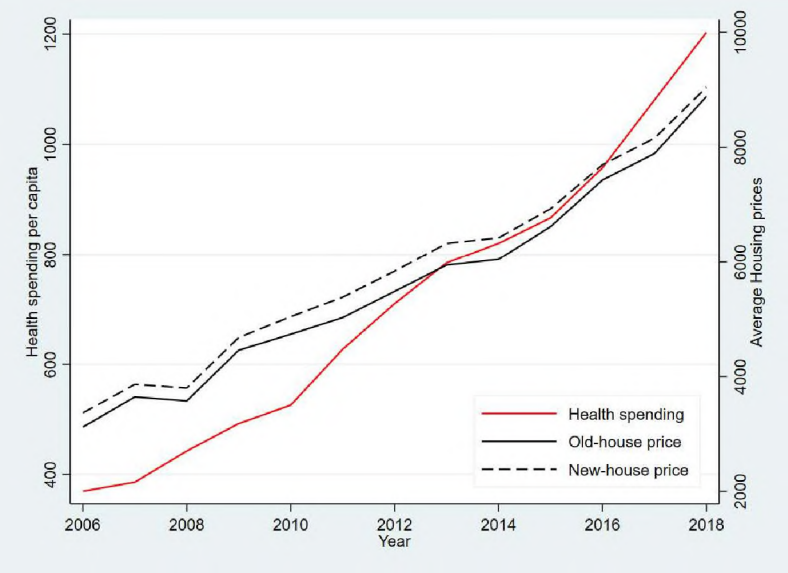
Source: World Health Organization Global Health Expenditure database.

FIGURE 2: Changes in Residential Sales Prices Index, 2010-2020



Notes: The graph presents the dynamics of the residential sales price index in 70 large and medium-sized cities, based on data from the National Bureau of Statistics of China (2023). All the new and second-hand houses are categorized by floor area (full sample and those below 90 m^2). For data before 2010, we use the housing index for "Affordable Housing" to represent those below 90 m^2.

FIGURE 3: Trends in Average Residential Housing Price and Health Spending Per Capita, 2006–2018



Notes: This figure plots the relationship between average housing prices (new and existing units, yuan/m^2) and aggregate health spending per capita (yuan). The horizontal axis reports years between 2006 and 2018. The primary (left-hand) vertical axis measures health spending per capita, and the secondary (right-hand) axis measures average commercial residential housing prices in China. The red line represents the trend in health spending per capita, and the black line represents the trend in residential housing prices over the same period.

Source: China National Bureau of Statistics.

A Appendix A

Statement: Due to length restrictions, the Appendices are available upon request. Please contact: z.he16@lancaster.ac.uk or zeen.he@outlook.com