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The effects of wealth shocks on public and private long-term care insurance

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ABSTRACT

The financing of long-term care services and supports (LTSS) relies heavily on self-insurance in the form of housing or financial wealth. Exploiting both *local market variation* in housing prices and individual-level variation in stock market wealth from 1996 to 2016, we show that exogenous wealth shocks significantly reduce the probability of LTCI coverage, without altering Medicaid eligibility among people with housing and financial assets. The effect of shocks to liquid wealth strongly dominates the effect of housing wealth changes. A $100 K increase in housing (financial) wealth reduces the likelihood of LTCI coverage by 1.24 (3.22) percentage points.

1. Introduction

A key challenge in aging western societies lies in finding ways to insure against and finance long-term services and supports (LTSS). Around half of adults who live to age 65 will need some form of LTSS before they pass away (Favreault and Dey, 2015). Furthermore, nearly 5 % of men and 12 % of women aged 65 and over will incur LTSS costs exceeding $250,000 in present discounted 2015 dollars before death (Favreault and Dey, 2015).[1] In 2022, Medicaid funded 44 % of total LTSS costs, with out-of-pocket expenses making up 14 % of such costs (CRS, 2023). Individuals often cover the cost of long-term services and supports (LTSS) by liquidating their assets, most commonly drawing from housing and financial wealth. Among these assets, housing wealth stands out as the primary and most substantial non-pension asset for many Americans (Venti and Wise, 1990). It plays a critical role in the financial strategies of older adults, roughly 80 % of whom are homeowners (Engelhardt, 2008). While housing assets are usually exempt in Medicaid eligibility determinations, many rely on selling their homes to finance LTSS out-of-pocket. Alternatively, individuals can use financial wealth, or 'self-insurance,' to pay for LTSS costs. Consequently, wealth shocks can drive shifts between self-insurance and private long-term care insurance (LTCI). A positive wealth shock, for example, could reduce the need for private LTCI coverage.

An alternative to paying for care out of pocket is to take-up a long-term care insurance (LTCI) policy. However, the LTCI market in the United States has seen limited growth, with only around 8 % of individuals owning such policies—a proportion that has steadily decreased over time (Brown and Finkelstein, 2006; 2011; Treasury, U.D., 2020; CRS, 2023). While self-insurance among wealthier individuals significantly reduces demand for LTCI, existing research also highlights a range of structural and behavioural barriers. One

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[1] For those who use LTSS, the expected present discounted value of care in 2015 dollars is estimated at $133,700 (Favreault and Dey, 2015).

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of the main obstacles is the high cost of premiums, particularly in the absence of subsidies (Brown and Finkelstein, 2011; Goda, 2011). Additionally, the complexity of LTCI policies and the limited financial literacy of the target population make the decision-making process even more challenging (Akaichi et al., 2020; Ameriks et al., 2016; McGarry et al., 2016). Coe, Skira, and van Houtven (2015) document that individuals with prior experience in caregiving or family long-term care episodes are more likely to be aware of and obtain LTCI coverage. Likewise, state-level tax incentive programs (Courtemanche and He, 2009; Goda, 2011), and Partnership program initiatives can only marginally help stimulate the coverage of LTCI (Costa-Font and Raut, 2025). Finally, Brown (2023) shows that informational campaigns can boost LTCI coverage, emphasizing the critical role of awareness in shaping long-term care planning behaviours. In sum, these findings point to a combination of market flaws, policy design constraints, and cognitive obstacles that prevent wider participation, in addition to the rational self-insurance of wealthier households, as the reason for the LTCI market's underdevelopment. Thus, self-insurance using one's own wealth may become the default financing strategy for a large share of the population (Davidoff, 2010).[2] Among those individuals, in a setting where the only government insurance for LTC is heavily means tested, changes in wealth resulting from shocks to both housing and financial assets can affect individuals' decision to have LTCI coverage. Testing this proposition is the purpose of this paper.

Older adults typically do not exhaust their housing assets until they experience a health shock (Costa-Font and Vilaplana-Prieto, 2022; Walker, 2004), and many face the risk of financial hardship due to the high costs of care at home or in a nursing home. Consequently, in the US, many who need long-term services and support (LTSS) due to functional impairments are forced to rely on Medicaid for LTSS expenses. However, to qualify for Medicaid-financed LTSS, individuals must meet specific eligibility criteria based on income, asset, and functional impairment. However, eligibility triggers can vary across states, with some having more restrictive eligibility rules, which adds barriers to Medicaid coverage (Ndumele et al., 2014). Hence, a significant financial setback, such as a negative wealth shock, can increase the likelihood of qualifying for the program. Therefore, household wealth plays a central role and testing this relationship involves identifying wealth effects that only affect the demand for long-term care (Garber, 1989; Meer et al., 2003).

One approach to studying the wealth effects on long-term care insurance (LTCI) is to examine the effect of exogenous wealth shocks, which can occur both at the individual level (e.g., stock value fluctuations) or in local markets (e.g., changes in housing prices). Home equity constitutes a significant share of wealth for most households, while financial assets, despite their steady growth in recent decades, remains concentrated in a small segment of the population. Significant and unexpected fluctuations in housing and stock prices can influence consumer behaviour, especially among older adults. Such wealth shocks often take the form of rapid and unforeseen surges in housing and stock values, often fuelled by speculative bubbles, are frequently followed by sharp declines in wealth. However, existing evidence on how changes in housing wealth affects participation in public and private long-term care insurance remains limited. Davidoff (2008) conducted an empirical analysis with data before 2006 to examine the effect of the ratio of housing assets to total wealth on the coverage of long-term care insurance.[3] While we are not the first to examine this relationship, our study is the first to leverage exogenous variation to estimate the local average treatment effect (LATE). However, the influence of stock wealth on long-term care insurance remains largely unexplored.[4] Identifying these effects would contribute to a more comprehensive understanding of how long-term services and supports (LTSS) are financed.

In this paper, we estimate the effects of wealth shocks on the take-up of Medicaid and private long-term care insurance (LTCI) in the US. We exploit variation in both housing and stock wealth, and we examine how such shocks influence the demand for public and private coverage of long-term services and supports (LTSS). Specifically, we assess the impact of wealth shocks on the extensive margin, that is, the individual-level probability of holding LTCI or enrolling in Medicaid. The period under study encompasses significant fluctuations in housing prices, beginning with the housing boom that started in the first quarter of 1999 and followed by the burst of the housing bubble in the first quarter of 2006 (Cohen et al., 2012).

Housing prices reached their peak in early 2006 after a decade of steady increases. However, by the end of that year, prices experienced a sudden, unexpected, and historically large decline of 18.9 %. That downward trend continued through 2009, followed by more moderate price reductions until 2012, when prices began to rise again. These fluctuations were far from uniform across the country; housing prices tended to appreciate much more rapidly in metropolitan areas along the East and West Coasts compared to those in the nation's interior (Cohen and Lopez, 2012).[5] Similarly, the U.S. stock market experienced two notable bubbles in recent decades: the Dot-com bubble of the mid-1990s and the mid-2000s bubble, which was closely tied to the housing boom and the subprime mortgage crisis. In this paper, we also demonstrate that pro-cyclical gains in home and stock equity for asset owners gave rise to health improvements, hence reducing reliance on long-term care services.[6]

We initially exploit the rich variation in housing price fluctuations across households, both geographically and over time. However,

[2] Davidoff (2010) shows that home equity can provide a similar role as long-term care insurance by providing cash payouts, arguing that if homeowners anticipate using home equity for LTSS, it supports the case for incorporating housing assets into Medicaid eligibility assessments.

[3] For instance, Davidoff (2010) argument is that illiquid housing can crowd-out LTCI demand, but not that financial wealth would crowd out LTCI.

[4] The exception is on the effect of wealth shocks on access to home health care and nursing home use alone (Costa-Font et al., 2019)

[5] So, prices in Boston during the boom increased by 121% and during the bust dropped by 15%, whilst in LA they increase by 231% during the boom and dropped by 40% during the burst. In contrast in Detroit, the price change was more balanced out with an increase during the boom was 46% and the house decline was 44%.

[6] The two main indexes that are regarded as reliable are the Standard & Poor's (S&P)/Case-Shiller house price index and the Federal Housing Finance Agency (FHFA) Purchase-Only. However, although variation is larger in the former, the two indexes are remarkably similar in the timing of the changes. Overall, metropolitan areas with the larger booms tended to have larger busts.

while local housing price changes are exogenous to individual households, they may still reflect underlying local economic conditions that could influence health through channels other than home equity. To address this concern, our empirical strategy includes controls for geographic location and time effects. Additionally, we estimate the impact of local housing price changes on renters, who are exposed to the same housing market conditions as homeowners but do not experience the associated wealth gains or losses, allowing us to isolate the wealth effect from other local economic influences.

We make use of quasi-experimental variation in wealth shocks to examine their effect on the uptake of both private LTCI and means-tested public insurance (Medicaid).[7] Using data from the Health and Retirement Study (HRS) (1996–2016), we specifically exploit state- and time-specific variation in housing price and stock market values to assess the impact of changes in wealth on private LTCI and Medicaid participation. Exploiting spatial variations in household wealth is crucial given the significant heterogeneity in the effects of the housing bubble across the U.S. We use reduced form estimates and perform additional robustness checks on our instruments to ensure the reliability of our findings. As expected, housing prices and stock market fluctuations are strong instruments for wealth variation. Our model also controls for individual characteristics that could influence caregiving and housing choices at older ages.[8] To test the robustness of our causal inference, we run two placebo tests: one on renters, assessing housing price changes, and another on individuals without financial assets, assessing stock market changes, as neither group should experience a wealth effect.

Our estimates yield two key findings. First, we find that a $100,000 increase in housing wealth reduces the likelihood of private long-term care insurance (LTCI) coverage by 1.24 percentage points, while a comparable increase in total assets lowers LTCI demand by 0.95 percentage points. Likewise, a $100,000 increase in stock wealth and total assets reduces the probability of holding private LTCI by 3.22 and 4.9 percentage points, respectively. These results point to clear wealth effects, significantly different from zero, influencing the demand for financial protection against long-term services and supports (LTSS) costs, which are larger for liquid (stocks) than illiquid (housing) wealth. This effect appears to be driven by a greater reliance on self-insurance and a reduced take-up of private LTCI. Second, we find no statistically significant evidence that wealth shocks influence the likelihood of Medicaid enrolment. This suggests that changes in wealth do not substantially affect individuals' Medicaid eligibility, indicating limited crowd-out effects on both self-insurance and public insurance coverage.

The structure of the paper is as follows. The next section briefly discusses the evidence on the effects of housing and stock wealth at old age, and an overview of the financing of LTSS, followed by a section describing our data and empirical strategy. In section four, we discuss our estimation results, and in the final section, we discuss the implications of the results.

2. Conceptual framework

The relationship between wealth, whether housing or financial, and long-term care insurance is especially important in aging western societies, where traditional caregiving support is declining (Costa-Font et al., 2015; Costa-Font et al., 2019). Changes in both housing and financial wealth can substantially affect a household's financial standing, purchasing power, and decision-making. An exogenous increase in housing and financial wealth boosts total household wealth, which in turn influences consumption choices, including the long-term care insurance purchase decision.

Housing at older age. One of the most striking trends in the US housing markets has been the sustained increase in the homeownership rate among people 65 years and older. This has been attributed, in part, to a rise in social security benefits (Engelhardt, 2008). Even decades ago, evidence pointed to a strong preference among older adults to age in place (Venti and Wise, 1990), which in turn gives rise to a correlation between income and homeownership among the elderly. Although housing wealth is often liquidated to fund consumption, evidence shows such effects mainly occur at very advanced ages, when individuals are 80 years and older. Walker (2004) shows that housing sales in old age for single households are mostly driven by health. This study adds to the existing evidence showing that such effects impact LTCI decisions.

Housing wealth effects on health and care needs. Individual net wealth is not independent of individual health. Net worth tends to increase with age among healthier households, and specifically among those in the top three quintiles of initial health status, while it remains flat or grows more slowly for less healthy households (Poterba, Venti, and Wise, 2011). Likewise, housing shocks can significantly influence major life decisions such as college enrolment decisions and human capital (Lovenheim, 2011) as well as fertility decisions of the household (Lovenheim and Mumford, 2013), both highlighting the role of housing wealth in shaping households' forward-looking decisions. Additionally, Case et al. (2005) and Campbell and Cocco (2007) showed that households modify their consumption in response to housing price changes, and Case et al. (2005) note that changes in aggregate housing prices expand consumption with an elasticity that ranges from 0.05 to 0.09. When long-run effects are accounted for, then housing wealth elasticity drops to 0.04 but remains significant (Carroll et al., 2006), although there is some heterogeneity in its effect size.[9]

In interpreting these findings, it is important to distinguish between perfectly anticipated housing price changes and unanticipated ones. In this study, we focus on house price shocks that we regards as orthogonal to individual decision-making. This view is based on

[7] Additional explanation about two types of long-term care insurance i.e. LTCI (private) and Medicaid (public) are provided in Section B in the Appendix.

[8] We address potential time- and state-specific unobserved factors by including time, state and individual fixed effects, to account for unobserved heterogeneity.

[9] Bostic, Gabriel, and Painter (2009) find higher elasticities of housing wealth on consumption than that for financial wealth in the U.S. Estimates from the UK by Disney, Gathergood, and Henley (2010) found slightly smaller elasticity estimates, which were different in magnitude for positive and negative wealth shocks.

the idea that housing has consumption effects, and individuals do not necessarily perceive its investment nature at every point in time. However, in the event of a combined health and wealth shock, then investment effects may become more salient. Other situations in which investment effects are important include downsizing decisions later in life (Campbell and Cocco, 2007). Among different shocks, the economic downturn allows for examining the impact of wealth shocks on related economic behaviour. Using evidence from the Social Security "notch" which would have differentially affected the income of retirees, Goda et al. (2011) find that a positive permanent income shock reduces the demand for nursing home care and increases the use of paid home care services.

We posit that these substantial and largely unexpected changes in housing prices can influence the financing of LTSS, given that older adults tend to draw on their housing assets for such purposes. After retirement, some individuals rely on their pension/401 K income and wealth in housing assets as self-insurance against the financial consequences of needing LTSS. For these people, we hypothesize that a shock to the value of housing assets may affect the type of long-term care used if functional impairments occur. Such shocks may be especially influential in choices between different types of formal LTSS (e.g., nursing home care, assisted living, and home health) and informal care provided by friends and family. Informal care remains the most common form of assistance to people with functional impairments.

The influence of housing assets on LTSS financing may work through several different channels. A negative housing asset shock can influence an individual's ex-ante planning for old age. Conditioned on initial income and asset levels, a wealth contraction may increase the probability of purchasing private-LTCI coverage to protect the remaining assets to pass on as bequests, thus making self-insurance less of an option. Conversely, a wealth shock may result in making Medicaid a more viable alternative. Additionally, wealthier individuals may have more access to financial advisors, who can, in turn, help incorporate LTCI into a comprehensive financial plan for later life. Therefore, the examination of how various asset classes affect the demand for LTCI is an important empirical question that may lead to understanding the largely unsuccessful attempts by both federal and state governments to stimulate the coverage of private-LTCI. However, because housing price shocks are largely unexpected, we argue that it is reasonable to view those effects as exogenous to individuals, allowing for a causal interpretation of our results. We also consider some potential mechanisms, including the effect of a change in housing assets on health, and more specifically on the probability of functional impairment at old age (Meer et al., 2003).

Financial Wealth Effects. Financial assets,[10] such as stocks and bonds, are often viewed as comparable to housing wealth in terms of their role in household wealth and financial decision-making (Di Maggio et al., 2020). However, the impact of changes in stock market wealth on household consumption remains mixed. Studies by Davis and Palumbo (2001), Case et al. (2005), Carroll et al. (2006) , Zhou and Carroll (2012), and Bostic, Gabriel, and Painter (2009) analyse aggregate and micro-level data and find that stock market wealth has only weak correlation with household consumption, with a marginal propensity to consume (MPC) of <5 %. Poterba (2000) argues that the direct wealth effect of stock market gains is likely small due to the skewed distribution of stock ownership. He also notes that stock price increases could have a spillover effect on household spending through enhanced consumer confidence, even for those who do not own stocks. In contrast, Dynan and Maki (2001) and Di Maggio et al. (2020) find that increases in stock wealth are strongly correlated with higher household consumption, with an MPC greater than 5 %. In our sample, we find that stock market wealth is primarily concentrated among wealthier households, who tend to feel more financially secure.

Income Effect and Substitution Effects. Changes in housing and financial assets increase an individual's perceived lifetime wealth. This wealth effect can lead to greater consumption of normal goods, including private-LTCI, as individuals may now be more capable of affording higher premiums. However, increased wealth may also be perceived as a form of self-insurance against potential LTSS expenses, possibly reducing the perceived need for LTCI coverage.

Other Behavioural Explanations. Individuals with greater housing and financial wealth may perceive risks differently compared to their less wealthy counterparts (Paravisini et al., 2017). The enhanced sense of financial security associated with higher wealth can, in turn, diminish the perceived need of LTCI.. Home equity holders exhibiting house price rises increase their non-essential consumption goods and services (Aladangady, 2017). Therefore, we hypothesize that the relationship between wealth and private-LTCI is negative when the cost of self-insurance declines.

3. Empirical strategy

Data and Sample. Our primary dataset is the Health and Retirement Study (HRS), a publicly available dataset sponsored by the National Institute on Aging. The HRS collects biennial data from respondents and their spouses, born between 1931 and 1941, starting in 1992. A separate sample, AHEAD, includes cohorts born before 1923, the 'war baby' cohort (born 1942–1947), and 'children of the

[10] This study does not consider stocks held in retirement accounts. It is important to note that the financial or stock market wealth variable consists only of stocks or bonds or mutual funds. It excludes any assets that is held in IRA or Keough accounts.

depression' (born 1924–1930). Since long-term care affects all these cohorts, we included them in our analysis. We used a version of the HRS assembled by the RAND Corporation, combining these cohorts, resulting in data from 1996 to 2016. We excluded the first two waves from our sample due to concerns about the clarity of certain questions, based on prior studies (Goda, 2011; Finkelstein and McGarry, 2006). The HRS provides a comprehensive set of socio-economic variables, including demographic characteristics, health status, chronic diseases, housing wealth, financial wealth, income, and insurance coverage.

With access to restricted data, we were able to examine changes in home wealth at the county and metropolitan statistical area (MSA) levels.[11] The housing boom and bust primarily affected certain counties and MSAs, allowing for enough variation in the data to estimate the local average treatment effect (LATE). Additionally, recognizing that unemployment rates could influence outcomes related to private LTCI decisions, we included state-level unemployment data from the Bureau of Labor Statistics as a control variable in our model.

Given that the majority of LTCI policies are purchased within the ages of 55 and 75, our sample is made of people aged 55 to 75 for reporting the likelihood of LTCI coverage. In contrast, to examine the effect of wealth on Medicaid uptake, we restrict the sample to individuals aged 65 and above. After the age of 65, people are more likely to use Medicaid for long-term care services; thus, it makes sense to focus our research on those who could qualify for long-term care benefits. Therefore, we limit our Medicaid sample to those who are 65 years of age or older.

The final sample contains the data from 1996 through 2016 and has 100,787 observations for 23,015 sample individuals. The dependent variables in the regressions are a set of binary variables that refer to receipt of Medicaid each year, as well as the coverage of private-LTCI. The average net worth (total assets), the total housing and financial assets, are treatment variables in the regression and are potentially endogenous. We use a housing price index (HPI) and a Constructed Stock-Market wealth shocks measure (CWS) based on the S&P 500 as an instrumental variable to address the endogeneity of housing assets and of financial assets, respectively. The HPI is a broad measure of the movement of single-family housing prices. It serves as a timely and accurate indicator of housing price trends in various geographic locations. The HPI[12] is published by the Federal Housing Finance Agency (FHFA) using data provided by Fannie Mae and Freddie Mac. Table 1 provides the descriptive statistics of two different samples. It summarises the average net worth (total assets), total housing assets, and total financial assets for respective samples.[13] We report descriptive statistics for other individual-level characteristics of the sample, such as income, health status, chronic diseases, and other demographic variables. The LTCI sample indicates that slightly over 12 % of individuals in the sample are covered by private-LTCI. The total wealth, housing wealth, and financial wealth for an average household of the sample are $463,510, $148,502, and $65,411[14] respectively. We scale all types of wealth, total, housing, and financial, to increments of $100,000 because this value is below the standard deviation of each respective wealth measure and therefore lies well within the empirical bounds of our data. Using this common scale ensures comparability across wealth categories while maintaining interpretability of the marginal effects.

Approximately 45 % of individuals in the sample are male, and one-third are single or unmarried. Additionally, nearly three-quarters of respondents report being in good or excellent health. Among chronic conditions, arthritis is the most reported condition, exceeding the prevalence of other major diseases in the sample. The average respondent is 64 years old, earns over $70,000 annually, and about 5.5 % are enrolled in Medicaid. Additionally, Figure A2 in the Appendix displays the differences in total (Figure A2.1), housing assets (Figure A2.2), and financial assets (Figure A2.3) by private-LTCI coverage status. The figure shows that both groups experience growth in housing assets that peaks in 2006, followed by a sharp decline from 2008 onward, while financial assets for both groups reflect the boom-and-bust cycles of the preceding two decades. Overall, for housing assets, we find that both groups are comparable until 2004, but differ greatly after 2006. In contrast, for financial assets, we observe that both groups are significantly different.[15] Figure A3 displays the trends in LTCI coverage for single vs married survey participants. Married individuals are more likely to have LTCI coverage, on average, than single individuals.

Table A2.2 in the Appendix displays the characteristics of the sample by insurance status (both public and private). As anticipated, private LTCI participation rises with wealth, income, and education, while Medicaid enrolment is more common among those with fewer assets and lower socioeconomic status. There are no substantial differences in age, gender, or parental status by LTSS insurance status. Similarly, Figure A4 in the Appendix illustrates how LTCI coverage and bequest motives have evolved alongside changes in health status. Finally, monthly data from the Standard and Poor's 500 (S&P 500) stock market index is matched with the interview month from the Health and Retirement Study (HRS) data. We further construct stock market wealth shocks as suggested by (Levine and Coile, 2004) and Schwandt (2018) and use them as an instrumental variable. To construct the samples for both housing and financial wealth, we conduct separate reduced-form regressions to assess whether non-treated groups should be retained in the main analysis (Appendix Table A3). Given that the reduced form estimates for renters indicate no significant relationship between housing prices and

[11] Given the granularity of MSA data, the literature regards MSA-level data on FHFA house prices as preferable. House prices at the MSA level are typically more responsive to regional economic shocks such as changes in employment, migration, or credit conditions than those in broader geographic units (Cotter Gabriel and Roll, 2011; Murphy, 2024). This makes MSA-level indices particularly useful for capturing heterogeneous housing wealth effects. Where MSA-level indices are unavailable, we use county-level indices as a second-best alternative. If neither MSA nor county data are available, we rely on state-level indices as a last resort. This hierarchy ensures that we exploit the most localized price variation available, thereby enhancing the precision and relevance of our estimates.

[12] The evolution House Price Indices are reported in Figure A1.1 in the Appendix.

[13] The trends of total, housing, and financial wealth are reported in Figure A1 (A1.2, A1.3, and A1.4).

[14] These figures are from the RAND HRS Longitudinal file 2016. These figures are inflation-adjusted to 2016.

[15] Appendix, Figure A3 – Percentage of private-LTCI uptake by marital status (singles vs married).

Table 1
Descriptive Statistics of the Sample.

	LTCI Sample (Age:50–75)			Medicaid Sample (Age:65–104)		
Variables	N (1)	Mean (2)	SD (3)	N (4)	Mean (5)	SD (5)
Private-LTCI	100,787	0.126	0.33			
Medicaid (Age:65+)				80,244	0.055	0.228
Total Wealth	100,787	465,789	785,817	80,244	499,997	805,274
Income	100,787	72,583	106,017	80,244	54,363	84,852
Housing Wealth	100,787	148,726	185,003	80,244	161,938	195,021
Financial Wealth	100,787	65,816	287,030	80,244	81,305	312,740
Age	100,787	64.47	5.92	80,244	74.4	6.94
Male	100,787	0.454	0.498	80,244	0.454	0.5
Married	100,787	0.74	0.44	80,244	0.64	0.48
College/More	100,787	0.47	0.5	80,244	0.41	0.49
Have Children	100,787	0.943	0.232	80,244	0.942	0.23
White	100,787	0.815	0.39	80,244	0.86	0.35
Unemployment rate	100,787	5.8	1.96	80,244	5.87	2.00
Fair/Poor Health	100,787	0.231	0.42	80,244	0.285	0.45
Lung Disease	100,787	0.073	0.26	80,244	0.098	0.3
Stroke	100,787	0.055	0.23	80,244	0.1	0.3
Heart Disease	100,787	0.19	0.39	80,244	0.3	0.46
Arthritis	100,787	0.532	0.5	80,244	0.64	0.48
Cancer	100,787	0.12	0.324	80,244	0.183	0.39
Mental disorder	100,787	0.13	0.34	80,244	0.12	0.33
Diabetes	100,787	0.184	0.39	80,244	0.21	0.41

Note: This table reports the descriptive statistics of the variables used in the analysis. There are two different samples, LTCI (Age: 50–75) and Medicaid (Age: 65–104) samples, differ based on age. The Sample is drawn from the Health and Retirement Study (HRS), Waves 3–13, 1996–2016. The sample excludes individuals with wealth greater than $10 million. (Ref. Table A1 in the Appendix provides description of all the variables used in the paper.).

long-term care insurance uptake, we limit our analysis to homeowners and leverage regional variation in housing prices to identify the wealth effect. Lastly, we find no significant impact of our constructed stock-wealth shock (CWS) on LTCI coverage among non-stockholders. However, we include non-stockholders in the main analysis, as it is reasonable to assume that some individuals may only temporarily hold a net-zero portfolio of financial assets.

Empirical Strategy. To identify the causal impact of wealth shocks on Medicaid enrolment and private LTCI coverage, we draw on an instrumental variable (IV) approach that exploits the timing of the shocks. Ordinary least squares (OLS) estimatees of the relationship between housing (financial) wealth and LTCI are potentially biased for three primary reasons. First, individuals with LTCI coverage might be in better health, which could enable them to manage and grow their housing or financial wealth more successfully than those without coverage. It is possible that the presence of reverse causality may result in an upward bias in the estimated effects. Second, OLS estimates might be affected by some omitted variable bias resulting from financial literacy, including better knowledge about the credit market and access to credit. Individuals with better access to credit might in turn be able to finance home purchases easily and afford LTCI. Hence, not controlling for credit related information can bias OLS estimates. Lastly, if housing and financial wealth are measured with error—owing to inaccurate asset valuations and outdated mortgage assessments—then, due to both structural and measurement endogeneity, the OLS estimates are likely to be biased and inconsistent. To address the endogeneity of housing and financial wealth, we employ an instrumental variable approach, using house prices and stock-wealth shocks as instruments for individual wealth. These instruments are expected to be correlated with housing and financial wealth, respectively, while remaining unlikely to influence LTCI

through any alternative channels. Our basic estimating equation or the second stage takes the following form:

$$(\boldsymbol{Y}_{ist}) = \boldsymbol{\gamma}_t + \boldsymbol{\mu}_i + \boldsymbol{X}_{ist} \cdot \boldsymbol{\delta} + \boldsymbol{\beta} \cdot \widehat{\boldsymbol{ASSETS}}_{ist} + \boldsymbol{\theta s} + \boldsymbol{\varepsilon}_{ist} \quad (1)$$

Where the first stage where we exploit changes in housing prices (HPI_{st}) as follows:

$$ASSETS_{ist} = \boldsymbol{a}_t + \boldsymbol{b}_i + \boldsymbol{d}_s + \boldsymbol{X}_{ist} \cdot \boldsymbol{\varphi} + \boldsymbol{\pi} \cdot HPI_{st} + \boldsymbol{u}_{ist} \quad (2)$$

and when we exploit changes in the value of stock market values (CWS_{it}) as below:

$$ASSETS_{ist} = \boldsymbol{\psi}_t + \boldsymbol{\tau}_i + \boldsymbol{\rho}_s + \boldsymbol{X}_{ist} \cdot \boldsymbol{\lambda} + \boldsymbol{\eta} \cdot CWS_{it} + \boldsymbol{\nu}_{ist} \quad (3)$$

In our model, Y_{ist} refers to the dependent variable, where (i) indexes individuals, (s) states, and (t) wave-years. We examine two alternative dependent variables: private-LTCI and Medicaid. Both are binary indicators, where private-LTCI equals 1 if the respondent has private-LTCI coverage, and Medicaid equals 1 if the individual is enrolled in the Medicaid program. γ_t denotes a set of time dummies (survey waves), θs denotes a set of state dummies, μ_i represents individual fixed effects that removes time-invariant individual level controls, X_{ist} is a vector of covariates that act as controls[16] (age, gender, married, education, health status etc.). To address potential endogeneity of housing an financial assets, we use two instrumental variables for two different markets. HPI refers to regional Housing Price Indices, which instruments for housing wealth, while *Constructed Stock Market Wealth Shocks (CWS)*[17] to instrument for financial wealth. The CWS is calculated using Eq. (4) below (Schwandt, 2018).

$$\boldsymbol{CWS}_{it} = \frac{\boldsymbol{SW}_{i,t-1}}{\boldsymbol{TW}_{i,t-1}} * \frac{\boldsymbol{\Delta SP}_t}{\boldsymbol{SP}_{t-1}} \quad (4)$$

where $SW_{i,t-1}$ refers to stock market wealth for individual *i* at time *t-1*, $TW_{i,t-1}$ indicates total wealth of an individual *i* for time *t-1*, and $\frac{\Delta SPt}{SPt-1}$ is the percentage change in the S&P500 index between *t* and *t-1*. Overall, we have estimated different specifications using two different dependent variables, namely, Medicaid and private-LTCI. We use two separate specifications for housing and financial wealth to avoid losing nearly a third of the housing wealth sample, as financial wealth has fewer observations. Furthermore, we consider several placebo tests and reduced forms of housing prices and of CWS to confirm that first stage regressions are suggestive of an experiment[18] as described in the results section.

4. Results

Reduced forms estimates. We begin by reporting reduced form estimates retrieved using variation in both HPI as well as CWS, including income, and other covariates - Tables A2.1 & A2.2 in the appendix contain the description and summary statistics of the main covariates we control for. We control for individual, state, and year fixed effects. Column 1–2 of Panels A and B of Table 2 reports the effect of a change in the housing prices index and CWS on the uptake of Medicaid and private-LTCI, respectively. As expected, we find that an increase in the housing price index (HPI) decreases the likelihood of private LTCI coverage, while no significant effect is observed on Medicaid enrolment. Additionally, most covariates display the expected signs, including income and health status.

Instruments' Validity. Next, we examine the validity of the instruments for both total housing assets as well as total financial assets. We find that, as expected, a change in the HPI significantly changes both total assets and total housing assets respectively (Column 3&4 of Panel A of Table 2). The F-tests are well above the conventional cut-off points for a weak instrument, and more specifically the first stage is 419 (t-stat=20.48) for total assets and 4042 (t-stat=63.58) for housing assets. Similarly, our estimates indicate that, as expected, a one-unit change in CWS exerts a positive effect in increasing total assets as well as total financial assets (Column 3&4 of Panel B of Table 2), and the values of respective F-tests are also well above the traditional thresholds. Table 4 (Panel A & C) examines the effects of wealth on LTCI (both private and public) for *non-homeowners* as well as for *non-stockholders* as a placebo test and consistently shows no effect. We therefore conclude that housing prices exert an effect on housing and total assets, and influence private LTCI converage only through its effect in assets. Furthermore, CWS exerts an effect on financial and total assets. Again, the evidence of a larger F-statistic suggests that they are not weak instruments.

[16] Greenhalgh-Stanley (2012) studied, using HRS, a related question: "Medicaid and the housing and asset decisions of the elderly: Evidence from estate recovery programs". The paper documents that controlling for TEFRA lien policy in the model can impact housing portfolio decisions. Hence, we check if that can be added into the model, but we find that most of the states that adopted TEFRA lien before 1996 and cannot be used into our model. Because our sample covers the years from 1996-2016 and that we use Fixed-Effect Models, the inclusion of this variable will be inappropriate. Additionally, the Medicaid Estate Recovery program (MERP) recovers only a tiny amount versus the total LTSS funding by Medicaid. For example, as per https://www.macpac.gov/wp-content/uploads/2020/09/Updates-on-Medicaid-Estate-Recovery-Analyses.pdf, the amount recovered from MERP between 2015-2019 is equivalent to only 0.53 to 6.62% of total LTSS spending by Medicaid.

[17] The construction of instrumental variables required wealth information from the previous wave and SP500 stock indices. The final version of the instrumental variable includes wealth shocks with respect to SP500 indices. Thus, as expected, changes in the constructed wealth shock do change the effect size of the stock market and, in turn change the likelihood of the coverage of private-LTCI.

[18] It is also possible that prior-period stockholdings are not excludable and can form part of the instrument for financial wealth and might lead to an endogeneity problem. Nevertheless, the individual fixed effects can absorb this. We believe that stock holdings are dynamic, and the portfolio might vary more frequently than other asset portfolios if an individual is more engaged in stock trading. However, it's also likely that some stocks are held for longer duration and some individuals are strategic in this. In that case the individual fixed effect should absorb this.

Table 2
Reduced form and First Stage Regressions –(OLS).

	PANEL A: Housing Market			
	Reduced Form		First Stage	
	Private LTCI (1)	Medicaid (2)	Total Wealth (in $100k) (3)	Housing Wealth (in $100k) (4)
House Price Index (HPI)	-3.82×10^{-5}***	-9.67×10^{-6}	0.00403***	0.00307***
	(1.13×10^{-5})	(9.14×10^{-6})	(0.0002)	(4.83×10^{-5})
No of observations	100,805	80,244	100,787	100,787
	PANEL B: Stock Market			
	Reduced Form		First Stage	
	Private LTCI (1)	Medicaid (2)	Total Wealth (in $100k) (3)	Stock Wealth (in $100k) (4)
Constructed Stock Wealth Shocks (CWS)	−0.066***	−0.0095	1.243***	1.97***
	(0.0175)	(0.016)	(0.306)	(0.142)
No of obs	74,033	49,927	75,331	75,331
State + Wave-Year Fixed Effects	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES

*Significant at 10 %; ** significant at 5 %; *** significant at 1 %. The standard errors are robust to heteroscedasticity, which are obtained after clustering at the household level.
Note: All the models include state, year, and individual fixed effects. Columns 1 and 2 correspond to reduced form models in which Private-LTCI and Medicaid are regressed on house price Indexes and on Constructed Stock-Market Wealth Shocks (CWS), whereas Column 3 and 4 correspond to first stage regression models in which total and housing wealth are regressed on house price indexes in Panel A and also total and stock wealth are regressed on Constructed Stock-Market Wealth Shock in Panel B. Sample is drawn from Health and Retirement Study (HRS), Waves 3–13, 1996–2016. Sample excludes individuals with wealth greater than $10 million. Control variables include age, ageˆ2, income, health status, chronic diseases, and marital status.

Private-LTCI Coverage. The relationship between wealth and LTCI coverage is theoretically ambiguous and thus unlikely to be monotonic. Prior literature suggests that individuals in the middle of the wealth distribution are the most likely purchasers of LTCI. This pattern arises because low-wealth individuals often cannot afford LTCI premiums and rely heavily on Medicaid, which imposes a very high implicit tax on LTCI—potentially close to 100 %—by reducing the value of private coverage for those who would otherwise qualify for public support (Pauly, 1990; Brown and Finkelstein, 2006; Brown and Finkelstein, 2011; Goda, 2011; Costa-Font and Raut, 2025). Although this implicit tax decreases with wealth, individuals at the top of the distribution are more likely to self-insure due to both their greater financial capacity and their limited marginal benefit of LTCI relative to their resources. In contrast, middle-wealth individuals face a distinct trade-off: they possess enough assets to warrant protection but not enough to comfortably self-insure against potentially catastrophic long-term care costs. Hence, they are often regarded as the primary target market for LTCI. Given these considerations, it is essential to empirically investigate how wealth affects the likelihood of LTCI coverage, particularly to resolve ambiguity regarding the direction and magnitude of this relationship. To that end, we employ an instrumental variables (IV) approaches to identify the causal effect of wealth on LTCI coverage.

We hypothesize that increases in total, housing, and financial wealth are likely to reduce private LTCI coverage, as greater wealth enhances individuals' capacity to self-insure. Table 2 reports a naïve regression, namely a reduced form of the effect of the housing price index on the coverage of private-LTCI and the receipt of Medicaid and consistently finds a negative and significant coefficient in the case of private-LTCI. The estimated impact on Medicaid is negative but non-significantly different from zero at conventional levels. Table 3 reports the baseline estimates for the effect of total assets, housing value, and financial assets on the coverage of private-LTCI and uptake of Medicaid. We report both OLS and IV estimates obtained using our fully specified models (Panel A & B) that account for state, year, and individual fixed effects. The estimates suggest that an increase in housing and financial assets reduced private-LTCI coverage. Most importantly, we find that IV estimates for private-LTCI from Panels A and B are significantly different from zero at all conventional levels of significance.

The magnitude of the effect of housing wealth on private-LTCI coverage is slightly larger than that for total wealth. More specifically, the effect sizes indicate that $100,000 increase in housing (total) assets decreases the likelihood of purchasing private-LTCI by 1.24 (0.95) percentage points (pp), whereas $100,000 increase in financial (total) assets reduces the coverage of private-LTCI by 3.22 (4.9) pp. Table 3[19] also reports the effect of a change in housing, financial, and total assets on the probability of Medicaid receipt. None of the wealth measures reveals any statistically significant impact on Medicaid receipt. The standard errors reported are robust to

[19] The full-scale IV regression results, including impact on various controls, are reported in Table A4 (housing market) and A5 (stock market) in the appendix.

Table 3
Effect of Total and Housing Assets on Private-LTCI and Medicaid.

	Dependent Variables			
	Private-LTCI		Medicaid	
Treatment	OLS	IV	OLS	IV
PANEL A: Housing Market	(1)	(2)	(3)	(4)
1) Total Wealth (in $100k)	0.00157***	−0.0095**	−0.000272*	−0.00295
	(0.0003)	(0.0047)	(0.00016)	(0.0028)
F-Statistic for Excluded Instrument Test		419		196
2) Housing Wealth (in $100k)	0.0026**	−0.0124**	−0.00154**	−0.0033
	(0.0011)	(0.006)	(0.000633)	(0.00315)
F-Statistic for Excluded Instrument Test		4042		2369
No of obs	100,787	100,787	80,244	80,244
PANEL B: Stock Market	(1)	(2)	(3)	(4)
1) Total Wealth (in $100k)	0.0015***	−0.049***	−0.00029	−0.0035
	(0.00024)	(0.0174)	(0.0002)	(0.006)
F-Statistic for Excluded Instrument Test		18.9		44.3
2) Stock Wealth (in $100k)	0.00135***	−0.0322***	−0.00026	−0.00313
	(0.000514)	(0.0088)	(0.0004)	(0.005)
F-Statistic for Excluded Instrument Test		204.5		214.2
No of obs	74,033	74,033	49,927	49,927
State + Wave-Year Fixed Effects	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES
Individual Fixed Effects	YES	YES	YES	YES

*Significant at 10 %; ** significant at 5 %; *** significant at 1 %. The standard errors are robust to heteroscedasticity, which are obtained after clustering at the household level.
Note: All the models include state, year, and individual fixed effects. Panel A represents Housing Market Regressions, and Panel B represents Stock Market-related regressions. Columns 1 and 2 correspond to first set of regressions where Private-LTCI (Age: 55–75) is regressed on total, housing, and stock wealth in which Columns 1 & 3 correspond to Ordinary Least Square (OLS) regression and Columns 2 & 4 refer to Instrumental Variable regression (known as 2SLS or Two stage least squares). Similarly, Columns 3 and 4 correspond to the second set of regressions where Medicaid (Age:65+) is regressed on total, housing, and stock wealth, in which Column 3 corresponds to OLS regression and Column 4 refers to IV regression. Samples are drawn from the Health and Retirement Study (HRS), Waves 3–13, 1996–2016. The sample excludes individuals with wealth greater than $10 million. Control variables include age, age^2, income, health status, chronic diseases, and marital status.

heteroscedasticity clustered at household level, where the variation in household wealth takes place. We also retrieve the standard errors using the bootstrap[20] technique to verify if it produces consistent standard errors, and we find similar results. Moreover, beyond a certain threshold of wealth that can comfortably finance long-term care, additional wealth may not meaningfully affect LTCI coverage. Since wealth is highly skewed, the observed results could be driven by extreme values. To address this concern, we check if these results are driven by outliers in Table A7 in the Appendix. To this end, we restrict the maximum total wealth to different wealth thresholds, such as below 8 million, 6 million, and 4 million. Our estimates are not affected by changing the wealth falls below 2 million.

Additionally, we re-estimate our specifications by splitting the sample based on a variable unaffected by wealth shocks. That is, Table A6 in the appendix presents results comparing individuals with pension and annuity income to those without. In the housing market context, the impact on private long-term care insurance (LTCI) remains consistent with the baseline estimates. However, for those receiving pension or annuity income, the effect is nearly twice as large as the baseline estimates. We posit that those who receive pension and annuity income are mostly retired individuals who are likely to self-insure if there is a positive wealth shock. In contrast, when we examine stock market wealth effects, we find non-significant results except for stock wealth change for individuals who do not receive pension and annuity income, in which the effect remains the same as our baseline estimates.

Identification. The estimates from the two-stage least squares (2SLS) approach help address potential endogeneity that arises from omitted variables, reverse causality, and measurement error.

For housing wealth, we employ regional house price indices as instruments, which exploit variation in local housing markets, consistent with Chetty and Szeidi (2017). The exogeneity assumption that regional house price indices are uncorrelated with the unobserved part of LTCI decisions is satisfied because the local housing market fluctuations are driven by macroeconomic factors such as interest changes and macroeconomic cycles that are orthogonal to individuals' LTCI preferences. Next, the exclusion restriction must satisfy that house price indices affect LTCI coverage only through their impact on housing wealth, not via other pathways such as local economic conditions. To ensure that this assumption holds, we add regional unemployment rates, individual demographics, and regional as well as year fixed effects into our empirical model. Finally, regarding the monotonicity assumption, we find it reasonable to

[20] We also considered other clustering at MSA and county level but unfortunately it would not allow us to run estimates on entire sample. We also considered state level clustering but that would ignore the variation happening at the smaller geographical level. Thus, we considered bootstrapping as an alternative robustness check, results of which are reported in Panel A of Table A11.

Table 4
Placebo Tests.

	PANEL A: Housing Market (Renters Only)			
	Reduced Form		First Stage	
	Private LTCI (1)	Medicaid (2)	Total Wealth (in $100k) (3)	Housing Wealth (in $100k) (4)
House Price Index (HPI)	6.3×10^{-6}	-3.36×10^{-5}	−0.00009	3.53e-07
	(1.64×10^{-5})	(2.6×10^{-5})	(0.00011)	$(1.32 \times 10–6)$
No of observations	24,695	23,556	24,695	24,695
	PANEL B: Stock Market (Non-Stockholders Only)			
	Reduced Form		First Stage	
	Private LTCI (1)	Medicaid (2)	Total Wealth (in $100k) (3)	Stock Wealth (in $100k) (4)
Constructed Stock Wealth Shocks (CWS)	−0.062	−0.045	−0.863	–
	(0.0432)	(0.078)	(0.55)	–
No of obs	50,406	32,969	51,349	–
State + Wave-Year Fixed Effects	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES

*Significant at 10 %; ** significant at 5 %; *** significant at 1 %. The robust standard errors are reported in the parentheses.
Note: The estimates are obtained using the sample from the Health and Retirement Study, Waves 3–13 (1996–2016). The placebo tests performed on different samples are presented in Panels A, B, & C. The estimates in Panel A indicate the estimates obtained using the sample of renters only. The estimates presented in Panel B are obtained for a sample of renters as well as homeowners combined. We performed reduced form regression to check that the house prices did not affect the likelihood of LTCI for renters. Finally, the estimates presented in Panel C are obtained using the sample of non-stockholders only. All models include state, year, and person-level fixed effects, along with control variables which include age, age^2, income, health status, chronic diseases, and marital status.

assume that housing wealth moves in the direction of local house price indices since the property or mortgage valuations are based on the overall state of the local property market majorly influenced by house prices (Tran et al., 2023). In other words, the violation of the monotonicity assumption is not an issue here.

When we examine changes in financial wealth, we construct exogenous wealth shocks using aggregate SP500 returns interacted with individuals' pre-existing stock market wealth, generating individual-specific wealth shocks driven by stock market variation that are independent of insurance decisions. Thus, this supports the exogeneity of our instrument. Additionally, given that these wealth-shocks affect the LTCI decision only through the stock market wealth and that we control for income and education of individuals, it is reasonable to beleive that the assumptions underpinning the exclusion restriction are met. Lastly, the monotonicity assumption is satisfied as positive SP500 aggregate returns increase the value of stock wealth holdings, which is consistent with the findings by Schwandt (2018).

Comparing OLS vs. *IV Results*: Our OLS results for both housing and financial wealth suggest that they are upward biased and indicate a positive relationship between wealth and LTCI coverage. A possible explanation of such bias is that individuals with higher risk aversion or financial awareness are more likely to accumulate wealth and, at the same time to get LTCI coverage, leading to a spurious positive correlation. Similarly, wealthy individuals may anticipate Medicaid ineligibility and protect their wealth by carefully planning future LTC needs. In contrast, the IV estimates retrieve the Local Average Treatment Effect (LATE), which is a causal effect of wealth on LTCI coverage. The negative sign of IV estimates indicates that when wealth increases unexpectedly, individuals are less likely to prefer LTCI coverage.

Placebo tests. One potential concern when analysing the impact of housing and financial wealth on insurance could be that the estimated effects occur because of some spurious relationship. Additionally, rising home prices might make LTSS more expensive, leading to reduced demand for such services. Hence, it can question our exclusion restriction. To address this concern, we conduct a set of placebo tests separately both for the remaining category of housing tenure or renters (no-housing assets) and for a non-stockholder to alleviate this concern. The tests consist of running a fully specified IV regression model for both renters as well as for non-stockholders, respectively, to check if house prices and constructed stock-market wealth shocks (CWS) impact the outcomes through the channel of wealth (total, housing, and financial). Panel A and B of Table 4 present the results for placebo tests. We find no evidence of a change in the probability of LTCI coverage or Medicaid receipt from a change in housing prices or CWS, as the results are not statistically significant. The first stage results for both housing and financial wealth are also reported to be not statistically significant. Thus, these tests alleviate the possibility of a spurious relationship and increase our confidence that there is indeed a causal relationship between wealth and LTCI.

A potential issue is that rising house prices may be associated with an increase in the cost of non-tradable services, potentially

Table 5
Heterogeneity in Response to Change in Total, Housing and Stock Wealth.

		Dependent Variable: Private LTCI			
		PANEL A: HOUSING MARKET		PANEL B: STOCK MARKET	
		TOTAL WEALTH (in $100k)	HOUSING WEALTH (in $100k)	TOTAL WEALTH (in $100k)	STOCK WEALTH (in $100k)
Controls		YES	YES	YES	YES
State FE, Wave-Year FE, Individual FE		YES	YES	YES	YES
		(1)	(2)	(3)	(4)
ALL					
Health	Good/Best/ Excellent	−0.008*	−0.01*	−0.058***	−0.035***
	Fair/Poor	−0.016*** †††	−0.023*** †††	−0.029** ††	−0.019** †
Gender	Female	−0.009	−0.01	−1.012	−0.035***
	Male	−0.01**	−0.015**	2.24	−0.03**
Education	High School/Less	−0.023***	−0.031***	0.18	−0.15*
	Some/More College	−0.004 †††	−0.004 †††	−0.052***	−0.023***
Bequest Motives	Yes	−0.01*	−0.012**	−0.028**	−0.022***
	No	−0.014**	−0.021***	0.041	−0.097
Income	Above Median	−0.017***	−0.02***	−0.019**	−0.016**
	Below Median	−0.007 †††	−0.009** †††	2.52	−0.152
Recession	Pre-Recession Period	−0.013**	−0.018***	−0.044***	−0.04***
	Recession Period	−0.007 †††	−0.009 ††	−0.011 †††	−0.003 †††
Marital Status	Singles	−0.014**	−0.019**	−0.022	−0.015
	Married	−0.008* †	−0.01*	−0.05***	−0.033***
Have Children	NO	0.023**	0.03**	0.014	−0.007
	YES	−0.012** †††	−0.017*** †††	−0.062*** †††	−0.037*** †††
Wealth Levels	Low (≤30th % le)	−0.096	−0.079	−1.1	−1.86
	Middle (30–85th % le)	−0.055***	−0.045***	−0.061*	−0.14**
	High (>85th % le)	−0.02	−0.012**	−0.19	−0.025***

Denotes significantly different from zero (significant at 10 %; ** significant at 5 %; *** significant at 1 %); + denotes that bottom category estimates are significantly different from top category ones († significant at 10 %; †† significant at 5 %; ††† significant at 1 %).
Note: The estimates are obtained using the sample from Health and Retirement Study, Waves 3–13, 1996–2016. Each coefficient indicates IV estimates for outcome, private-LTCI (Age:55–75) for both Panel A and B. Panel A represents Housing Market Regressions and Panel B represents Stock Market related regressions. Both outcome variables are binary variables. All the models include state, year, and individual fixed effects. Control variables include age, age^2, income, health status, marital status, and chronic diseases. Each category on the left-hand side of the table indicates a separate regression that includes interactions between subgroup indicators and treatment variable.

making LTCI less desirable and leading to the violation of our exclusion restriction (Schmalz et al., 2017). Estimates of Panel A are somewhat imprecise and lack power due to a smaller number of observations for renters. Nonetheless, this concern could be partially addressed by including both homeowners and renters in the same panel regression, with the coefficient of interest being the interaction term between HPI and homeowner status (Schmalz et al., 2017). Table A9 in the Appendix represents the estimates produced after interacting renters with house prices. Our estimates suggest that the coefficient for the interaction term (renters interacted with house prices) is not statistically significant, indicating that there is no detectable difference in the effect between homeowners and renters. As house prices also impact rent positively, it affects the renters' wealth negatively.

Heterogeneity. Table 5 summarizes the effects of our analysis across different subsamples. We specifically examine the heterogeneous treatment effects by interacting housing, financial, and total wealth with various socioeconomic variables, including gender, education, marital status, income, and recession periods. We find that individuals in fair or poor health respond more negatively to housing wealth shocks than those in good health, showing a larger decline in LTCI coverage. Conversely, they react less negatively to financial wealth shocks, consistent with financial wealth being more liquid and easier to adjust to different needs. Healthier individuals may feel less need for LTCI as their financial wealth increases, while those in poorer health may be more responsive due to underwriting constraints and the greater flexibility of financial assets. Our estimates indicate slight gender differences in the responsiveness of long-term care insurance (LTCI) coverage to wealth changes. Women appear slightly more likely than men to purchase private LTCI in response to increases in housing and total wealth. In contrast, the effect of housing wealth on Medicaid[21] use is not statistically significant for women, whereas men become less likely to rely on Medicaid following a rise in housing wealth. However, when financial wealth changes are considered separately, women are less likely than men to purchase private LTCI coverage. Similarly, married individuals are slightly less responsive to positive housing wealth shocks compared to single individuals, who exhibit a stronger negative response in LTCI coverage following increases in housing wealth. Similarly, married individuals respond more

[21] The estimates for the impact of wealth on Medicaid uptake are reported in Table A12 of the Appendix

Table 6
Robustness Check: Effect of Wealth on LTC-Insurance (Private & Public).

	Value of mortgages	Value of other debts	Controlling for lagged wealth		Adding Pension Income to Wealth(T)		Controlling for LTCI Tax Subsidy	
			LTCI	Medicaid	LTCI	Medicaid	LTCI	Medicaid
	1	2	3	4	5	6	7	8
PANEL A: HOUSING MARKET								
1) Total Wealth (in $100k)	4660***	86	−0.0128**	0.0082	−0.0094**	−0.003	−0.009*	−0.003
	(899)	(241)	(0.0064)	(0.01)	(0.0047)	(0.0028)	(0.0047)	(0.0028)
2) Housing Wealth (in $100k)	6117***	113	−0.016**	0.004	—	—	−0.012**	−0.0034
	(1022)	(316)	(0.00708)	(0.006)			(0.0059)	(0.0032)
PANEL B: STOCK MARKET								
1) Total Wealth (in $100k)	6180**	−787	—	—	−0.05***	−0.0035	—	—
	(3074)	(1188)			(0.0178)	(0.006)		
2) Stock Wealth (in $100k)	3907**	−497	—	—	—	—	—	—
	(1692)	(747)						
State + Wave-Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES	YES	YES

*Significant at 10 %; ** significant at 5 %; *** significant at 1 %. The standard errors are robust to heteroscedasticity, which are obtained after clustering at the household level.
Note: All the models include state, year, and individual fixed effects. Panel A represents Housing Market Regressions and Panel B represents Stock Market-related regressions. Columns 1 to 8 correspond to Instrumental Variable models. The sample is drawn from the Health and Retirement Study (HRS), Waves 3–13, 1996–2016. The sample excludes individuals with wealth greater than $10 million. Control variables include age, age^2, income, health status, chronic diseases, and marital status. All the odd columns correspond to the effect of wealth (both housing and financial market cases) on private-LTCI (Age: 55–75); all even columns correspond to the effect of wealth on Medicaid (Age:65+).

negatively to positive financial wealth shocks, with a larger decline in LTCI coverage relative to their single counterparts. Additional heterogeneity emerges when comparing individuals above and below the median income. As expected, the negative effect of housing wealth on private LTCI coverage is larger in magnitude among higher-income individuals, suggesting that higher income households are more responsive to housing wealth shocks in their insurance decisions. Finally, its worth mentioning that the likelihood of purchasing LTCI in response to a positive wealth shock is lower among less-educated individuals compared with college graduates. One possible explanation is that individuals with lower educational attainment are more prone to overestimate the persistence of their wealth gains, leading them to perceive a reduced need for insurance coverage. In contrast, college-educated individuals are less likely to overestimate their lifetime wealth following a positive shock and therefore less likely to underestimate the risk of requiring long-term care. This difference in wealth perception and risk assessment helps explain the weaker negative effect of housing wealth on LTCI coverage among the more educated.

Our estimates also suggest that individuals with children are less likely to purchase private LTCI in response to increases in housing, financial, or total wealth, suggesting that the presence of potential (future) informal caregivers reduces the perceived need for formal insurance. In contrast, childless individuals are more responsive to positive wealth shocks and more likely to obtain LTCI coverage. Bequest motives also appear to moderate this relationship. Individuals who expect to leave substantial inheritances to their descendants exhibit a weaker response of LTCI coverage to housing wealth increases, consistent with the view that stronger bequest intentions constrain the use of housing assets for financing care. Temporal heterogeneity is also evident. During the pre-recession period, individuals were more likely to self-insure as their housing and stock market wealth rose. After the recession, this effect attenuates, indicating a decline in the perceived substitutability between private wealth and formal LTCI.

Finally, the impact of wealth varies across the wealth distribution. The strongest negative effect of housing wealth on LTCI coverage occurs among middle-wealth households (30th–85th percentiles), where a $100,000 increase in housing net worth reduces the likelihood of holding LTCI by approximately 4.5 percentage points. This negative effect weakens among households in the top 15 % of the distribution and is statistically insignificant among the bottom 30 %. These results imply an inverted U-shaped relationship between wealth and LTCI coverage, low-wealth individuals rely primarily on public programs such as Medicaid, high-wealth individuals tend to self-insure, and middle-wealth households face the most pronounced trade-offs between formal insurance and informal, asset-based self-insurance. However, no significant relationship is found between wealth and Medicaid participation.

Robustness checks. Panel A & B of Table 6 report the results for the fully specified model using four different specification changes: 1) Impact on the amount of mortgage and other debts, 2) Controlling for lagged wealth, 3) Adding pension income to wealth, and 4) After controlling for LTCI tax subsidy. We obtained similar estimates to those from the main specifications after running several robustness checks.

A central robustness check includes examining the extent to which the change in housing and financial wealth impacts the amount of mortgage and other financial debt. A rise in housing wealth may encompass the take up of additional mortgage loans insofar as a) housing equity can be used as a collateral for home loans, b) opting for refinancing mortgages, c) expand borrowing, d) increased prospects of buying expensive high-quality properties, and e) a change in consumer confidence due to increase in the demand for

housing. Thus, we can expect to see a positive impact of change in housing as well as financial wealth on mortgage. Similarly, we expect to see no statistically significant impact of housing and financial wealth on the value of other debts. Column 1 in Table 6 indicates that changes in housing and financial wealth positively impact the amount of mortgage loans, whereas Column 2 points to no statistically significant relationship with the value of other debts.

Next, it is likely that more affluent households with greater initial housing and stockholdings assets exhibit greater coverage of private-LTCI than other households. Thus, it is important to check if the upward-trending house and stock prices affect the LTCI holding. To do that, we control for lagged wealth as it picks up an individuals' initial housing and stockholding information. We considered too, the inclusion of wealth lags as a control variable in the model can capture the upward trend by accounting for persistence or autocorrelation in wealth levels due to upward trends in house or stock prices over time. Similarly, adding wealth lags allows to separate the effect of current wealth from the longer-term wealth accumulation effect, preventing short-term market volatility with underlying trends. If LTCI ownership decisions were influenced by long-term financial expectations rather than short-term wealth gains, then the inclusion of lagged wealth can help explain the relevant dynamics. However, our results suggest that after controlling for lagged wealth in the model, the estimated effects remain consistent and are only slightly altered in magnitude. Additionally, we add pension income into the total wealth as the HRS sample does not account for pension income while calculating total wealth. We find that our estimates remain unaltered after this modification of the total wealth variable. Finally, after incorporating the LTCI tax subsidy into our specifications, the estimated effects of housing, financial, and total wealth on private LTCI and Medicaid exhibit only slight variation. The LTCI tax subsidy is a dummy variable that takes the value of 1 if the state was providing a tax payment incentive in each state in time t, else 0. Therefore, the above evidence suggests that our results are robust to various specification changes.

We also perform additional robustness checks reported in Table A8 in the Appendix, which includes removing health from the baseline model, estimating a first difference models, using a sample of never movers, restricting the sample to people with positive total wealth , controlling for medical care price indices, and running model after removing wealth influencing controls (unemployment rate, income, marriage, children, and lung disease). Finally, we report the balance test of instrumental variable results reported in Table A10; and we examine as a robustness check a specification including month-year fixed effects in place of Wave-year fixed effects for stock market is reported in Panel B of Table A11 in the Appendix.

Potential Mechanisms.[22] We identify two distinct pathways through which wealth may influence the coverage of LTCI, namely, a direct effect via financial affordability, and an indirect effect through expected disability risk at older ages, which affects the prob-

Table 7
Potential Mechanisms.

	P(leaving Bequest)[a] (1)	Capital Income (2)	Out of Pocket Expenses (3)	Fair/Poor Health (4)	Children help with ADL/IADL (5)
Panel A: Housing Market					
Total Wealth (in $100k)	0.0075*	1478*	209*	−0.008**	0.127
	(0.00423)	(800)	(109)	(0.0035)	(0.245)
Housing Wealth (in $100k)	0.01*	2005.6*	280*	−0.01**	0.031
	(0.0056)	(1098)	(146)	(0.005)	(0.042)
No of obs	92,120	100,787	91,442	100,787	4004
Panel B: Stock Market					
Total Wealth (in $100k)	0.0257	5267**	130.4	0.033	–
	(0.0183)	(2521)	(531.3)	(0.024)	–
Stock Wealth (in $100k)	0.0174	3751***	82.41	0.019	–
	(0.0119)	(1842)	(335.3)	(0.0126)	–
No of obs	68,126	76,671	75,331	75,748	–
State + Wave-Year FE	YES	YES	YES	YES	–
Controls	YES	YES	YES	YES	–
Individual FE	YES	YES	YES	YES	–

*Significant at 10 %; ** significant at 5 %; *** significant at 1 %. The standard errors are robust to heteroscedasticity, which are obtained after clustering at the household level.

Note: Sample is obtained from Health and Retirement Study (HRS), Waves 3–13, 1996–2016. Sample excludes individuals with wealth greater than $10 million. Panel A represents Housing Market Regressions and Panel B represents Stock Market related regressions. Each column of the table refers to a specific outcome regressed on total, housing, and stock wealth. Control variables include age, ageˆ2, income, health status, chronic diseases, and marital status. All the models include state, year, and individual fixed effects. Sample used to produce these estimates consists of individuals aged 55 to 75 years.

[a] This variable from HRS records the self-reported probability of leaving a bequest of at least $10k. https://hrs.isr.umich.edu/sites/default/files/meta/2018/core/codebook/h18p_r.htm.

[22] The comparative trends of private-LTCI and potential channels (Bequest, fair/poor health status, out-of-pocket expenses, and capital income) are depicted in Figures A4, A5, and A6 in the Appendix.

ability of needing long-term care. The first pathway, the financial affordability effect, captures how higher levels of wealth enhance a household's capacity to self-insure against potential LTC expenses. An increase in wealth, setting aside potential limited liquidity constraints, can increase the financial affordability of a household. Wealth can have a positive impact on the well-being of an individual via improving access to good healthcare, regular check-ups, a healthy diet, and better living conditions (Cheng et al., 2018). In addition, individuals save money today to fund their future LTSS costs. A positive housing (financial) wealth shock leads to an increase in both housing (financial) and total assets, and it increases the income generated by assets and other forms of capital income. In addition, individuals invest more towards retirement benefits, leading to an increase in pension and annuity income post-retirement. Overall, this continuous source of income acts as an enhanced source of self-insurance. Another potential channel may arise via intrafamily incentives, whereby increases in both housing and total wealth can stimulate a bequest-seeking behaviour among children or relatives, which in turn can increase the care options available to people in need of LTSS. Estimates from Column 1 of Table 7 indicate that an increase in both housing and total wealth significantly increase the probability of individual's reporting to be leaving a bequest of at least $10k, suggesting that individuals prefer to pay for LTSS expenses via wealth transfers to their children or relatives and rather not rely on private-LTCI coverage entirely.

The second channel refer to the improvement in health status resulting from wealth expansions consistently with some recent findings (Schwandt, 2018). In the case of older adults, transitioning from fair/poor health to good/excellent health can significantly reduce the need of long-term services and supports. Therefore, an individual can anticipate fewer care needs resulting in a decrease in likelihood of purchasing private-LTCI. Column 4 of Table 7 shows that the change in housing and total wealth significantly decreases the probability of a person being in a fair/poor health, meaning that there is an improvement in health status occurring due to increase in overall wealth which leads to decrease in the usage of LTSS.

Aditionally, we estimate a specification to examine whether the reduced likelihood of being insured, resulting from increases in wealth, affects out-of-pocket medical expenses. Column 3 of Table 7 shows that an increase in both total and housing wealth by $100k significantly increases the out-of-pocket medical spending by $209 and $280 respectively. This finding is in line with the notion that insurance coverage reduces out-of-pocket expenses and specifically, it removes its volatility. However, our results indicate that changes in financial wealth have no statistically significant impact on the out-of-pocket medical expenses.

Lastly, in addition to bequest motives, we check if the effect of wealth on LTCI is driven by informal care provisions from the children. That is, we examine whether increases in wealth affect the provision of informal care from children, and find that the results are not statistically significant. Although this question is restricted to individuals who need care, and the sample size is smaller, Column 5 of Table 7 report no effects of wealth on the provision of informal care from children.

5. Conclusion

Using two sources of quasi-experimental variation in housing and financial wealth in the U.S., this paper examines the causal effect of wealth on private long-term care insurance (LTCI) coverage and the Medicaid enrollment. We document that a $100,000 increase in housing assets (total assets) reduces the likelihood of purchasing private-LTCI by 1.24 (0.95) percentage points, which is equivalent to 9.84 % (7.54 %) with respect to sample mean. Similarly, we show that a $100,000 increase in financial assets (total assets) decreases the probability of purchasing private-LTCI by 3.22 (4.9) percentage points. Such a negative effect can be attributed to self-insurance.[23] However, as expected the effects are not observed for renters or non-stockholders, regardless of whether we examine total wealth or separate housing and financial assets.

Consistent with Davidoff (2010), we document that individuals use their housing wealth as form of self-insurance for future long-term care costs. The back of the envelope calculations point to a 6.52 % decrease in LTCI coverage between 2016 and 2025, with a mean LTCI coverage in 2016 being 0.126. However, we find no significant evidence that a positive wealth shock affects Medicaid receipt, most likely because the sample of individuals that hold housing or financial wealth are unlikely to meet the Medicaid eligibility requirements. That is, individuals at risk of spending down to Medicaid tend to hold fewer assets, making them less responsive to wealth shocks.

Our findings suggest that increases in housing and financial wealth decrease the demand for private-LTCI, which has important welfare implications. This highlights the financial vulnerability of households relying on wealth as a safety net, which can lead to asset depletion in the absence of LTCI coverage. The lack of private-LTCI coverage can, in turn, limit access to long-term care services and create unmet insurable needs for long-term care services (LTSS). Finally, we document that while among individuals who hold significant wealth, there is a clear substitution between private insurance and self-financing of long-term care, no such effect is found for public insurance or Medicaid.

Statement

During the preparation of this work, we used ChatGPT to correct the grammar and punctuation of some of the sentences/paragraphs. After using this tool/service, we reviewed and edited the content as needed and take full responsibility for the content of the published article.

[23] That is, individuals' perceptions of their wealth as a form of self-insurance, which might lead them to overestimate liquidity, delay insurance purchases, or misallocate resources by prioritizing other investments or underestimating long-term care needs

CRediT authorship contribution statement

Joan Costa-Font: Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Richard G Frank:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Nilesh Raut:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

We certify that we have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jhealeco.2025.103086.

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