Federal Reserve Bank of Cleveland Working Paper Series

How to Reform US Long-Term Care

R. Anton Braun and Karen Kopecky

Working Paper No. 26-25

September 2026

Suggested citation: Braun, R. Anton and Karen Kopecky. 2026. "How to Reform US Long-Term Care." Working Paper No. 26-25. Federal Reserve Bank of Cleveland. https://doi.org/10.26509/frbc-wp-202625.

Federal Reserve Bank of Cleveland Working Paper Series
ISSN: 2573-7953

How to Reform US Long-Term Care*†

R. Anton Braun
National Graduate Institute for Policy Studies
and Canon Institute for Global Studies
r.anton.braun@gmail.com

Karen A. Kopecky
Federal Reserve Bank of Cleveland
and Emory University
karen.kopecky@clev.frb.org

July 2026

Abstract

Long-term care is costly. About 45 percent of 65-year-old Americans will require formal long-term care assistance during their lifetime and one in twelve will incur out-of-pocket expenses of $200,000 or more. Surprisingly, only 10 percent of retirees have private long-term care insurance. We use a quantitative structural model to show that an obstacle to increasing coverage is disagreement across the income distribution: scaling back public long-term care insurance expands the private market and benefits the affluent but imposes large welfare losses on the poor, while universal public insurance does the opposite. We then show that making the main public insurer, Medicaid, the primary rather than the secondary payer of long-term care costs, while retaining its means tests, raises welfare for nearly all Americans. Private insurers respond by offering smaller, more profitable policies, and total coverage against long-term care risk rises with only a modest increase in public expenditures.

Keywords: long-term care insurance; Medicaid; means-tested transfers; adverse selection; insurance rejections.

JEL Classification numbers: D82, D91, E62, G22, H30, I13.

*The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Cleveland or the Federal Reserve System.

†We thank Michael Keane, Alexander Ludwig, Amanda Michaud, and Felix Wellschmied for their helpful comments. We also received helpful feedback from presentations at the 2025 Vienna Global Macro Workshop, FRB Philadelphia Macro-Health Mini Workshop, the 2025 CEPR Summer Conference: the Economics of Aging, and the 2026 OIST Demographics, Health and Inequality Workshop.

1 Introduction

The single largest financial risk faced by elderly Americans is the possibility of a costly long-term care (LTC) event. About 45 percent of 65-year-olds will require formal LTC assistance during their lifetime, yet public LTC benefits are largely limited to the impoverished, and only about 10 percent of retirees have private long-term care insurance (LTCI). In the absence of insurance coverage, many middle-class and affluent Americans rely on their personal savings to finance LTC services, and roughly one in twelve will incur out-of-pocket expenses of $200,000 or more.

These observations suggest scope for reforms of US LTCI arrangements that increase total insurance coverage against LTC expense risk. Our objective is to propose a reform that increases total coverage and generates broad-based welfare gains across the permanent income distribution. To evaluate reforms, we build a structural model that takes explicit positions on the market failures responsible for the small size of the private LTCI market, and on the qualification rules and benefit levels of the main public insurer, Medicaid. The model captures both the challenges to and the opportunities for reform. The central challenge is disagreement among individuals about the appropriate scale of public LTC insurance. Reducing its scale expands the private market, increases total coverage, and raises the welfare of affluent individuals, but generates large welfare losses for poor and middle-class individuals, who face high premiums on their private insurance policies. Expanding its scale also increases total coverage but has the opposite welfare effects: the welfare of lower- and middle-income individuals rises, while the welfare of the most affluent falls because their exposure to LTC expense risk is relatively small and their tax bills are higher.

Despite this disagreement, we show that consensus is possible around a reform to the way Medicaid insures LTC risk that modifies the program's structure rather than its scale. Under current policy, Medicaid benefits are means-tested and cover only the LTC costs remaining after private insurance has paid out. In other words, Medicaid acts as a secondary payer. We find that, when Medicaid instead serves as the primary payer of LTC expenses, private LTCI takeup rises from about 11 to 62 percent and welfare increases across the income distribution. The poor are largely unaffected: they have low wealth and continue to qualify for means-tested Medicaid. Middle-class individuals benefit because they can now combine private and public insurance in ways that increase their total coverage against LTC risk. Affluent individuals benefit too. Those who purchase insurance adjust their saving and coverage to reduce their total cost of insuring LTC risk. The wealthiest, who self-insure, gain because they own the private insurer and receive larger dividend income from higher insurer profits. Crucially, these gains come at little fiscal cost: aggregate Medicaid outlays for LTC rise only modestly, so taxes change little. Making Medicaid the primary payer of LTC costs thus achieves both of our objectives: it raises total coverage against LTC risk while generating broadly shared welfare gains.

We reach these conclusions using a general equilibrium optimal contracting model of US private and public LTC arrangements. Individuals differ in frailty and permanent earnings, which shape both the risk of a costly LTC event and their resources for coping with it. They hold private information about this risk and adjust their saving and private insurance purchases accordingly. One justification for public provision of LTCI is that informational restrictions and adverse selection hamper the private market. Our model incorporates these supply-side frictions and captures the three ways that US private insurers confront them: they allocate significant resources to screening applicants, reject those deemed high risk, and use risk-based pricing to design contracts for those who pass underwriting. The insurer in our model likewise sorts individuals into risk groups based on observable information, decides which risk groups to insure and which to deny coverage, and chooses the optimal menu of contracts for each insurable risk group. The US private market is highly concentrated, and we capture this in a simple way by assuming the insurer is a monopolist. Modeling the insurer's problem allows us to analyze how denials, pricing, takeup, coverage ratios conditional on purchase, and profits respond to changes in the qualification rules for public LTC insurance benefits. Using this model, we show that all three frictions—Medicaid, administrative costs, and private information—depress the private market, but that their relative importance varies across the income distribution: Medicaid crowds out demand most among lower-income individuals, while administrative costs and adverse selection weigh most heavily on the affluent.

Brown and Finkelstein (2008) argue that making Medicaid the primary payer of LTC expenses while preserving its means tests would do little to stimulate private LTCI demand, because private insurance preserves wealth and thereby reduces the likelihood of qualifying for means-tested benefits. Their analysis, however, abstracts from the insurer's contracting problem and holds household saving fixed. In contrast, our model allows both to respond to the reform. Insurers re-optimize their contracts and households re-optimize their saving. In particular, insurers offer smaller policies, and most middle- and higher-income individuals both save less for retirement and purchase private LTCI. Contrary to Brown and Finkelstein's mechanism, these equilibrium responses raise rather than lower individuals' likelihood of qualifying for Medicaid benefits and, at the same time, produce a large rise in private LTCI takeup.

Our optimal contracting model builds on the work of Hendren (2013), Chade and Schlee (2020), and Braun et al. (2019). Hendren (2013) shows that private information can generate coverage denials when the pooled cost of insuring higher risks exceeds any type's willingness to pay. Chade and Schlee (2020) add administrative costs to the monopoly screening framework of Stiglitz (1977) and demonstrate that they generate coverage denials of high-risk individuals along with incomplete coverage and high premiums for those who pass underwriting. Braun et al. (2019) show that a model incorporating Medicaid, administrative costs, and asymmetric information can account for the low takeup of private LTCI, along with many other features of the US private LTCI market. Our framework embeds the model of Braun et al. (2019) in general equilibrium, adding a government budget constraint, administrative costs of public insurance, and a channel through which insurer profits accrue to households as dividends.

Previous research has found that individuals value means-tested Medicaid benefits for the elderly and has analyzed reforms that change the scale of these benefits (De Nardi et al., 2016; Kopecky and Koreshkova, 2014; Braun et al., 2017; Conesa et al., 2018).[1] The largest component of Medicaid expenditures for the elderly is LTC, yet this literature abstracts from

[1] A related literature studies the effects of Medicaid benefits on working-age individuals and finds that they distort labor supply (Pashchenko and Porapakkarm, 2017; Capatina and Keane, 2026).

the private LTCI market. This raises the question of whether public LTCI continues to be valued when individuals have the outside option of purchasing private LTCI. Our structural model suggests that it is: ex ante welfare is higher in our Baseline economy with means-tested Medicaid benefits than in the No Medicaid economy, where the consumption floor is substantially reduced.

Other research analyzes the effects of historical policy reforms on the private LTCI market. Aizawa and Ko (2025) study how changes in the regulatory environment for private LTCI affected welfare and market performance. They find that shifting aggregate risk from policyholders to insurers modestly increased welfare but reduced insurer profits and increased market concentration. A second strand of the literature evaluates the Long-Term Care Insurance Partnership (LTCIP) program, which relaxes Medicaid asset tests for individuals who purchase qualifying private LTCI policies. The goal of the program is to increase private LTCI coverage and reduce reliance on Medicaid for LTC expenses. Early studies, including Lin and Prince (2013), Goda (2011), and Bergquist et al. (2018), find relatively small effects of the program on LTCI takeup. More recent work using more years of data finds larger impacts. In particular, Costa-Font and Raut (2025) estimate that the LTCIP increases LTCI takeup by 14.7 percent and reduces Medicaid participation by 13.3 percent. They also document heterogeneous effects of the program across the wealth distribution: while LTCI takeup increases monotonically with wealth, Medicaid participation exhibits a hump-shaped response, with the largest declines in participation among middle-wealth individuals. Whereas this literature evaluates reforms that have already been implemented, our structural model lets us analyze counterfactual reforms that have not.

Finally, a large literature following the insight of Hubbard et al. (1995) emphasizes that asset tests in public insurance programs distort saving incentives, and recent contributions, including Wellschmied (2021) and Joyce and Singh (2025), document that asset-tested social insurance reduces precautionary saving among low-income individuals. Because saving responses are central to how the reforms we study affect welfare and Medicaid outlays, we use this literature to assess our model's empirical validity. Maynard and Qiu (2009) estimate that increases in Medicaid generosity during the late 1980s and early 1990s reduced the wealth of working-age households, with a U-shaped response across the wealth distribution. Increasing Medicaid generosity for the elderly in our general equilibrium framework generates declines of similar magnitude and a similar pattern, with the largest declines in saving occurring in the middle of the wealth distribution. As in Hubbard et al. (1995), greater generosity has a smaller effect on wealthy individuals, who are unlikely to qualify for benefits, and on poorer individuals, who are already well insured by Medicaid in the Baseline. That our model reproduces this externally estimated pattern (one it was not calibrated to match) lends credibility to the saving responses underlying our reform analysis.

The remainder of the paper is organized as follows. Section 2 provides an overview of how LTC is provided and insured in the US. Section 3.1 presents a graphical analysis of the information frictions that provide a rationale for public insurance and illustrates how administrative costs and Medicaid's means-testing and payer rules affect the pricing, coverage, and takeup of private LTCI. Section 3.2 describes our quantitative general equilibrium model, and Section 4 explains how we parameterize it. Our main results are reported in Section 5. Section 6 concludes.

2 Long-Term Care Risk and Coverage in the US

To motivate our analysis, we first describe the likelihood and cost of LTC events in the US, along with the structure of existing private and public insurance arrangements. An LTC event refers to a sustained period during which an individual requires assistance with activities of daily living (ADLs)—such as bathing, dressing, or eating—because of physical or cognitive impairments. The severity of need is commonly measured by the number of ADLs an individual cannot perform without help. For instance, under the Health Insurance Portability and Accountability Act (HIPAA), an LTC event is defined as requiring assistance with at least two ADLs or substantial supervision due to cognitive impairment (Accountability Act, 1996). In our analysis, we define an LTC event as a spell during which assistance with ADLs is needed for more than 100 days but the individual is not terminally ill. By defining an LTC event in this way, we exclude short-term and end-of-life care that is largely covered by Medicare.[2]

The risk of an LTC event increases with age and is higher for women as compared to men. According to the estimates of Favreault and Dey (2022), as of age 65, the probability of meeting the HIPAA definition of need for care before death is 64 percent for women and 49 percent for men. Conditional on needing LTC, the average duration of care is only slightly higher for women (5.6 years versus 5.1 years). Variation in the risk of needing LTC is smaller by income and health status than by gender. The risk declines from about 63 percent for 65-year-olds in the lowest income quintile to 54 percent for those in the highest, and from about 60 percent for sixty-five-year-olds with poor self-reported health to about 55 percent for those who report their health as good, very good, or excellent. On the one hand, higher-income and better-health individuals are healthier, which reduces their risk of needing LTC, but on the other hand, they live longer, increasing their risk.

Most individuals who experience an LTC event rely on informal care from relatives or friends. Still, the risk of needing formal LTC before death remains substantial. Using the 2018 Health and Retirement Study (HRS), Gruber and McGarry (2023) show that 69 percent of current care recipients rely exclusively on informal care, most often provided by adult children (46 percent) or spouses (32 percent). Yet not all elderly individuals have family members or friends to rely on. Moreover, since informal caregiving can impose significant burdens on family members as care requirements intensify, the likelihood of using formal LTC rises with the severity of need. Among individuals aged 65 and older who are currently receiving care, the probability of formal care use is approximately 22 percent for those needing help with two ADLs and increases to about 50 percent for those needing help with three or more ADLs (Gruber and McGarry, 2023). Consistent with this pattern, Favreault and Dey (2022) estimate that 45 percent of 65-year-olds will require formal LTC at some point before death. While about half will use formal care for less than one year, 37 percent will require two to four years of care and 10 percent more than five years.

Formal LTC services are costly. According to Genworth Financial (2024), the median annual cost in 2024 was $77,800 for in-home care provided by a home health aide and

[2] Medicare provides near-universal medical coverage for adults aged 65 and older, including hospice care and short-term post-acute nursing care (fully covered for 20 days and partially covered for the next 80), but does not insure against the risk of needing prolonged LTC.

$111,325 for a semi-private room in a skilled nursing facility. Moreover, most LTC costs are not covered by Medicare. Instead, the main public insurer of LTC risk is Medicaid. It provides a basic level of support services in licensed LTC facilities and more recently at home. Eligibility, however, is tightly means-tested. In most states, individuals must hold less than $3,000 in countable assets and meet strict income criteria. Although the primary residence is often excluded from the asset test, Medicaid may place a lien on the home and recover expenditures from the estate after death. Medicaid is also a secondary payer of LTC services. Coverage comes into effect only after all other payment sources (including private insurance) have been exhausted.

Given the lack of extensive public insurance, one might expect a large private market for LTCI. In practice, however, the market is small and shrinking: only about 10 percent of current retirees hold an LTCI policy, and overall market size has declined steadily since 2002 (US Department of the Treasury, 2020). The remaining market is highly concentrated, with a small number of insurers dominating new sales. In 2023, the three largest carriers accounted for 84 percent of newly issued policies (Thau et al., 2024).

Contracts offered in this concentrated market are characterized by strict underwriting, limited coverage, and high prices. To mitigate adverse selection, insurers screen applicants and reject those deemed too risky, resulting in high denial rates. In 2022, 20 percent of applicants ages 50–59, 30 percent of applicants ages 60–64, and 38.2 percent of applicants ages 65–69 were denied coverage (American Association for Long-Term Care Insurance, 2024). Conditional on obtaining insurance, indemnities typically cover only 34–66 percent of expected losses, and loads—markups over actuarially fair insurance—ranged from 0.18 excluding lapses to 0.51 including lapses in 2000, and from 0.32 to 0.50 in 2010 (Brown and Finkelstein, 2007, 2011). These loads are higher than those observed for other life insurance products. For example, Mitchell et al. (1999) estimate loads on life annuities of 0.15 to 0.25. One contributing factor is that underwriting and claims processing are considerably more complex for LTCI than for life insurance or annuity products.[3]

Low takeup of private LTCI, along with Medicaid's strict means tests and secondary-payer provisions, implies that many Americans rely on their own savings to finance formal LTC services. Indeed, Favreault and Dey (2022) project that roughly one in twelve individuals will incur out-of-pocket LTC expenses of $200,000 or more. While LTC encompasses home care, community-based services, and institutional care, the right tail of lifetime out-of-pocket risk is concentrated in extended nursing home stays (Hurd et al., 2017), and Kopecky and Koreshkova (2014) find that NH expenses are a primary driver of wealth accumulation during retirement. Together, these findings suggest scope for reforms that increase total insurance coverage. Yet under the current system, there is also substantial heterogeneity in exposure to LTC expense risk. Less affluent individuals—who are most likely to satisfy Medicaid's means tests—are relatively well insured through the public system, while highly affluent individuals can easily self-insure through private savings. In contrast, middle-class Americans, who are too affluent to readily qualify for Medicaid yet insufficiently wealthy to self-insure, face the greatest out-of-pocket expense risk. This heterogeneity in risk exposure makes it difficult to find LTC policy reforms that generate broad-based welfare gains.

[3]See Eaton (2016), who finds that while broker commissions are similar across LTCI and other life insurance lines, underwriting and claims processing are more expensive for LTC policies.

3 The Model

Our quantitative general equilibrium model has multiple periods, incorporates multiple sources of uncertainty, and features heterogeneous individuals with private information about their LTC risk. When young, individuals self-insure against LTC risk and other retirement risks through saving. Upon retirement, they may purchase private LTCI from a monopolistic issuer. The insurer uses observable indicators of LTC risk to assign individuals to risk groups, decides which risk groups to insure or deny coverage, and designs optimal contracts for those deemed insurable. Public LTCI is also available, but it is means-tested and acts as a secondary payer. The quantitative model is calibrated to NH risk, the component of LTC costs where catastrophic out-of-pocket expenses are concentrated. Throughout the paper we use "LTC risk" and "NH risk" interchangeably.

The quantitative model reproduces key empirical features of the US private LTCI market, including participation and coverage patterns across health status and permanent earnings quintiles. Before presenting the quantitative model, we develop intuition for the underlying economic mechanisms using a static contract design problem in which a monopolistic LTCI issuer faces a single risk group. This one-period model is then used to illustrate how Medicaid's crowd-out effects on private insurance can be mitigated by making it a primary payer.

3.1 The One-Period Model

Consider a continuum of individuals each with resources $w+a$ and private type $i \in \{L, H\}$.[4] The fraction of individuals with private type L is ψ and the fraction with private type H is $1-\psi$. The risk of entering a nursing home (NH), θ^i, is lower for type-L individuals than type-H individuals, i.e., $0 < \theta^L < \theta^H < 1$. The simple model has two instants of time. At the beginning of the period, individuals decide whether to purchase an LTCI contract. Then the NH event is realized and a fraction $\eta \equiv \psi\theta^L + (1-\psi)\theta^H$ of individuals incur NH expenses m.[5] If eligible, NH entrants may receive public LTCI benefits. The benefit level for type i is given by T^i. LTCI contracts specify a premium and an indemnity and are type specific. The premium for type i is π^i and the net indemnity is $\iota^i - \pi^i$.

The Individuals' Problem. Individuals are risk-averse and maximize utility subject to participation and incentive-compatibility constraints. An individual of type i solves

$$\max_{c^i_{NH}, c^i, \pi^i, \iota^i} \theta^i u(c^i_{NH}) + (1-\theta^i)u(c^i), \tag{1}$$

[4]We give individuals two endowments here to facilitate comparison with our quantitative model which has multiple periods and saving. In that model, w is the endowment and a is beginning-of-period asset holdings.

[5]An NH event (or equivalently an LTC event) in the model is an expense shock. These expenses represent the care component of NH costs.

subject to

$$c^i = w + a - \pi^i, \tag{2}$$
$$c^i_{NH} = w + a - m + \iota^i - \pi^i + T^i, \tag{3}$$
$$\tag{4}$$

where $u(c) = c^{1-\sigma}/(1-\sigma)$ with $\sigma > 0$ and T^i are public NH benefits.

The Insurer's Problem. The insurer cannot directly observe an individual's risk exposure type i and faces claims processing costs $(\lambda - 1 \geq 0)$ that are proportional to indemnities. He chooses a menu of contracts to offer that maximizes his expected profits subject to the participation and incentive-compatibility constraints of each private type by solving

$$\max_{\{\pi^i,\iota^i\}_{i\in\{L,H\}}} \psi[\pi^L - \lambda\theta^L\iota^L] + (1-\psi)[\pi^H - \lambda\theta^H\iota^H], \tag{5}$$

subject to

$$(PC_i) \quad U(\theta^i\pi^i, \iota^i) - U(\theta^i, 0, 0) \geq 0, \quad i \in \{L, H\}, \tag{6}$$
$$(IC_i) \quad U(\theta^i, \pi^i, \iota^i) - U(\theta^i, \pi^j, \iota^j) \geq 0, \quad i, j \in \{L, H\}, \tag{7}$$

where $U(\theta^i, \pi^i, \iota^i) = \theta^i u(c^i_{NH}) + (1-\theta^i)u(c^i)$. Equation (6) states that each type $i \in \{L, H\}$ must be at least as well off with the contract designed for them as they would be if they did not purchase any private insurance. Equation (7) states that individuals must weakly prefer their own contract to the contract designed for the other private type.

It will be helpful in the graphical analysis that follows to refer to the optimality conditions for the insurer's problem

$$MRS(\theta^L, \pi^L, \iota^L) = \lambda\eta, \tag{8}$$
$$MRS(\theta^H, \pi^H, \iota^H) = \lambda\theta^H, \tag{9}$$
$$U(\theta^L\pi^L, \iota^L) - U(\theta^L, 0, 0) = 0, \tag{10}$$
$$U(\theta^H, \pi^H, \iota^H) - U(\theta^H, \pi^L, \iota^L) = 0, \tag{11}$$

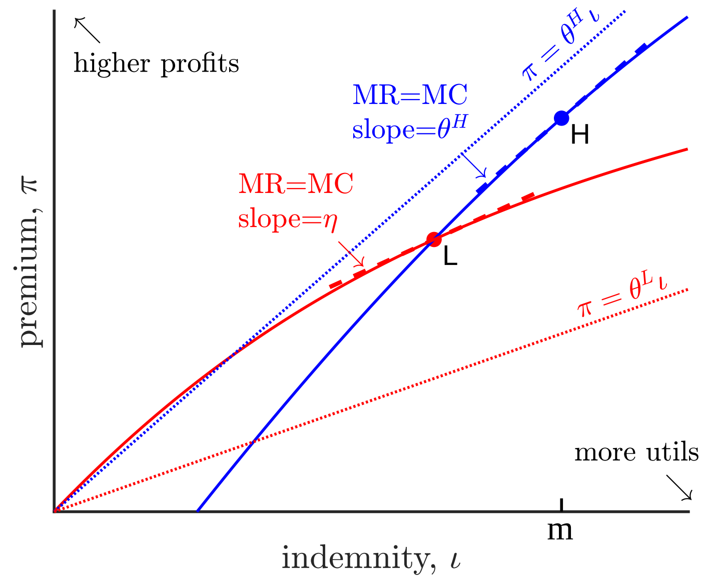
where the marginal rate of substitution (MRS) of type i,

$$MRS(\theta^i, \pi^i, \iota^i) = -\frac{dU(\theta^i, \pi^i, \iota^i)/d\iota^i}{dU(\theta^i, \pi^i, \iota^i)/d\pi^i},$$

is the amount by which the indemnity ι^i must increase given a marginal increase in the premium π^i so as to keep type i's utility constant. Observe that at the optimal menu of contracts, the participation constraint binds for type L and the incentive-compatibility constraint binds for type H.

Optimal Contracts without Claims Processing Costs or Public Insurance. When claims processing (CP) costs are zero $(\lambda = 1)$ and public insurance is absent $(T^L = T^H = 0)$,

Figure 1: Optimal contracts with no administrative costs and no public insurance



Note: Point H is the optimal contract for type-H individuals and point L is the optimal contract for type-L individuals. The parameterization used to create the figure is $\sigma = 1.1$, $\psi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w + a = 1.0$, $m = 0.8.$, $\lambda = 1$, and $\underline{c}_{NH} = 0$.

our model is equivalent to the specification considered by Stiglitz (1977). Figure 1 illustrates the optimal contracts in this case. The solid curved lines are (indirect) indifference curves of types L and H with utility increasing to the southeast.[6] The slopes of the dashed lines are the marginal costs of insuring each given type. The contracts at points L and H satisfy the optimality equations (8)–(11). At point L, the MRS (marginal revenue) equals marginal cost for type L—equation (8). At point H, the same condition holds for type H—equation (9). Type L's participation constraint binds because his indifference curve passes through the origin, indicating that he is indifferent between no insurance and contract L; in other words, equation (10) is satisfied. Equation (11) is satisfied too. The incentive-compatibility constraint of type H binds because his indifference curve passes through point L indicating that he is indifferent between the two contracts.

As Figure 1 shows, the optimal contracts are separating and feature full coverage of the loss m for high-risk (H) types and partial coverage for low-risk (L) types.[7] While high-risk types always receive full insurance, the optimal contract for low-risk types may involve no coverage at all. To understand why, notice that, when low-risk types obtain positive insurance, the optimal contracts always feature cross-subsidization from low-risk to high-risk types. The dotted straight lines in the figure are actuarially fair contract rays (along which expected indemnities equal premium revenue within the given type). The optimal contract for type H lies below its zero-profit ray, implying losses on high-risk contracts, whereas the optimal contract for type L lies above its zero-profit ray, generating offsetting

[6]The indifference curves are implicit functions of consumption. Our objective is to illustrate how administrative costs and public insurance influence the pricing and coverage of private insurance contracts. It is easier to do this in the contract space than in the consumption space.

[7]The optimal contracts are always separating. Consider a pooling contract at point L. The MRS is steeper than the marginal cost for type H at this point, so contracts to the right along type H's indifference curve remain incentive compatible while reducing insurer losses.

profits. As long as profits are positive on net, the optimal menu will feature a positive amount of coverage for both types. However, cross-subsidization becomes more costly when high-risk individuals become relatively more expensive to insure—either because their risk of nursing home entry increases or because their share of the risk pool rises. Once cross-subsidization is no longer profitable, the optimal menu excludes low-risk types—consisting of a full-coverage contract for type H and a $(0, 0)$ contract for type L.[8]

Notice that the optimal contracts are inconsistent with two of the main features of the US private LTCI market described in Section 2. First, conditional on obtaining insurance, policies in the US private LTCI market only provide partial coverage. In contrast, in the model, high-risk types always receive full insurance. Second, in the US market, entire risk groups are deemed unprofitable and denied coverage. In contrast, in the model, at least one non-zero insurance contract is always offered to the risk group—the one designed for the high-risk types.

Optimal Contracts with Claims Processing Costs. Setting $\lambda > 1$ introduces proportional claims processing costs, which raise the marginal cost of providing insurance to both types, as shown in equations (8) and (9). Modeling these administrative costs substantially alters the optimal contracts, generating features that better resemble the US private LTCI market. Coverage becomes incomplete even for high-risk types, and if λ is sufficiently high, profitable contracts no longer exist, leading the insurer to deny coverage to the entire risk group.[9]

Figure 2 illustrates how optimal contracts evolve as claims processing costs increase. As λ rises, higher marginal costs reduce coverage ratios, moving both high- and low-type contracts down the agents' indifference curves toward the origin. At the same time, cross-subsidization becomes progressively more costly as the slopes of the zero-profit rays (the dotted lines) increase, reducing profits on low-risk contracts and increasing losses on high-risk contracts. When claims processing costs are moderate, the insurer continues to use separating contracts and cross-subsidization to confront asymmetric information. As λ rises further, however, cross-subsidization becomes infeasible, and a pooling equilibrium emerges as illustrated in Panel 2c. At the optimal pooling contract, marginal cost exceeds the MRS for high-risk types, but incentive compatibility prevents the insurer from offering them a lower coverage contract.

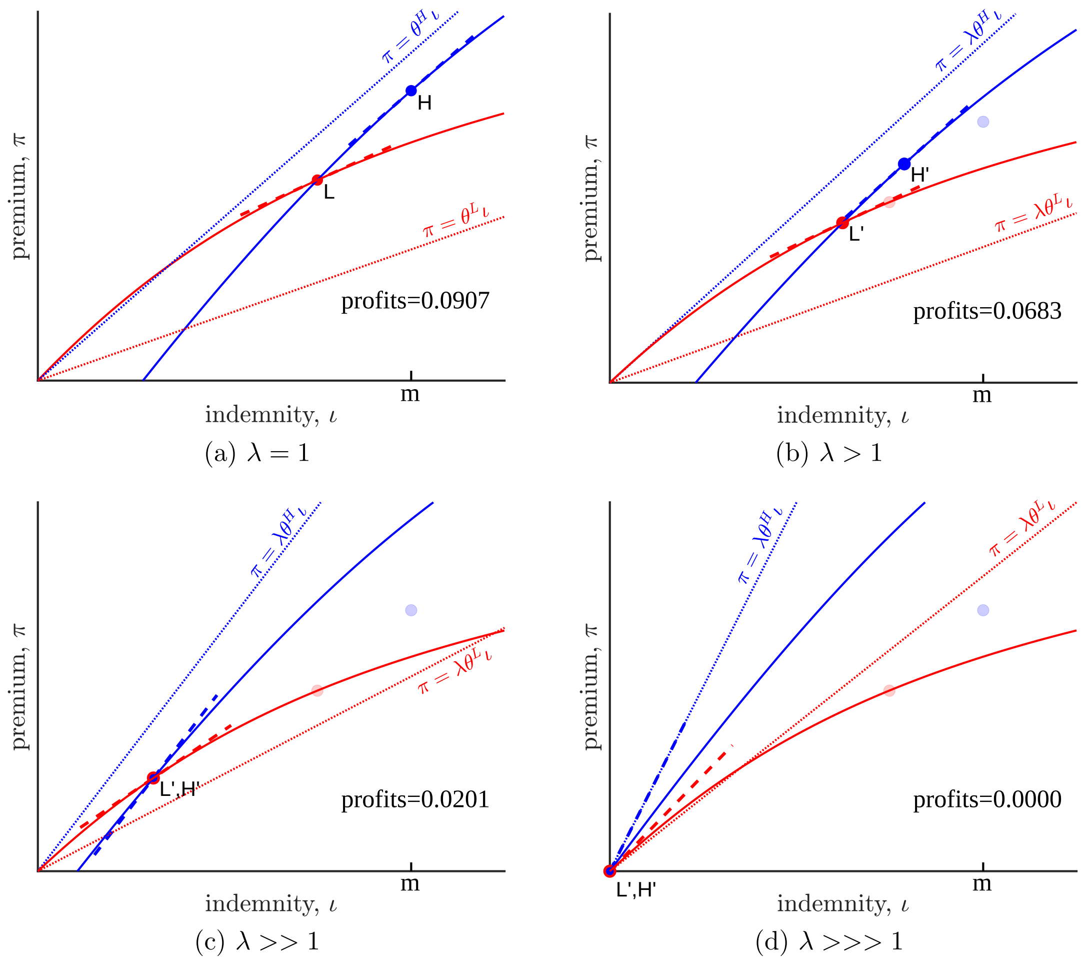
For sufficiently large λ, coverage falls to zero as reported in Panel 2d. Since marginal cost exceeds MRS for both types at $(0, 0)$, no profitable insurance contracts exist and the entire risk group is denied coverage.[10] All else equal, denials are more likely when the fraction of

[8]Optimal contracts with incomplete coverage for low-risk types and cross-subsidization arise because of asymmetric information. Under full information, both types receive a full coverage contract, but the insurer extracts all the surplus. The optimal contracts lie at the intersection of each type's binding participation constraint and a vertical line passing through point $\mathbf{m}$. Type L's utility is unchanged, as in both cases he is on his participation constraint, while type H's utility falls due to higher premiums.

[9]Administrative costs also strengthen the case for public insurance, as emphasized in the public finance literature (Gruber, 2022). Suitably designed public insurance can extend coverage to groups denied private insurance and can supplement coverage for insured risk groups. Public provision may also avoid administrative costs faced by private insurers, such as underwriting expenses and commissions paid to insurance brokers.

[10]While there are no profitable menus with private information, notice that the slope of the zero-profit ray is flatter than the slope of the low-risk type's indifference curve at $(0, 0)$. The optimal menu with full

Figure 2: Optimal contracts with administrative costs



(a) $\lambda = 1$ (b) $\lambda > 1$ (c) $\lambda >> 1$ (d) $\lambda >>> 1$

Note: Panel (a) shows the baseline case with no administrative costs ($\lambda = 1$). In panel (b), administrative costs are positive ($\lambda > 1$), and the optimal contract menu is separating. In panel (c), administrative costs are higher ($\lambda \gg 1$), and the optimal menu is a pooling contract with positive coverage. In panel (d), administrative costs are even higher ($\lambda \ggg 1$) and the optimal menu is a pooling $(0, 0)$ contract. Faded dots in panels (b)–(d) denote the optimal contracts in the absence of administrative costs. The parameterization used to create the figure is $\sigma = 1.1$, $\psi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w + a = 1.0$, $m = 0.8$, $\lambda \in \{1, 1.15, 1.65, 2.5\}$, and $\underline{c}_{NH} = 0$.

high-risk types, $1 - \psi$, is large or when high-risk individuals face substantially higher NH entry risk than low-risk individuals ($\theta^H >> \theta^L$), as both increase the overall cost of insuring the risk group, reducing profitability. Denials are also more likely when endowments are high relative to expected losses, as this lowers individuals' marginal rates of substitution relative to marginal costs, indicating that the entire risk group prefers to self-insure. This last channel proves important for generating low private LTCI participation among higher-income individuals in our quantitative model.

Optimal Contracts with Public Insurance. The availability of means-tested public insurance has a large impact on the private market. By reducing individuals' willingness to

information would feature positive insurance for low-risk types and no insurance for high-risk types at this value of λ.

pay (WTP) for private coverage, public insurance lowers the profitability of private LTCI and can eliminate private coverage altogether if a risk group's endowment is sufficiently low. To illustrate these effects, assume public NH benefits are given by

$$T^i = \max\left\{0, \underline{c}_{NH} - \left[w + a - m + \iota^i - \pi^i\right]\right\}, \tag{12}$$

which makes them just enough to provide their recipient with the level of consumption $\underline{c}_{NH}$ in the NH state.

Equation (12) is a stylized representation of how Medicaid works in practice that effectively captures the program's two key features. First, benefits are means-tested, declining with an individual's endowment. Second, Medicaid operates as a secondary payer, reducing benefits one-for-one with net private insurance payouts. Figure 3a illustrates this mechanism for an individual who experiences an NH event and qualifies for Medicaid in the absence of private insurance ($\underline{c}_{NH} + m > w + a$). The figure shows that purchasing private LTCI does not increase total resources in the NH state unless the individual forgoes Medicaid entirely, since any private payout reduces public benefits dollar-for-dollar.

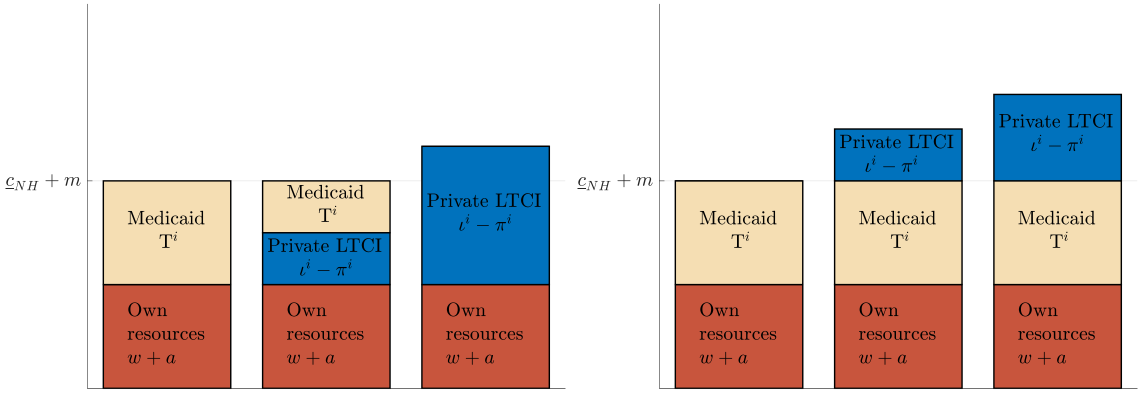
Because Medicaid benefits are means-tested, their effects on private insurance coverage and pricing depend on individuals' income and wealth. For very wealthy individuals, Medicaid will have no direct impact. For individuals with more moderate income and wealth, however, it alters private LTCI contracts in ways that depend on the amount of resources they have at the time of NH entry. Figure 4 illustrates Medicaid's effects by comparing optimal contracts in the absence of public NH insurance (panel 4a) with those that arise when it is available (panels 4b and 4c).[11] In both Medicaid cases, individuals would qualify for public benefits in the absence of private LTCI ($\underline{c}_{NH} > w + a - m$), but the size of their endowment relative to the Medicaid consumption floor differs across panels: in panel 4b endowments are low relative to $\underline{c}_{NH}$, while in panel 4c they are relatively high.

The secondary-payer provision is central to the changes in optimal contracts shown in Figure 4. By improving individuals' outside option, it tightens their participation constraints, leading to the kinks and downward shifts in the indifference curves in panels 4b and 4c.[12] Individuals are unwilling to purchase contracts to the left of the kinks because they offer less coverage than they can get for free from Medicaid. To the right of the kinks, private insurance provides more coverage of the loss than Medicaid, but because individuals can get free Medicaid benefits if they don't purchase private LTCI, WTP for that coverage declines. When the consumption floor is high relative to endowments, as in panel 4b, no menu of contracts that are both attractive to individuals and profitable to the insurer exists. When endowments are higher, as in panel 4c, private insurance remains viable and, as in the baseline, high-risk types receive full coverage, but insurers must offer more generous terms to induce participation. Consequently, premiums and profits are substantially lower than in the absence of Medicaid. Modeling these crowding-out effects of Medicaid plays a central role in our quantitative model's ability to reproduce low takeup rates of private LTCI among lower-income Americans.

[11] Claims processing costs are absent in all Medicaid scenarios.

[12] Recall that indifference curves are defined over contracts, not consumption.

Figure 3: Total resources in the LTC state under different insurance arrangements when Medicaid is a secondary payer versus a primary payer



(a) Medicaid secondary payer (b) Medicaid primary payer

Note: The figure shows total resources for an individual who would qualify for Medicaid in the absence of private insurance (i.e., $\underline{c}_{NH} + m > w + a$). Panel (a) considers the case in which Medicaid is a secondary payer. Panel (b) considers the case in which Medicaid is a primary payer. In each panel, the left bar corresponds to no private insurance, and the middle and right bars illustrate how total resources change as private LTCI coverage increases.

Optimal Contracts with Public Insurance as a Primary Payer. Figure 4 shows that when Medicaid is a secondary payer, it reduces WTP for private insurance and crowds out the private market by both shrinking the set of risk groups that are profitable to insure and reducing profits within insurable groups. If Medicaid remains means-tested but instead becomes a primary payer, these crowding-out effects are attenuated, leading to both a larger set of profitable risk groups and higher profits among those previously insurable.

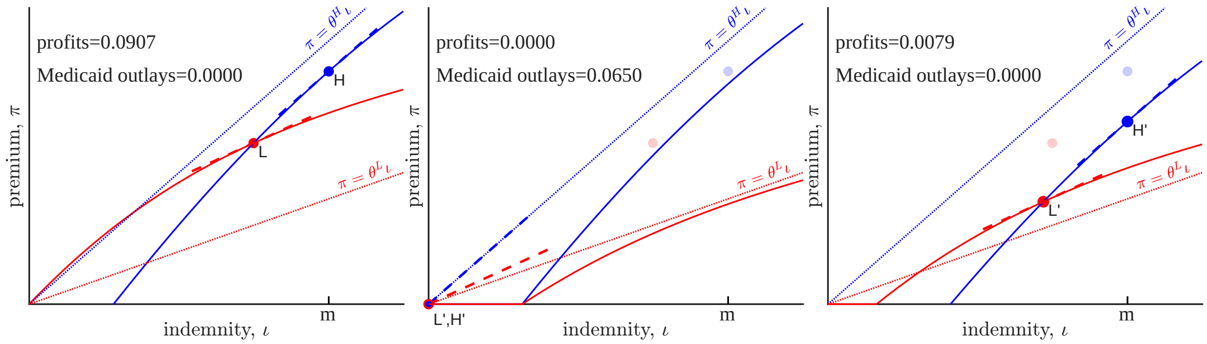
To illustrate this case, suppose public NH benefits are instead given by

$$T = \max\Big\{0, \underline{c}_{NH} - \big[w + a - m\big]\Big\}. \tag{13}$$

Public insurance remains means-tested, since individuals with sufficiently high endowments do not receive benefits, but individuals who may qualify for Medicaid now have a stronger incentive to purchase private insurance. As shown in Figure 3b, private insurance becomes a top-up to public coverage: individuals receive public benefits of T and can insure part or all of the residual loss $m - T$. As a result, while marginal WTP for additional private insurance is lower—because the effective loss is smaller—participation constraints are relaxed. Thus, whereas secondary-payer Medicaid tightens participation constraints, primary-payer Medicaid instead reduces marginal rates of substitution.

Figure 5 compares optimal contracts when Medicaid acts as a secondary payer versus a primary payer for the same two risk groups considered in Figure 4. Consider first the risk group with low endowments, $w+a$, relative to $\underline{c}_{NH}$. Under the baseline Medicaid secondary-payer arrangement, this group is uninsurable and the private insurer earns zero profits. When Medicaid instead acts as the primary payer, participation constraints are relaxed and both high-risk and low-risk types choose to purchase private coverage. Medicaid outlays to the risk group remain unchanged relative to the baseline, but total insurance coverage against the loss increases because individuals now supplement public insurance with private LTCI.

Figure 4: Optimal contracts when public insurance is means-tested and a secondary payer



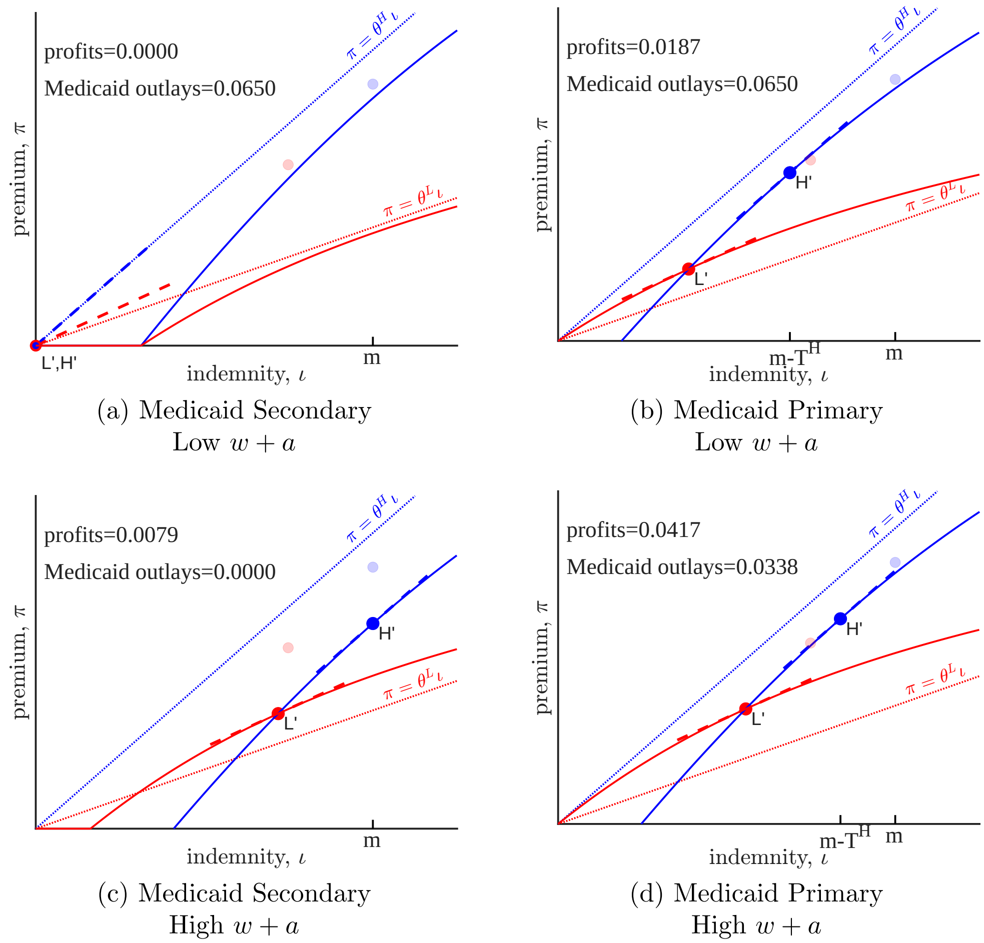
(a) $\underline{c}_{NH} = 0$ (b) $w + a$ low relative to $\underline{c}_{NH}$ (c) $w + a$ high relative to $\underline{c}_{NH}$

Note: Panel (a) shows the baseline case with no public insurance ($\underline{c}_{NH} = 0$). In panel (b), $w + a$ is low relative to $\underline{c}_{NH}$, and the optimal contract menu is a pooling $(0, 0)$ contract. In panel (c), $w + a$ is high relative to $\underline{c}_{NH}$, and the optimal contract menu is separating with positive coverage for both types. Faded dots in panels (b) and (c) denote the optimal contracts in the absence of public insurance. The parameterization used to create the figure is $\sigma = 1.1$, $\psi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w + a = 1.0$, $m = 0.8$, $\lambda = 1$, $\underline{c}_{NH} \in \{0, 0.45, 0.33\}$.

In contrast, for the risk group with high endowments, private insurance contracts are smaller when Medicaid acts as the primary payer, as shown in panels 5c–5d. When Medicaid acts as a secondary payer, this group receives no public insurance benefits because net private indemnities count toward the Medicaid means test. When Medicaid serves instead as the primary payer, net private indemnities are excluded from the means test, and individuals in this group now qualify for Medicaid benefits. As a result, Medicaid outlays for the group increase from zero to 0.0338. With Medicaid covering a share of the loss, the marginal value of additional private insurance (MRS) declines for both types, leading to lower coverage levels and premiums. Despite the smaller contract size, insurer profits are higher than under the Medicaid secondary-payer arrangement. This is due to the relaxation of the participation constraint: individuals no longer need to pay for coverage they could otherwise obtain for free through Medicaid in order to purchase additional protection. Overall WTP for private insurance is higher because net private indemnities are excluded from the Medicaid means test. In both the high- and the low-endowment risk group, high-risk individuals receive full coverage of the loss with Medicaid covering T^H and private insurance covering $m - T^H$.

We conclude the analysis of the one-period model by summarizing its main properties. First, when Medicaid and claims processing costs are absent, high-risk types always receive complete coverage. Type L may be excluded, but LTCI takeup in a given risk group is always positive. Second, claims processing costs increase the marginal cost of private insurance, leading to lower takeup rates, coverage ratios, and profits. In the presence of these costs, risk groups with high endowments relative to the loss, or with a high share of high-risk individuals, are more likely to be excluded (no-trade), and aggregate LTCI participation can decline. Third, means-tested public insurance crowds out private coverage and can generate no-trade outcomes for risk groups with sufficiently low endowments, further reducing aggregate LTCI participation. Fourth, crowding out is particularly strong when Medicaid acts as a secondary payer. When Medicaid is instead a primary payer, private LTCI participation increases.

Figure 5: Optimal contracts when public insurance is means-tested and a primary payer



(a) Medicaid Secondary
Low $w + a$

(b) Medicaid Primary
Low $w + a$

(c) Medicaid Secondary
High $w + a$

(d) Medicaid Primary
High $w + a$

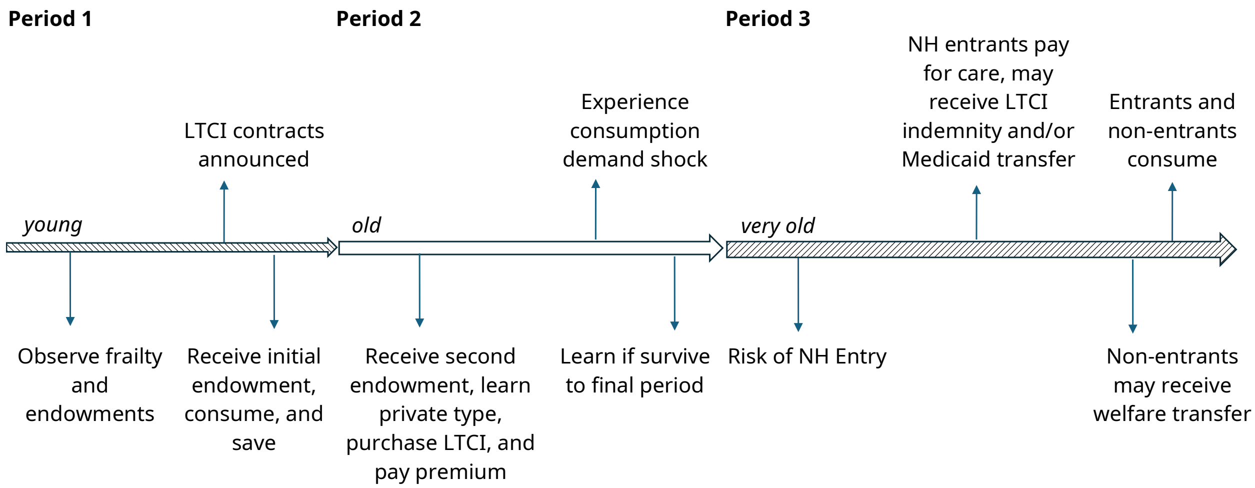
Note: Panels (a) and (c) reproduce panels (b) and (c) of Figure 4 for ease of comparison. In panels (a) and (b), $w + a$ is low relative to $\underline{c}_{NH}$. Panel (a) shows the optimal contract menu when Medicaid is a secondary payer, while panel (b) shows the corresponding menu under the same parameterization when Medicaid is a primary payer. In panels (c) and (d), $w + a$ is high relative to $\underline{c}_{NH}$. Panel (c) shows the optimal contract menu when Medicaid is a secondary payer, and panel (d) shows the corresponding menu when Medicaid is a primary payer. Faded dots in panels (a)–(d) denote the optimal contracts in the absence of public insurance. The parameterization used to create the figure is $\sigma = 1.1$, $\psi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w+a = 1.0$, $m = 0.8$, $\lambda = 1$, with $\underline{c}_{NH} = 0.45$ in the upper panels and $\underline{c}_{NH} = 0.33$ in the lower panels.

At the same time, Medicaid recipiency rates rise for higher-endowment risk groups while remaining unchanged for those with lower endowments. This last result does not carry over to our quantitative model, where households make retirement saving decisions. There, making Medicaid the primary payer strengthens saving incentives for lower-middle-income households, leading some to lose Medicaid eligibility due to higher wealth accumulation. The resulting decline in Medicaid outlays for this group partially offsets the rising outlays among higher-income groups.

3.2 The Quantitative Model

Our quantitative model extends the one-period model along four dimensions. First, it is a multi-period framework in which individuals save when young and can self-insure against

Figure 6: Timeline of events in the quantitative model



LTC risk through accumulated wealth. Second, it embeds the contracting problem in general equilibrium: Medicaid is financed by income taxation, the public insurer incurs administrative costs, and insurer profits accrue to households as dividends. Third, individuals face mortality risk and uncertainty about their resources at the time of NH entry. Fourth, the insurer faces a full distribution of observable risk groups rather than a single one, so denials and contract terms vary across the population.

To incorporate uncertainty about resources at the time of NH entry, we add a consumption demand shock realized after LTCI purchase. In the US, the average age of private LTCI purchase is 60, while the average age of NH entry is 83. Over those two decades individuals face acute medical expenses, spousal death, and other expenditure risks, and those who enter an NH late in life will have consumed more of their lifetime endowment beforehand. The shock allows us to capture these facts in a tractable way. Medicaid eligibility at NH entry depends on the shock: only individuals whose resources are sufficiently depleted qualify. Private insurance is therefore valuable because it covers the states in which the shock is small and Medicaid does not pay. For the same reason, individuals do not want full coverage, since Medicaid already insures them in expectation against part of the NH risk.

3.2.1 Timing of Events

Figure 6 shows the timing of events in the model. In period 1, an individual observes his frailty status f and lifetime endowment of the consumption good $\mathbf{w} = [w_y, w_o]'$, which are jointly distributed with density $h(f, \mathbf{w})$. Frailty status and endowments are noisy public indicators of NH risk. He also observes his survival probability from period 2 to period 3, $s_{f,\mathbf{w}}$, which varies with f and $\mathbf{w}$, and the menus of LTCI contracts that will be available in period 2. The individual then decides how to divide his earnings, w_y, between consumption c_y and assets a for retirement.

At the beginning of period 2, the individual receives a pension w_o and observes his true risk of entering an NH conditional on surviving to period 3: $\theta^i_{f,\mathbf{w}}$, $i \in \{g, b\}$ with $\theta^g_{f,\mathbf{w}} < \theta^b_{f,\mathbf{w}}$. With probability ψ the individual realizes a low (good) NH entry probability, $i = g$, and with probability $1-\psi$ he realizes a high (bad) NH entry probability, $i=b$. The individual's true type $i \in \{g,b\}$ is private information.[13] Note that NH entry probabilities vary with f and $\mathbf{w}$ in addition to the private type i.

The individual then chooses an LTCI contract from the menu offered to him by the private insurer.[14] The insurer observes individuals' frailty status, endowments, and assets, and conditions the menu of contracts offered to them on these characteristics. We assume that the insurer observes assets because LTC insurers are required by regulators in many states to ascertain that the LTCI product sold to an individual is suitable (affordable).[15] Each menu contains a contract for each type: one for the good types and one for the bad types. A contract consists of a premium $\pi^i_{f,\mathbf{w}}(a)$ that the individual pays to the insurer and an indemnity $\iota^i_{f,\mathbf{w}}(a)$ that the insurer pays to the individual if an NH event occurs.

After purchasing LTCI, individuals experience the demand shock described above, which induces them to consume a fraction κ of their young endowment, where $\kappa \in [\underline{\kappa}, \overline{\kappa}] \subseteq [0,1]$ with density $q(\kappa)$. Period 2 then ends with the death event. With probability $s_{f,\mathbf{w}}$ individuals survive until period 3, and with probability $1-s_{f,\mathbf{w}}$ they consume their wealth and die.[16] We model mortality risk because it is correlated with frailty and wealth and affects the likelihood of NH entry.

Finally, in period 3 the NH shock is realized. Those who enter an NH pay the cost m, and those with private insurance receive an indemnity toward it. NH entrants may also receive benefits from Medicaid, the public LTCI program. Medicaid is means-tested and acts as a secondary payer: it guarantees a consumption floor of $\underline{c}_{NH}$, but benefits are reduced by both the individual's own resources and any private insurance payout. Individuals who do not enter an NH may also receive means-tested transfers, which guarantee a consumption floor, $\underline{c}_o$. These transfers stand in for SSI and other assistance available to low-income retirees.

3.2.2 Individual's Problem

Individuals are forward-looking. They understand that when the LTCI purchase decision is made, they will hold an informational advantage over the insurer regarding their likelihood of NH entry. Individuals also recognize that they may be denied coverage altogether: based on their observable characteristics, there may be no contract that they are willing to purchase and that is profitable for the insurer to offer. Their saving decisions are influenced by Medicaid and by the pricing and coverage levels of private LTCI contracts. Because Medicaid

[13] Individuals may have private information about their likelihood of needing NH care for several reasons, including superior information about their own health or financial resources and private information about the likelihood of receiving informal care from a relative.

[14] We assume the insurer does not offer insurance to working-age individuals in period 1 because LTCI takeup rates are low among younger individuals. For example, only 9 percent of LTCI buyers were less than 50 years old in 2015 according to LifePlans, Inc. "Who Buys Long-Term Care Insurance? Twenty-Five Years of Study of Buyers and Non-Buyers in 2015–2016" (2017).

[15] Lewis et al. (2003) report that 31 states had adopted some form of asset suitability guidelines by 2002. The National Association of Insurance Commissioners' Long-Term Care Insurance Model Regulation contains a personal worksheet for reporting financial assets that is used to determine suitability (National Association of Insurance Commissioners, 2017).

[16] There is evidence that individuals anticipate their death. Poterba et al. (2011) find that most retirees die with very little wealth, and Hendricks (2001) finds that most individuals receive very small or no inheritances. Abstracting from bequest motives eliminates any desire for agents to use LTCI to insure survival risk.

benefits are means-tested and Medicaid is a secondary payer, low-income individuals have an incentive both to save less and to refrain from purchasing private LTCI in order to qualify. High-income individuals have the option of saving more and self-insuring against NH risk, so their willingness to pay is depressed by the incomplete coverage and unfavorable pricing of private LTCI contracts.

An individual of type $(f, \mathbf{w})$ solves the following maximization problem, where the dependence of choices and contracts on f and $\mathbf{w}$ is omitted to conserve notation,

$$U_1(f, \mathbf{w}) = \max_{a \geq 0, c_y, \mathbf{c}_o, \mathbf{c}_{NH}} u(c_y) + \beta U_2(a),$$

with

$$U_2(a) = \left[\psi u_2(a, \theta^g_{f,\mathbf{w}}, \pi^g, \iota^g) + (1-\psi) u_2(a, \theta^b_{f,\mathbf{w}}, \pi^b, \iota^b)\right],$$

and

$$u_2(a, \theta^i, \pi^i, \iota^i) = \int_{\underline{\kappa}}^{\overline{\kappa}} \Big\{ u(\kappa w_y) + \alpha \Big[s_{f,\mathbf{w}} \big(\theta^i u(c^{i,\kappa}_{NH}) + (1-\theta^i) u(c^{i,\kappa}_o)\big) + (1 - s_{f,\mathbf{w}}) u(c^{i,\kappa}_o) \Big] \Big\} q(\kappa) d\kappa,$$

subject to

$$\begin{aligned} & c_y = w_y - T(w_y) - a, \\ & c^{i,\kappa}_o + \kappa w_y = y_o - T(y_o) + a - \pi^i(a), \\ & c^{i,\kappa}_{NH} + \kappa w_y = y_o - T(y_o) + a - m + \iota^i(a) - \pi^i(a) + TR(y_o, a, \pi^i(a), \iota^i(a), m, \kappa), \end{aligned} \tag{14}$$

for $i \in \{g, b\}$. Income in old age is defined as

$$y_o \equiv w_o + ra + d_{\mathbf{w}} \bar{\Pi}, \tag{15}$$

where $\bar{\Pi}$ denotes aggregate profits, $d_{\mathbf{w}}$ is an individual's dividend expressed as a share of aggregate profits, and r denotes the (net) real interest rate. The parameter β captures discounting between the time individuals start working and the start of retirement, while the parameter α captures discounting between the start of retirement and the moment of NH entry. Taxes are progressive, specifically,

$$T(y) = \tau \max(y - \tau_0, 0), \tag{16}$$

where τ is the tax rate and τ_0 units of income are tax exempt. The Baseline Medicaid transfer is

$$TR(y_o, a, \pi, \iota, m, \kappa) = \max\left\{0, \underline{c}_{NH} - \left[y_o - T(y_o) + a - m + \iota - \pi - \kappa w_y\right]\right\}. \tag{17}$$

In the following analysis, we will also consider policy reforms where Medicaid benefits are means-tested but Medicaid is a primary payer. Under this assumption, Medicaid transfers are given by

$$TR^P(y_o, a, \pi, \iota, m, \kappa) = \max\left\{0, \underline{c}_{NH} - \left[y_o - T(y_o) + a - m - \pi - \kappa w_y\right]\right\}, \tag{18}$$

and the individual's problem is found by replacing TR with TR^P in equation (14).

Recall that individuals who do not enter an NH may also receive means-tested transfers. We include these transfers in a simple way. We start by solving each individual's problem above, which assumes that only the NH state has a consumption floor. Then we check whether the individual prefers to save nothing, not purchase LTCI, and consume the consumption floors $\underline{c}_{NH}$ in the NH state and $\underline{c}_o$ in the non-NH state. If he does, we assign him the two consumption floors and set his assets and private LTCI coverage to zero.[17]

3.2.3 Insurer's Problem

The insurer observes each individual's endowments $\mathbf{w}$, frailty status f, and assets a. He does not observe an individual's true NH entry probability, $\theta^i_{f,\mathbf{w}}$, but knows the distribution of NH risk in the population and the individual's survival risk $s_{f,\mathbf{w}}$. We assume that the insurer does not recognize that asset holdings depend on $\mathbf{w}$ and f through household optimization. In practice, insurers condition on reported assets at the time of application rather than modeling how those assets were accumulated.

For each group of observable types, the insurer chooses a menu of contracts $\big(\pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a)\big)$, $i \in \{g, b\}$, to maximize expected profits, taking into account that individuals face survival risk after insurance purchase and that the demand shock is realized after contracting. As in the simple model, the insurer incurs a variable cost of paying claims proportional to indemnities, with factor $\lambda - 1 \geq 0$. In addition, he incurs a per-capita fixed cost of paying claims $\gamma \geq 0$.

His maximization problem is

$$\Pi(f, \mathbf{w}, a) = \max_{(\pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a))_{i\in\{g,b\}}} \psi\Big\{\pi^g_{f,\mathbf{w}}(a) - s_{f,\mathbf{w}}\theta^g_{f,\mathbf{w}}\big[\lambda\iota^g_{f,\mathbf{w}}(a) + \gamma I(\iota^g_{f,\mathbf{w}}(a) > 0)\big]\Big\} \qquad (19)$$
$$+ (1-\psi)\Big\{\pi^b_{f,\mathbf{w}}(a) - s_{f,\mathbf{w}}\theta^b_{f,\mathbf{w}}\big[\lambda\iota^b_{f,\mathbf{w}}(a) + \gamma I(\iota^b_{f,\mathbf{w}}(a) > 0)\big]\Big\},$$

subject to the incentive compatibility and participation constraints

$$(IC_i) \quad u_2(a, \theta^i_{f,\mathbf{w}}, \pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a)) \geq u_2(a, \theta^i_{f,\mathbf{w}}, \pi^j_{f,\mathbf{w}}(a), \iota^j_{f,\mathbf{w}}(a)), \quad \forall i, j \in \{g, b\}, i \neq j, \quad (20)$$
$$(PC_i) \quad u_2(a, \theta^i_{f,\mathbf{w}}, \pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a)) \geq u_2(a, \theta^i_{f,\mathbf{w}}, 0, 0), \quad \forall i \in \{g, b\}. \quad (21)$$

Let $\tilde{h}(f, \mathbf{w}, a)$ denote the measure of agents with frailty status f, endowment $\mathbf{w}$, and asset holdings a. Then total profits for the insurer are given by

$$\bar{\Pi} = \sum_f \sum_{\mathbf{w}} \sum_a \Pi(f, \mathbf{w}, a)\tilde{h}(f, \mathbf{w}, a). \qquad (22)$$

3.2.4 Government's Problem

In period 1 the government taxes the income of workers and saves the proceeds, earning a return of $1 + r$. Then in period 2, it taxes old individuals' income and uses its resources

[17] Modeling SSI in this way helps us to generate the low saving of individuals in the bottom wealth quintile without introducing additional nonconvexities into the insurer's maximization problem.

to finance the two means-tested welfare programs. Like the private insurer, the government incurs administrative costs of running both of these programs.[18] Neither program pays broker commissions, but both must assess applicants' eligibility and transfer amounts, so we model them as a fixed cost per recipient, which makes total administrative costs proportional to the fraction of individuals receiving transfers. Let γ_{gov} denote the cost per transfer recipient.

Given the two consumption floors guaranteed by the programs, $\{\underline{c}_{NH}, \underline{c}_o\}$, the income tax rate τ is set to satisfy the government budget constraint

$$\text{REV} = \sum_{\mathbf{w}} \sum_{f} \left[\text{TR}^{f,\mathbf{w}} + \gamma_{\text{gov}} n^{f,\mathbf{w}}\right] h(f, \mathbf{w}), \tag{23}$$

where $\text{TR}^{f,\mathbf{w}} h(f, \mathbf{w})$ is aggregate spending on transfers to individuals of type $(f, \mathbf{w})$ via the two welfare programs and $n^{f,\mathbf{w}}$ is the fraction of individuals of type $(f, \mathbf{w})$ receiving government transfers. Aggregate government revenue, REV, is given by

$$\text{REV} \equiv \sum_{\mathbf{w}} \sum_{f} (1+r) T(w_y) h(f, \mathbf{w}) + \sum_{\mathbf{w}} \sum_{f} \sum_{a} T(y_o) \tilde{h}(f, \mathbf{w}, a),$$

where the tax function $T(\cdot)$ is defined in equation (16) and income in old age y_o is defined in equation (15).

3.2.5 Equilibrium

We solve for a competitive equilibrium under the assumption that the real interest rate is exogenous. The US economy has strong international financial linkages, and it is unlikely that changes in LTCI arrangements would have a large effect on US real interest rates. Medicaid is financed with an income tax that distorts saving incentives, and Medicaid incurs administrative costs that depend on the number of recipients, which in turn depends on private insurance contracts. We thus solve a fixed-point problem that ensures that the government budget constraint is satisfied and that contracts are optimal given households' asset holdings and asset holdings are optimal given contracts. In the equilibrium, all insurer profits accrue to individuals, so dividend shares sum to one:

$$\sum_{\mathbf{w}} \sum_{f} d_{\mathbf{w}} \, h(f, \mathbf{w}) = 1.$$

Definition 1 (Competitive Equilibrium)**.** Given a distribution of individuals by frailty and endowments $h(f, \mathbf{w})$, a real interest rate r, consumption floors $\{\underline{c}_{NH}, \underline{c}_o\}$, and dividend shares $\{d_{\mathbf{w}}\}$, a competitive equilibrium consists of a set of insurance contracts $\{\pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a)\}$, $i \in \{g, b\}$; profits $\bar{\Pi}$ generated by those contracts; a government income tax rate τ; consumption allocations $\{c_y^{f,\mathbf{w}}, c_o^{f,\mathbf{w},i,\kappa}, c_{NH}^{f,\mathbf{w},i,\kappa}\}$, $i \in \{g, b\}$; and a saving policy $a^{f,\mathbf{w}}$ such that the consumption allocations and saving policy solve the individuals' problems, the insurance contracts solve the insurer's problem, the distribution of agents by frailty, endowments, and assets is such that

$$\tilde{h}(f, \mathbf{w}, a) = \begin{cases} h(f, \mathbf{w}), & \text{if } a = a^{f,\mathbf{w}}, \\ 0, & \text{otherwise}, \end{cases}$$

and the government budget constraint, equation (23), holds.

[18] In Braun and Kopecky (2024) we assume that administrative costs only apply to the Medicaid program.

Table 1: Government policy parameters

Parameter	Description	Value
τ	income tax	0.0153
τ_0	tax exemption	0.2744
γ_{gov}	Medicaid fixed admin. cost	0.0022

4 Parameterization and Assessment

We parameterize the model to match key features of US LTCI arrangements and then assess its fit along dimensions not used in calibration. Parameterizing the model requires confronting a subtle identification problem: individuals have private information about their NH entry risk, so the dispersion in risk within observable groups is not directly measurable. Our identification strategy and most data targets are the same as in Braun et al. (2019). However, because the model here is a general equilibrium framework, it introduces additional parameters that must be calibrated.

Table 1 reports the values of the government policy parameters in the Baseline economy. The income tax rate, τ, is set such that the government budget constraint, equation (23), holds, yielding an income tax rate of 1.53 percent. The tax exemption, τ_0, is set to $7,200 per year or 27.44 percent of the average earnings per adult aged 18–64 in 2000.[19] According to the 2008 Actuarial Report on the Financial Outlook for Medicaid, Medicaid spent $17.3 billion on program administration in FY 2007, representing 5.2 percent of total outlays. The per-capita fixed cost of administering the two public insurance programs in the model, γ_{gov}, is set such that the total administrative costs of both means-tested welfare programs are 5.2 percent of total program outlays. This results in a value of γ_{gov} of 0.0022.

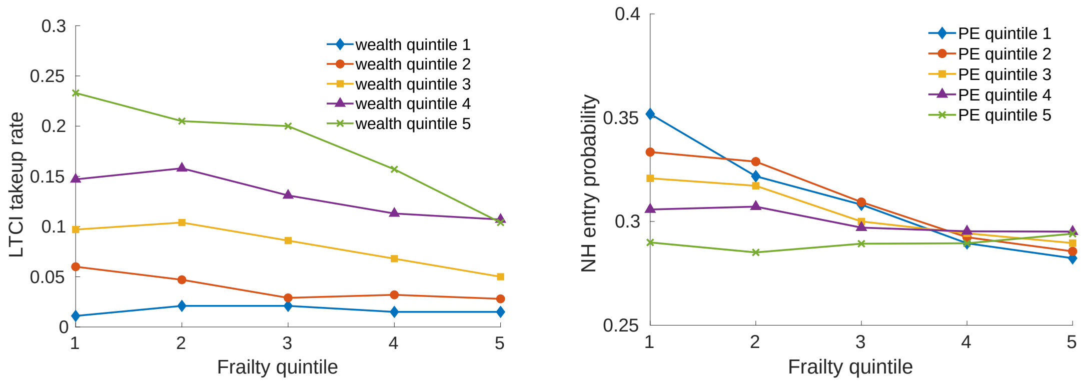
Consistent with the way the US LTCI system works in practice, the public LTC insurance program in the Baseline economy is significantly less costly to administer than private insurance. Private LTC insurers incur higher administrative costs because they pay broker commissions and conduct extensive medical underwriting, unlike Medicaid, which does neither. As in Braun et al. (2019), $\lambda - 1$, the proportional claims processing cost of providing private insurance is set such that total variable costs are consistent with commissions paid to brokers. These costs amounted to 12.6 percent of the present-value premium on average in 2000.[20] The per-capita fixed cost, γ, is set such that total fixed costs capture underwriting costs and costs of paying claims. These costs amounted to 20 percent of the present-value premium on average in 2000. The resulting values of λ and γ are 1.195 and 0.019, respectively.

We assume that all the insurer's profits are distributed to the top 1 percent of earners. This assumption reflects the fact that the income of executives and other highly affluent individuals is more sensitive to fluctuations in profits than that of others. In the policy

[19] In the model, endowments to the young are calibrated to permanent earnings. We normalize the mean young endowment to 1. This is equivalent to a mean permanent earnings of $1,049,461 in 2000, or the average earnings per adult aged 18–64 in 2000 multiplied by 40 years.

[20] See Eaton (2016) for a breakdown of administrative costs as a share of premium revenue.

Figure 7: LTCI takeup rates and lifetime NH entry rates in the data



(a) LTCI takeup rates (b) NH entry rates

Note: LTCI takeup rates are those of 62–72 year-olds in our HRS sample. NH entry rates are for an NH stay of 100 days or longer, and are based on our auxiliary simulation model, which is estimated using HRS data. Frailty, wealth, and PE increase across quintiles. The wealth and PE quintiles reported here are marginal and not conditional on the frailty quintile; so, for example, only around 7 percent of people in frailty quintile 1 are in wealth quintile 1, while 33 percent are in wealth quintile 5.

experiments we consider, the welfare of the top 1 percent is primarily influenced by changes in profit-based income and taxes. This is partly because the top 1 percent owns the private insurer and partly because this group is generally healthier, prefers to self-insure against LTC risk, and is highly unlikely to receive Medicaid LTC benefits.

The remaining calibration of the model proceeds in the same way as in Braun et al. (2019).[21] We posit 750 distinct risk groups that differ by frailty and permanent earnings. Some parameters are set directly using the data, while others are estimated by minimizing the distance between data moments and model counterparts. Most data statistics are based on an HRS data sample running from 1992 to 2012.[22] Our frailty index is constructed to reflect the underwriting criteria used by LTC insurers. Finally, lifetime NH entry probabilities for HRS respondents are estimated using an auxiliary simulation model. According to the simulation model, approximately 30 percent of 65-year-olds will experience a nursing home stay exceeding 100 days before death.[23] Conditional on staying at least 100 days, the average duration is three years, and we assume the third period of the model has the same length.

The consumption floor provided by Medicaid, $\underline{c}_{NH}$, and the consumption floor for those who do not enter an NH, $\underline{c}_o$, are both set to 1.855 percent of mean permanent earnings. Because the third period of the model represents the average three-year NH stay, this corresponds to an annual floor of \$6,540. The annual floor is the same as that used by Brown and Finkelstein (2008) and consists of a consumption allowance of \$30 per month and housing and food expenses of \$515 per month. The former is based on Medicaid administrative rules and the latter was the monthly amount that SSI paid a single elderly individual in 2000.

We choose the fraction of good types, ψ, so that the dispersion in private information

[21] Table 5 in the Appendix reports many of the Baseline parameter values.

[22] The HRS data is sponsored by the National Institute of Aging (grant number U01AG009740) and is conducted by the University of Michigan.

[23] This figure counts only nursing home stays and is therefore lower than the 45 percent of 65-year-olds who will use some form of formal LTC assistance, cited in the introduction. The model targets the nursing home measure, consistent with its focus on NH risk.

in the model is consistent with estimates from the data. The only direct proxy for private information available in the HRS is respondents' self-reported probability of entering an NH within the next five years. We therefore set ψ so that the coefficient of variation of NH entry probabilities in the model matches the coefficient of variation of these self-reported probabilities in the HRS. Ideally, we would use information on the dispersion of self-reported NH entry risk by frailty and wealth to identify variation in dispersion across risk groups. However, this measure of private information is noisy—particularly as sample sizes decline—and it does not capture individuals' lifetime NH entry risk. For these reasons, we do not use it to directly parameterize $\{\theta^b_{f,\mathbf{w}}, \theta^g_{f,\mathbf{w}}\}$. Instead, as described below, we use these data to evaluate the plausibility of our parameterization.

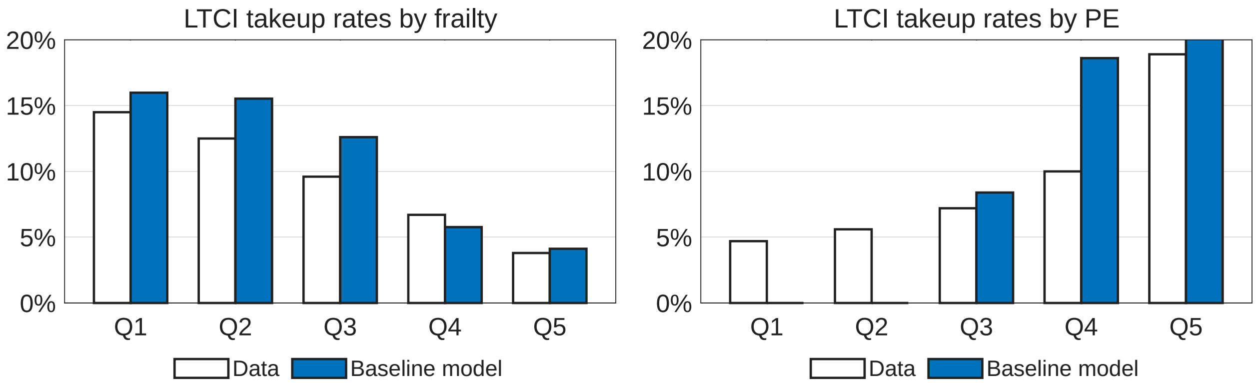
The NH entry probabilities conditional on survival within each of the 750 risk groups, $\{\theta^b_{f,\mathbf{w}}, \theta^g_{f,\mathbf{w}}\}$, are identified using data on NH entry by frailty and PE, together with data on LTCI takeup by frailty and wealth. The left panel of Figure 7 reports LTCI takeup rates of HRS respondents by frailty and wealth quintile. Our frailty index is constructed so that less frail individuals have a low index value. Wealth quintiles are organized to increase in wealth. Average takeup is low (9.4 percent), declines with frailty, and increases with wealth. The right panel of Figure 7 shows how the lifetime NH entry probability of a 65-year-old varies across frailty and PE quintiles. NH entry risk varies little with frailty within each PE quintile: it is essentially flat in PE quintiles 4 and 5 and declines slightly in quintiles 1–3. Similarly, NH entry risk varies little across PE within each frailty quintile. It declines modestly with PE in frailty quintiles 1–3 and is nearly constant in frailty quintiles 4 and 5. These patterns arise because frailty and PE are informative about both NH entry risk and mortality risk.

To illustrate how the model adjusts $\{\theta^b_{f,\mathbf{w}}, \theta^g_{f,\mathbf{w}}\}$ to jointly match the observed patterns of NH entry and LTCI takeup, consider PE/wealth quintiles 4 and 5. In these quintiles, LTCI takeup declines with frailty, while the mean probability of NH entry remains roughly constant. The model can generate both patterns only if the dispersion in private information, and thus the severity of adverse selection, increases with frailty within these quintiles. In other words, the dispersion in NH entry probabilities conditional on survival, $\{\theta^g_{f,\mathbf{w}}, \theta^b_{f,\mathbf{w}}\}$, must increase. As a second example, note that in frailty quintiles 4 and 5, LTCI takeup rises with wealth even though mean NH entry probabilities do not vary with PE. To reconcile these two facts, the model requires the dispersion in $\{\theta^g_{f,\mathbf{w}}, \theta^b_{f,\mathbf{w}}\}$ to decline with PE/wealth within these frailty quintiles.

Figure 8 reports how the private LTCI takeup rates in our model compare to their data counterparts. The left panel of the figure reports private LTCI takeup rates of 62–72-year-olds in our HRS data sample and the model by frailty quintile. The right panel of Figure 8 reports private LTCI takeup rates by PE quintile. PE increases from PE quintile 1 to 5. Thus, the individuals with the highest earnings appear in Q5. Observe that private LTCI takeup rates decline with frailty and increase with PE in both the data and the model.

As we mentioned above, we do not use the dispersion in self-reported NH entry probabilities of 65–72-year-old HRS respondents by frailty and PE quintile to identify the variation in private information across risk groups; consequently, the fit of these statistics provides a way to assess the model's fit with the data. Table 2 reports the standard deviation of self-reported (private) NH entry probabilities by frailty and PE quintile in our HRS data and in the model. Observe that the dispersion of private information increases with frailty

Figure 8: LTCI takeup rates by frailty and PE quintiles in the model and US data



Note: Data source is 62–72 year olds in our HRS sample. Frailty and PE increase across quintiles.

Table 2: Standard deviation of self-reported NH entry probabilities by frailty and PE quintile

	Frailty quintile				
	1	2	3	4	5
Data	1.00	1.00	1.03	1.27	1.47
Model	1.00	1.08	1.20	1.32	1.47
	Permanent earnings quintile				
	1	2	3	4	5
Data	1.00	0.92	0.85	0.79	0.76
Model	1.00	0.96	0.91	0.80	0.58

Note: The standard deviations of frailty and PE quintile 1 are normalized to 1. Data values are standard deviations of self-reported probabilities of entering an NH in the next 5 years for HRS respondents ages 65–72, excluding observations where the probability is 0, 100% or 50%. The decline in standard deviation with PE in the data is robust to how we handle these observations.

and decreases with PE in both the data and our model.

Because saving responses are central to the impact of policy reforms on aggregate Medicaid outlays, we assess whether the saving responses generated by our model are consistent with the empirical evidence. Using a quantile regression approach, Maynard and Qiu (2009) estimate the impact of changes in Medicaid generosity on the savings of working-age households with positive net worth in the Survey of Income and Program Participation (SIPP). They examine Medicaid reforms between 1984 and 1993 and measure the effect of an increase in Medicaid eligible dollars, defined as the product of a higher probability of coverage and greater benefits conditional on receipt. They find that a $1000 increase in Medicaid eligible dollars (in 1987 dollars) reduces household wealth by 2.6 percent on average, with a U-shaped response across the wealth distribution (Table 3, second row).

The top row of Table 3 reports the corresponding effects in our model. We increase Medicaid generosity by relaxing the consumption floor, which raises both the probability of receiving benefits and the benefit amount. The mean saving response in our model closely matches the empirical findings: a $1000 (1987 dollars) increase in expected Medicaid benefits lowers retirement wealth by 2.6 percent on average. We also find a U-shaped response across

Table 3: Saving responses to an increase in the Medicaid consumption floor by wealth for those with positive wealth only

	Wealth deciles									
	Mean	10th	20th	30th	40th	50th	60th	70th	80th	90th
Model	-0.026	-0.018	-0.018	-0.024	-0.030	-0.034	-0.042	-0.050	-0.065	-0.038
Maynard and Qiu (2009)	-0.026	-0.003	-0.019	-0.041	-0.051	-0.055	-0.056	-0.050	-0.033	-0.003

Note: The top row reports the change in retirement wealth due to a \$661 (2000 dollars; \$1000 in 1987 dollars) increase in expected Medicaid outlays for agents with positive retirement wealth in the Baseline. The bottom row reports the change in wealth over the first 10 years after a \$1000 (1987 dollars) increase in expected Medicaid dollars for working-age SIPP households with positive net worth, from Table III of Maynard and Qiu (2009).

the wealth distribution, with smaller declines at the bottom and top and larger declines in the middle. As in Hubbard et al. (1995), the increase in the Medicaid consumption floor has a smaller impact on the saving behavior of wealthy individuals who have a low probability of qualifying for Medicaid benefits. In the model, increasing the consumption floor also has a smaller impact on poorer individuals, as they were already relatively well insured by Medicaid in the Baseline.

While we get the same U-shape and an average effect very similar to that of Maynard and Qiu (2009), our model differs in the magnitude of the saving responses across the wealth distribution. Whereas Maynard and Qiu (2009) find the largest declines around the 60th percentile, our model produces the largest effect at the 80th percentile. Moreover, the declines are somewhat larger at the tails in our model. Several factors may explain these differences. First, their estimates capture changes in net worth within 10 years of a reform for working-age households, whereas changes in our model are changes in accumulated wealth at retirement. Second, their analysis concerns expected Medicaid dollars for acute medical expenses, while our model focuses on LTC. As shown by Braun et al. (2017) and De Nardi et al. (2016), higher-wealth households are more likely to receive Medicaid in old age due to LTC expenses, and households in PE quintile 4 (roughly the 60th–80th percentiles of positive wealth) save the most to self-insure against these expenses (Kopecky and Koreshkova, 2014).

5 Results

We present two sets of results. We start by documenting how public insurance, administrative costs, and private information influence takeup rates of different risk groups. Then we use the model to analyze how three distinct reforms impact individuals' welfare, government expenditures, and the functioning of the US private LTCI market.

5.1 How Medicaid, Administrative Costs, and Private Information Contribute to Low Takeup and Coverage

Our analysis of the one-period model suggests that administrative costs and Medicaid may have a large impact on the private LTCI market, but it only considers a single risk group and abstracts from saving behavior. The quantitative model encompasses the full distribution of household types, incorporates endogenous retirement saving decisions, and is calibrated to reproduce key features of US LTCI arrangements. We now use it to assess the quantitative significance of administrative costs, Medicaid, and private information for private LTCI takeup and coverage ratios. Throughout, the coverage ratio is the fraction of NH costs covered by a policy, computed for individuals with positive private coverage.

Figures 9 and 10 report LTCI takeup and coverage ratios by PE quintile for the Baseline and three alternative economies. The No Medicaid economy sets the consumption floor provided by Medicaid to NH entrants, $\underline{c}_{NH}$, to 0.001 of mean permanent earnings or approximately \$350 per year.[24] The No Administrative Costs economy sets the fixed administrative costs to zero and the variable costs, λ, to one. Finally, the Full Information economy assumes that the insurer can directly observe each individual's NH entry probability, θ.

Comparing the Baseline and No Medicaid economies in Figure 9 reveals a large crowding-out effect: removing Medicaid raises private LTCI takeup from 10.8 to 92.3 percent, with increases across all five PE quintiles and even in the top deciles. In the Baseline, there is no basis for trade with private insurers among individuals in PE Q1–Q2, and even at higher PE levels, Medicaid suppresses takeup by providing an outside option that tightens participation constraints. When Medicaid is removed, nearly all individuals in PE Q2–Q4 purchase private LTCI, as do most in PE Q1.[25] An LTC event is very costly, even for individuals with moderate PE, and demand for private insurance is highly inelastic when public insurance is not available. The modest decline in takeup among the top 5 percent is the exception: absent Medicaid, higher after-tax income leads to a larger share of wealthy individuals who choose to self-insure.

As Figure 10 shows, removing Medicaid also affects coverage ratios, though two competing forces partially offset one another, producing a smaller net change than for takeup. First, because Medicaid partially insures individuals against NH entry risk in the Baseline, individuals prefer partial private coverage, and removing that outside option shifts demand toward fuller coverage. Second, the absence of Medicaid leads to higher after-tax income and strengthens precautionary saving motives, both of which increase asset accumulation and reduce the marginal value of additional insurance coverage. This second effect shifts demand toward lower coverage. The relative strength of these forces varies across the wealth distribution: the first dominates for lower-PE individuals, who have limited capacity to self-insure through saving, while the second dominates for those with higher PE. Because removing Medicaid shifts the composition of private insurance purchasers toward lower-PE individuals (Figure 9), the first effect prevails in the aggregate, and average coverage rises from 59.5 percent in the Baseline to 66.0 percent in the No Medicaid economy.

We next compare private LTCI takeup and coverage ratios in the Baseline economy to those in the No Administrative Costs economy. Removing administrative costs leads to a marked increase in takeup, from 10.8 to 60.1 percent. This overall increase is due to a sharp rise in takeup among affluent individuals in PE quintiles 3 through 5, including those in the top 10, 5, and 1 percent of the distribution. In the absence of administrative costs, nearly 100 percent of individuals in these higher PE groups purchase private LTCI.

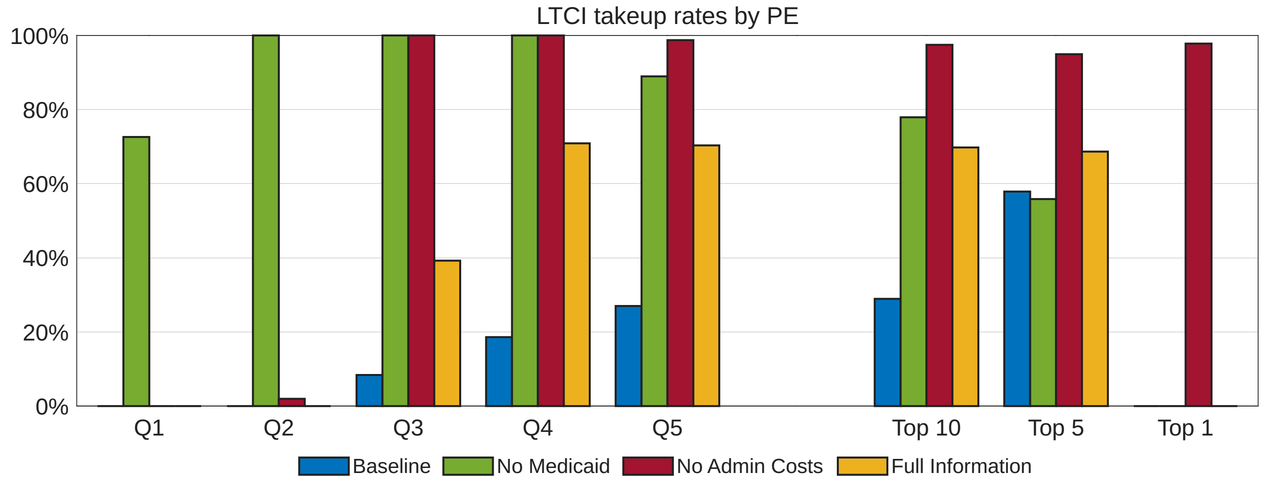
Coverage ratios also rise slightly on average, from 59.5 to 61.9 percent. Conditional on takeup, coverage increases in every PE group except Q3, where the decline reflects a change in

[24] We do not reduce $\underline{c}_{NH}$ to zero because then some individuals would experience negative consumption.

[25] The increase in Q1 is less than 100 percent because the consumption floor is very small but still positive.

Figure 9: LTCI takeup rates in alternative model scenarios

	Baseline	No Medicaid	No Admin Costs	Full Information
LTCI takeup rate (%)	10.8	92.3	60.1	36.1



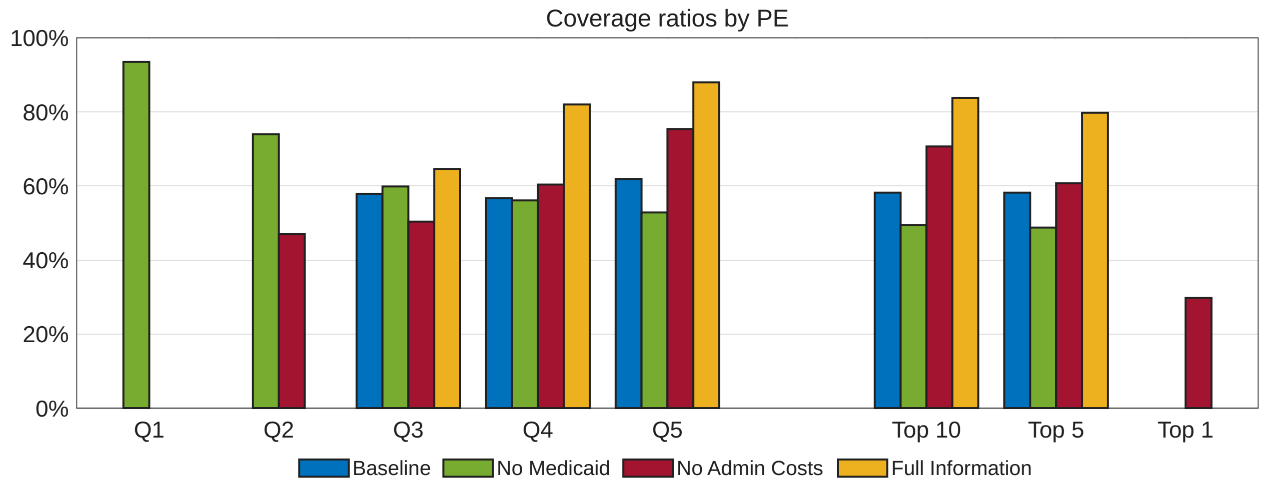
composition rather than a change in behavior. This group experiences the largest increase in takeup when administrative costs are removed, and the newly insured choose lower-coverage policies. The increase in coverage ratios is largest for individuals around the 85th percentile of PE, the group most exposed to LTC risk in the Baseline: their probability of qualifying for Medicaid is low enough that the program provides little implicit insurance, yet they are not wealthy enough to self-insure easily through saving. Below this group, as PE falls and Medicaid eligibility becomes more likely, expected out-of-pocket NH costs decline and so does demand for private coverage. Above it, as PE rises, coverage also declines, but for the opposite reason: greater wealth makes self-insurance an attractive substitute for private insurance.

Finally, removing private information also has a large impact on private LTCI takeup and coverage levels. Under full information, takeup rises to 36.1 percent and average coverage to 80.5 percent. Private insurance takeup rates in PE Q4–Q5 and in the top 10 and top 5 percent groups exceed 60 percent, with coverage ratios of 80 percent or higher. The increases in takeup are due to a large rise in takeup rates among low-risk types, whose takeup goes from 10.8 to 50.2 percent. Since the insurer directly observes each individual's risk type, he no longer has to design menus that satisfy incentive compatibility. As a result, low-risk types no longer cross-subsidize high-risk types or become excluded. Instead, the insurer offers them more coverage with a lower load. High-risk types are offered more coverage as well, but at higher loads, and their denial rates rise, so their takeup falls from 10.9 to 1.7 percent.

The overall message that emerges from these findings is that all three frictions—Medicaid, administrative costs, and private information—depress private insurance markets. Medicaid plays the largest role among lower PE groups, while administrative costs and private information have a larger impact on the demand for private LTCI among more affluent individuals.

Figure 10: LTCI coverage ratios for individuals with positive private coverage in alternative model scenarios

	Baseline	No Medicaid	No Admin Costs	Full Information
Coverage ratio (%)	59.5	66.0	61.9	80.5



5.2 Policy Reforms

We now use our quantitative model to assess the aggregate and distributional consequences of three distinct policy reforms, evaluating each based on how it impacts the fiscal situation of the government, the functioning of the private LTCI market, and individual and average welfare. The ensuing analysis assumes that the government has a balanced budget constraint and adjusts the income tax rate to cover any change in public expenditures. It also assumes that all private insurer profits are distributed to individuals in the top 1 percent of PE, since equity holdings of US companies are well known to be concentrated among high-income individuals. This assumption matters for our welfare conclusions because it means that reform-induced changes in profitability accrue entirely to the most affluent. This group is unique in other respects as well. They are too affluent to qualify for Medicaid and would rather self-insure against LTC risk than be covered by private LTCI. As a result, they prefer reforms that lower their tax bill and/or raise insurer profits.

The No Medicaid Economy. We have seen that Medicaid depresses private LTCI takeup rates (Figure 9) and coverage ratios of private insurance policies (Figure 10). This raises the question of whether individuals would prefer a much smaller public insurance program for LTC risk. We investigate this possibility using the No Medicaid economy discussed in Section 5.1. In this economy, the Medicaid LTC consumption floor is set to 0.001 or approximately \$350 per year.[26] Statistics related to public and private insurance arrangements and welfare for this economy are reported in column two of Table 4.

[26]The consumption floor provided to poor elderly individuals who do not experience an NH event, $\underline{c}_o$, is held fixed at its Baseline value.

Reducing the scale of publicly funded LTCI results in significant fiscal savings. First, the percentage of NH entrants who receive public LTC benefits drops from 49.4 to 5.4 percent, and public expenditures on LTC decline by 88.2 percent relative to the Baseline (column one of Table 4). Second, reduced public coverage of LTC expenses increases precautionary saving, which reduces the fraction of elderly on the non-NH consumption floor, lowering non-Medicaid government expenditures by 86.5 percent. Lower public expenditures on social insurance translate into a lower income tax rate, with tax revenues falling from 0.652 to 0.080 percent of GDP.

The reform results in a large increase in WTP for private LTCI, and takeup rises from 10.8 to 92.3 percent, with near-universal takeup in PE Q2–Q4 and 72.6 percent in Q1 (Section 5.1 and Table 4). The insurer responds on two margins. It raises loads on risk groups it already insured, and it extends coverage to lower-PE groups it previously rejected. Loads on these newly insured groups are even higher, since these individuals have neither Medicaid nor the means to self-insure. Both margins push up the average load, which rises from 0.410 to 0.556, while the fraction of NH costs covered by an average policy increases from 59.5 to 66.0 percent. Aggregate profits rise from 0.24 to 31.4 percent of premium revenue, and the gains are highly uneven across the PE distribution. Profits are highest in PE Q1, at 49.4 percent of premium revenue, a group on which the insurer earned nothing in the Baseline because takeup was zero. They rise more modestly at higher PE levels, reaching roughly 9 percent of premium revenue in Q5, because the option to self-insure limits the insurer's ability to extract rents from more affluent individuals.

Despite lower taxes and a much larger private market, ex ante welfare of a newborn is lower in the No Medicaid economy. Consumption there would have to rise by 23 percent to match Baseline welfare (a compensating variation of -23.0 percent).[27,28] Total coverage against LTC risk does increase: average consumption of NH entrants is 17.9 percent lower than that of non-entrants, compared with 34.6 percent in the Baseline. But this coverage is purchased on terms that leave the poorest far worse off. The compensating variation in PE Q1 is -45.3 percent, reflecting the loss of free Medicaid benefits and the high loads these individuals now face. Individuals in PE Q4–Q5 prefer the No Medicaid economy, since they were unlikely to qualify for Medicaid in the Baseline and benefit from lower taxes when it is scaled back. The top 1 percent of the PE distribution gains the most due to a combination of lower taxes and higher dividends from the private insurer.

The Universal Medicaid Economy. The No Medicaid economy removes the demand-side friction but leaves the supply-side frictions in place, and welfare falls. This raises the opposite question: whether individuals would prefer a public program large enough to bypass the private market altogether. A universal public insurer still incurs administrative

[27] Compensating variations are reported with the sign reversed, so that negative values correspond to welfare losses.

[28] This finding is consistent with Braun et al. (2017), who show in a model with no private LTCI but richer end-of-life dynamics—where individuals can enter a nursing home as private payers and later exhaust their wealth—that Medicaid is highly valued even by the affluent. Our consumption demand shock captures this spend-down risk parsimoniously. However, adding more periods at the end of life to our current model could make it easier to build a consensus behind means-tested public LTC insurance because means-tested Medicaid would insure more of the tail risk associated with persistent realizations of high-marginal-utility states.

Table 4: Welfare, fiscal aggregates, and private LTCI market outcomes in the Baseline and three counterfactual economies

Scenario	Baseline	No Medicaid	Universal Medicaid	Medicaid Primary
Welfare (newborn)	-2.757	-3.390	-2.699	-2.746
Compensating variations (%)	–	-22.96	2.101	0.415
Average:				
Consumption of NH entrants relative to non-entrants (%)	-34.63	-17.90	0.000	-31.92
Medicaid outlays (% change from Baseline)	–	-88.21	144.5	7.297
Non-NH-related outlays (% change from Baseline)	–	-86.51	-48.29	-1.546
Govt tax revenue (% of GDP)	0.652	0.080	1.307	0.686
NH entrants on Medicaid (%)	49.44	5.421	100.0	55.91
Profits/Premium revenue (%)	0.244	31.38	–	20.95
LTCI takeup rate	0.108	0.923	0.000	0.618
LTCI coverage ratio conditional on takeup	0.595	0.660	–	0.244
Load	0.410	0.556	–	0.648
Compensating Variations (%) by PE Quintile				
1	–	-45.31	0.446	-0.002
2	–	-12.46	3.527	0.253
3	–	-2.614	4.654	1.515
4	–	0.169	2.799	0.864
5	–	1.989	0.338	0.263
High PE				
top 10	–	2.981	-0.420	0.230
top 5	–	4.569	-1.076	0.382
top 1	–	16.39	-2.159	3.166
Profits/Premium revenue (%) by PE Quintile				
1	–	49.37	–	–
2	–	38.10	–	23.37
3	0.057	22.84	–	18.59
4	0.106	16.83	–	22.29
5	0.395	9.349	–	20.76
High PE				
top 10	0.760	3.943	–	19.23
top 5	0.760	3.014	–	18.96
top 1	–	–	–	–
LTCI takeup rate by PE Quintile				
1	0.000	0.726	0.000	0.000
2	0.000	1.000	0.000	0.332
3	0.084	1.000	0.000	1.000
4	0.186	1.000	0.000	1.000
5	0.270	0.890	0.000	0.759
High PE				
top 10	0.289	0.779	0.000	0.517
top 5	0.579	0.559	0.000	0.167
top 1	0.000	0.000	0.000	0.000
LTCI coverage ratio conditional on takeup by PE Quintile				
1	–	0.935	–	–
2	–	0.740	–	0.161
3	0.579	0.599	–	0.175
4	0.567	0.561	–	0.258
5	0.619	0.528	–	0.351
High PE				
top 10	0.582	0.494	–	0.350
top 5	0.582	0.488	–	0.501
top 1	–	–	–	–

Note: Compensating variations are the percentage change in consumption in the counterfactual economy required to make a newborn indifferent between the counterfactual and the Baseline. We report them as negative, so that negative values correspond to welfare losses. A reported value of -23, for example, means that consumption in the counterfactual must rise by 23 percent to match Baseline welfare. The LTCI coverage ratio is the average indemnity divided by the medical and nursing cost of an NH stay (ι/m) for individuals with positive private coverage.

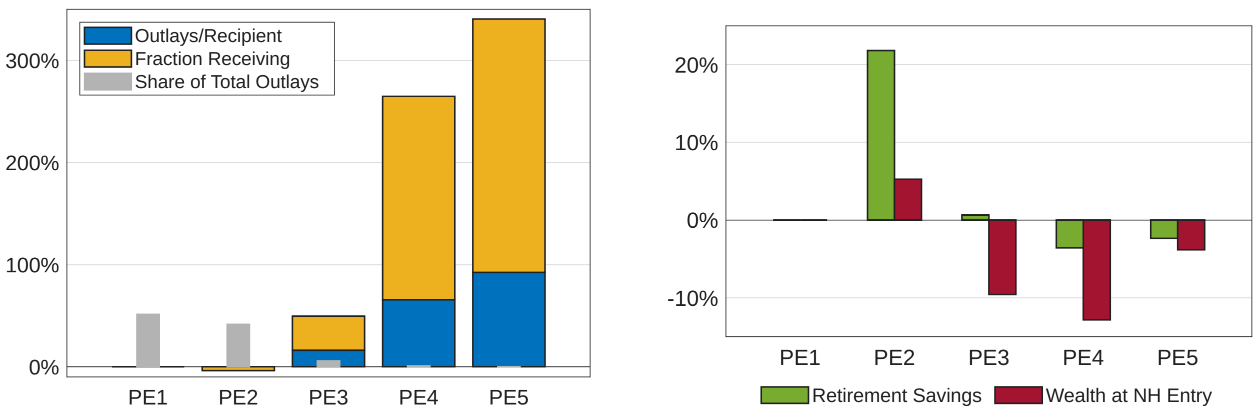
costs, but it does not pay broker commissions or conduct medical underwriting, and it has no need to screen since coverage is not a choice. We investigate this possibility using an economy in which the medical and nursing expenses associated with an NH stay are fully covered by universal public insurance and the public insurer incurs the same per-recipient administrative cost, γ_{gov}, as Medicaid does in the Baseline. Statistics for this economy are reported in column three of Table 4.

In the Universal Medicaid economy, the private LTCI market is dormant and government LTC expenditures are 145 percent higher than in the Baseline, equivalent to approximately 1.2 percent of GDP, or about 20 percent of US Social Security outlays in 2023. This increase is partially offset by a 48 percent decline in non-NH-related public expenditures and, on net, tax revenue roughly doubles, from 0.652 to 1.307 percent of GDP. The decline in non-NH-related expenditures is driven by a fall in the fraction of lower-middle-income individuals on the non-NH consumption floor. For these individuals (who are primarily in PE Q2), Medicaid's means test and secondary-payer status jointly impose a strong implicit tax on saving in the Baseline. Higher wealth reduces their Medicaid benefits, and because private insurance is largely redundant with Medicaid, remaining Medicaid-eligible is the only way to be insured. When Medicaid is universal, this tax disappears and they save more for retirement. As a result, fewer end up on the non-NH consumption floor. As we discuss in the Medicaid Primary economy section below, part of this saving distortion is attributable to the secondary-payer provision alone.

Welfare of a newborn is 2.1 percent higher than in the Baseline, and the gain comes with a large redistribution from high- to low- and middle-income individuals. Universal coverage of the medical component of NH care allows individuals to equate old-age consumption across the NH and non-NH states, and compensating variations are positive in all five PE quintiles. Individuals in PE Q3 benefit most, with a compensating variation of 4.7 percent. The gain in PE Q1 is only 0.45 percent, since public insurance of LTC risk is similar for these individuals in both economies while some now pay higher income taxes. Among the most affluent, however, the picture reverses: all three high PE groups prefer the Baseline. They are relatively healthy and have the resources to self-insure, and they would rather not finance a program whose primary beneficiaries are lower- and middle-class individuals. The top 1 percent experiences the largest loss, with the highest tax burden, no dividend income, and a compensating variation of -2.2 percent.

The Medicaid Primary Economy. The two previous counterfactuals illustrate that coverage against LTC risk can be increased by either reducing Medicaid's crowding-out effect on private insurance or increasing the extent of public coverage and forgoing the private market. But they also illustrate that a major obstacle to such reforms is disagreement about the scale of public insurance. Reducing the safety net provided by Medicaid raises WTP for private insurance and increases the welfare of affluent individuals, but imposes large welfare losses on the poor and middle class. Universal public insurance does the reverse: it produces broad-based gains across all five PE quintiles, but reduces the welfare of the top 10, 5, and 1 percent, who are less exposed to LTC risk and bear the higher taxes. We now show that making Medicaid the primary payer while retaining its means tests bridges this gap. In the Medicaid Primary economy, private insurance indemnities no longer reduce Medicaid

Figure 11: Changes in government outlays, retirement savings, and wealth at NH entry by PE when Medicaid is made the primary payer



(a) Government outlays

(b) Retirement savings and wealth at NH entry

Note: Changes in government outlays are split into changes in outlays per recipient (blue) and changes in the share receiving transfers (yellow). In PE quintile 2, outlays per recipient rise while the recipient share falls. The rise in outlays per recipient offsets 43 percent of the decline, while the fall in the recipient share accounts for 143 percent of it. Gray bars show each quintile's share of total outlays in the Baseline.

transfers—that is, Medicaid transfers are determined by equation (18) instead of equation (17). Premiums, however, continue to enter the means test, so these payments still reduce resources at NH entry and thereby raise the Medicaid transfer.[29]

Making Medicaid the primary payer has a large positive impact on the functioning of the private insurance market. The average LTCI takeup rate increases from 10.8 percent in the Baseline to 61.8 percent in the Medicaid Primary scenario (column 4 of Table 4), and the increases are broadly based across the PE distribution. Private insurance takeup rates increase in PE Q2–Q5 and in the top 10 percent. As we explain in Section 3.1, the secondary-payer provision of Medicaid depresses LTCI takeup because private coverage is redundant in states of nature where individuals satisfy the Medicaid means test. Making Medicaid the primary payer eliminates this friction.

Insurers respond to the new public policy environment by offering contracts with less coverage, and the average coverage ratio declines from 59.5 to 24.4 percent. Coverage ratios fall because individuals can now top up Medicaid benefits with a small private insurance policy. Low-coverage policies allow them to increase their total coverage if they qualify for Medicaid benefits, while also providing valuable insurance in states of nature where their resources exceed the Medicaid means-test threshold. The decline in the average coverage ratio comes partly from existing policyholders and partly from new ones. Coverage ratios of previously insured individuals in PE Q3–Q5 fall by an average of 33 percentage points. Meanwhile, takeup in PE Q2 rises from zero to 33.2 percent, and this group obtains the lowest coverage ratio of any group (16.1 percent). Their private insurance coverage is low because Medicaid covers a larger share of their losses than it does for higher-PE individuals. Even though coverage levels of private insurance are lower when Medicaid is primary, insurer profitability increases in all insured risk groups. This is consistent with the intuition from the

[29]This creates an incentive to purchase private insurance partly in order to qualify for Medicaid. We have experimented with excluding premiums from the means test and found the effect to be small.

one-period model: primary-payer Medicaid lowers marginal WTP by reducing the expected size of the loss, but overall WTP rises because participation constraints are relaxed.

Households pair these smaller insurance policies with a second adjustment: they change how much they save (Figure 11b). Individuals in PE Q4–Q5, as well as those in PE Q3 above the 51st percentile of the PE distribution, reduce their saving for retirement (green bars) and purchase private LTCI policies with low coverage levels at the start of retirement. This strategy reduces their wealth at the NH entry stage (red bars), which is when the Medicaid asset test is applied, and increases their overall coverage against NH risk. In contrast, individuals in PE Q2, along with those in PE Q3 below the 51st percentile, increase their retirement saving and therefore have higher wealth at NH entry. As explained in the discussion of the Universal Medicaid economy above, the secondary-payer provision reduces the incentives of lower-middle-income individuals to save for retirement in order to purchase private LTCI, and removing it lowers Medicaid's overall implicit tax on their saving. Their higher saving is notable because the means test is unchanged: it isolates the contribution of the secondary-payer provision to the implicit tax on saving.

The strategic response of individuals in PE Q3–Q5 to the new policy increases government outlays. Medicaid recipiency rates and Medicaid expenditures per recipient increase in PE Q3–Q5 when Medicaid is primary (Figure 11a).[30] Higher Medicaid expenditures on these groups are partially offset by lower government expenditures on individuals in the PE Q2 group. In comparison to the Baseline, this group now has more wealth at the date of NH entry and lower transfer recipiency rates. Still, they benefit from higher total coverage (private plus public) of NH risk and their compensating variation is positive in the Medicaid Primary scenario. Because the share of this group in total government outlays is large compared with PE Q3–Q5 (Figure 11a), aggregate public expenditures increase by only 5.3 percent.[31]

With a compensating variation of 0.415 percent, welfare of a newborn is higher in the Medicaid Primary scenario than in the Baseline. The size of the welfare increase is smaller than in the Universal Medicaid scenario, but that scenario exhibits considerable disagreement between high PE and other PE groups. In the Medicaid Primary scenario, no compensating transfers would be needed to build consensus, because essentially no group loses. Welfare increases in PE Q2–Q5 as well as in the three high PE groups in Table 4. The only group that experiences a decline in welfare is PE Q1, and the magnitude of the decline is small (the compensating variation is -0.002 percent). Their safety net is preserved, but their taxes are marginally higher and they do not have the resources to top up their Medicaid coverage with private insurance. The other PE groups, including the top 10 and top 5 percent PE groups, benefit from higher total insurance coverage against LTC risk on attractive terms overall. The benefits of easier access to public insurance and the ability to top up Medicaid with private coverage more than offset both the higher loads on their private policies and their higher taxes. The top 1 percent PE group still prefers to self-insure LTC risk, but they benefit from higher dividend income (insurer profits increase) and this benefit exceeds the costs of their higher tax bills.

[30] Non-NH-related government outlays are unchanged in PE Q3–Q5 and decline slightly in PE Q2. Nearly all of the variation in Figure 11a reflects changes in Medicaid outlays.

[31] This number reflects a 7.3 percent increase in Medicaid outlays and a 1.5 percent decline in non-NH-related government outlays (Table 4). Medicaid accounts for roughly 77 percent of government outlays in the Baseline.

Robustness and Discussion. Perhaps our most interesting result is that making Medicaid the primary payer is nearly Pareto-improving: welfare increases for most individuals, and the decline in PE Q1 is negligible. We believe this result is robust to reasonable variations in the calibration. Medicaid LTCI benefits are means-tested, which keeps the program small and well targeted, so the tax cost of the reform is modest. At the same time, even relatively affluent individuals face some risk of having low resources when an LTC shock arrives, and Medicaid benefits are highly valued in this high-marginal-utility state.[32] Aggregate government expenditures rise only slightly under the reform because higher outlays on middle- and higher-PE groups are largely offset by lower outlays on PE Q2, whose share of Baseline government spending is large. The modest fiscal cost, combined with individuals' new ability to affordably top up public benefits with private coverage, is what allows welfare to rise across nearly the entire PE distribution.

Other reforms could produce even larger ex ante welfare gains. For instance, the welfare of a newborn is higher in our Universal Medicaid scenario than under Medicaid Primary. However, that reform generates significant disagreement, and building a consensus behind it would require specifying a way to tax the middle-class winners and compensate the affluent losers. We leave the analysis of reforms made Pareto-improving through tax–transfer schemes to future research.

We find that making Medicaid the primary payer has a large impact on private LTCI takeup. In contrast, Brown and Finkelstein (2008) argue that this reform would have a small impact if Medicaid's means tests are retained. They reason that private insurance demand would continue to be low because private insurance would preserve wealth when an LTC need arises, making it harder for households to satisfy the Medicaid asset test as they spend down their resources over a care spell. Our three-period model abstracts from these spend-down dynamics, so we cannot evaluate their channel directly. Our results suggest, however, that two margins absent from their fixed-contract, exogenous-saving framework counteract their argument. First, households adjust their retirement saving: individuals in PE Q3–Q5 save less when Medicaid is primary and enter the NH-entry stage with less wealth, raising their likelihood of qualifying for Medicaid benefits. Consequently, Medicaid outlays in PE Q3–Q5 rise significantly despite the large increase in LTCI takeup. Second, insurers optimally adjust contracts: policies offered under the reform insure more individuals but cover a much smaller share of the loss than Baseline policies. As a result, privately insured individuals who do not qualify for Medicaid pay a sizable share of LTC expenses out of pocket. These same forces would operate in a model with multiple periods of spend-down dynamics: lower saving and smaller contracts would reduce retirement wealth and leave assets running down toward the test threshold, so private insurance would slow, but not prevent, the spend-down to Medicaid eligibility that Brown and Finkelstein emphasize. We therefore expect the takeup response to remain substantial even in a richer model of LTC need.

We have modeled the LTC event as an expenditure shock and thereby abstracted from moral hazard in claiming. One way to introduce moral hazard into our model would be to allow for state-dependent preferences related to health status, as in Ameriks et al. (2020). Copays and other partial coverage contracts are standard ways to mitigate moral hazard,

[32] For instance, Medicaid recipiency rates and outlays per recipient exhibit a small increase in the top 5 percent of the PE distribution when Medicaid is primary.

and partial coverage is a feature of both public and private US insurance arrangements that our Baseline economy reproduces. Under the Medicaid Primary reform, coverage remains far from complete: consumption of NH entrants is 31.9 percent below that of non-entrants, little changed from 34.6 percent in the Baseline (Table 4). Individuals thus continue to bear substantial costs at the margin, limiting the scope for moral hazard. Our model also reproduces the fact that affluent NH entrants spend more on their care than poor entrants, but this pattern does not reflect moral hazard. NH costs in the model have a medical and nursing component, which insurance partially covers, and an amenity component, which individuals choose and pay for out of their own resources. Wealthier entrants purchase more amenities because they can afford them at full marginal cost, not because insurance subsidizes their consumption. Thus moral hazard on the amenity margin is absent by construction, and partial coverage would limit its scope on the claiming margin. We therefore do not expect our results to change much were we to model state-dependent preferences.

Perhaps the biggest omission from our analysis is that we have abstracted from bequest motives and from informal care provided by families. Lockwood (2018) finds that modeling a warm glow bequest motive in conjunction with LTC risk accounts for the saving patterns of the elderly. Braun et al. (2017), in contrast, abstract from warm glow bequests and account for the saving patterns of the elderly with a richer model of LTC risk. Barczyk and Kredler (2021) propose a theory of two-sided altruism between a parent and a child, and Barczyk et al. (2022) find that homeownership helps the elderly pre-commit to compensating a caregiving child with a bequest. Mommaerts (2025) finds that the availability of informal care from family members lowers demand for private LTCI, and that extending insurance to pay cash benefits for informal care would raise insurance demand and family welfare while reducing Medicaid spending. Relatedly, Ko (2022) shows that when insurance covers only formal care, private information about the likelihood of receiving family care becomes a source of adverse selection. Our model implicitly assumes that insurance contracts cannot cover informal care, so informal care by family members is one interpretation of the private information underlying adverse selection in our framework. A related simplification is that Medicaid in our model covers only NH care. Medicaid spending on home and community-based services (HCBS) has grown substantially in recent decades. Modeling HCBS jointly with informal family care is a natural extension, since the two are close substitutes. Building on these frameworks to jointly model private LTCI, public LTC insurance including HCBS, and informal insurance arrangements provided by families and the community is a challenge we leave to future work.

Finally, we have analyzed the broad-based welfare gains from making Medicaid primary. This is not the only way to relax the secondary-payer provision of Medicaid in our model, however. For example, allowing households to exempt assets from the Medicaid asset test on a one-for-one basis with payouts from their private insurance policies also relaxes the secondary-payer provision, as we explain in Braun and Kopecky (2024). LTCIP policies, which are now offered in most US states, have this provision. There are, however, other distinctions between LTCIP and our proposal to make Medicaid the primary payer. Private insurance still pays first under LTCIP, and there is some uncertainty about whether and in what circumstances assets exempted from the Medicaid asset test can be used to increase amenities for Medicaid recipients. In addition, the LTCIP program is not available in all US states, and participating individuals must still satisfy the Medicaid income test and comply with Medicaid rules on the treatment of the primary residence in the asset test.[33] Minimum coverage requirements for qualifying LTCIP policies also constrain demand. In our view, a simpler way forward is to make Medicaid the primary payer, maintain its asset test, and leave individual choices of private LTCI policy unrestricted.

6 Conclusion

The United States and other advanced economies are aging, and with aging comes higher demand for LTC services. Yet private LTCI markets are shrinking, and most Americans pay for expensive LTC episodes out of pocket. In this paper, we used a quantitative structural model of public and private insurance in the US to consider reforms to LTC arrangements that increase total coverage against LTC risk.

Our results explain why it is difficult to build a consensus behind large-scale reductions or expansions of the public LTC benefits provided by Medicaid. Reducing Medicaid benefits increases coverage against LTC risk and raises the welfare of affluent individuals, but imposes large welfare losses on poor and middle-class individuals, who are the main beneficiaries of Medicaid. Universal public insurance also increases coverage: lower- and middle-income individuals benefit, but the welfare of the rich falls because they are less exposed to LTC risk and bear the brunt of the higher taxes required to fund it. Although individuals in our model have very different views about the appropriate scale of Medicaid, we show that a reform to its structure generates broad support: making Medicaid the primary payer preserves the safety net for impoverished elderly individuals, revitalizes the private LTCI market, and increases total coverage against LTC risk at a modest fiscal cost, raising the welfare of nearly all Americans.

References

Accountability Act (1996): "Health Insurance Portability and Accountability Act of 1996," *Public Law*, 104, 191.

Aizawa, N. and A. Ko (2025): "Dynamic Pricing Regulation and Welfare in Insurance Markets," *Journal of Political Economy*, 133, 2371–2413, https://doi.org/10.1086/735512.

American Association for Long-Term Care Insurance (2024): "2024 Long-term Care Insurance Statistics Data Facts," Retrieved from https://www.aaltci.org/long-term-care-insurance/learning-center/ltcfacts-2024.php.

Ameriks, J., J. Briggs, A. Caplin, M. D. Shapiro, and C. Tonetti (2020): "Long-Term-Care Utility and Late-in-Life Saving," *Journal of Political Economy*, 128, 2375–2451, https://doi.org/10.1086/706686.

[33] Alaska, Massachusetts, Mississippi, Utah, and Vermont do not currently participate, and California does not offer reciprocity benefits to holders of private LTCI from other states.

Barczyk, D., S. Fahle, and M. Kredler (2022): "Save, Spend, or Give? A Model of Housing, Family Insurance, and Savings in Old Age," *The Review of Economic Studies*, 90, 2116–2187, https://doi.org/10.1093/restud/rdac081.

Barczyk, D. and M. Kredler (2021): "Blast from the past: The altruism model is richer than you think," *Journal of Economic Theory*, 198, 105375, https://doi.org/10.1016/j.jet.2021.105375.

Bergquist, S., J. Costa-Font, and K. Swartz (2018): "Long-term care partnerships: Are they fit to purpose?" *The Journal of the Economics of Ageing*, 12, 151–158, https://doi.org/10.1016/j.jeoa.2018.03.006.

Braun, R. A. and K. Kopecky (2024): "Reforming the US Long-Term Care Insurance Market," Prepared for Pension Research Council "Household Retirement Saving, Investment, and Decumulation: New Lessons from Behavioral Finance.".

Braun, R. A., K. Kopecky, and T. Koreshkova (2017): "Old, Sick, Alone and Poor: A Welfare Analysis of Old-Age Social Insurance Programmes," *Review of Economic Studies*, 84, 580–612, https://doi.org/10.1093/restud/rdw016.

——— (2019): "Old, frail, and uninsured: Accounting for features of the U.S. long-term care insurance market," *Econometrica*, 87, 981–1019, https://doi.org/10.3982/ECTA15295.

Brown, J. R. and A. Finkelstein (2007): "Why is the Market for Long-Term Care Insurance So Small?" *Journal of Public Economics*, 91, 1967–1991, https://doi.org/10.1016/j.jpubeco.2007.02.010.

——— (2008): "The Interaction of Public and Private Insurance: Medicaid and the Long-Term Care Insurance Market," *American Economic Review*, 98, 1083–1102, https://doi.org/10.1257/aer.98.3.1083.

——— (2011): "Insuring Long-Term Care in the United States," *Journal of Economic Perspectives*, 25, 119–42, https://doi.org/10.1257/jep.25.4.119.

Capatina, E. and M. Keane (2026): "Health Shocks, Health Insurance, Human Capital, and the Dynamics of Earnings and Health," *Journal of Political Economy*, 134, 1714–1774, https://doi.org/10.1086/739831.

Chade, H. and E. E. Schlee (2020): "Insurance as a Lemons Market: Coverage Denials and Pooling," *Journal of Economic Theory*, 189, 105327, https://doi.org/10.1016/j.jet.2020.105085.

Conesa, J. C., D. Costa, P. Kamali, T. J. Kehoe, V. M. Nygard, G. Raveendranathan, and A. Saxena (2018): "Macroeconomic effects of Medicare," *The Journal of the Economics of Ageing*, 11, 27–40, https://doi.org/10.1016/j.jeoa.2017.06.002.

Costa-Font, J. and N. Raut (2025): "Long-Term Care Partnership Effects on Medicaid and Private Insurance," *Health Economics*, 34, 1171–1187, https://doi.org/10.1002/hec.4949.

De Nardi, M., E. French, and J. B. Jones (2016): "Medicaid Insurance in Old Age," *American Economic Review*, 106, 3480–3520, https://doi.org/10.1257/aer.20140015.

Eaton, R. (2016): "Long-Term Care Insurance: The SOA Pricing Project," Society of Actuaries.

Favreault, M. and J. Dey (2022): "Long-Term Services and Supports for Older Americans: Risks and Financing, 2022," Tech. rep., US Department of Health and Human Services.

Genworth Financial (2024): "Genworth Cost of Care Survey," Website, annual survey of long-term care costs across the United States.

Goda, G. S. (2011): "The impact of state tax subsidies for private long-term care insurance on coverage and Medicaid expenditures," *Journal of Public Economics*, 95, 744 – 757, https://doi.org/10.1016/j.jpubeco.2010.11.001.

Gruber, J. (2022): *Public Finance and Public Policy*, New York: Worth Publishers, 7th ed.

Gruber, J. and K. M. McGarry (2023): "Long-term Care in the United States," Working Paper 31881, National Bureau of Economic Research.

Hendren, N. (2013): "Private Information and Insurance Rejections," *Econometrica*, 81, 1713–1762, https://doi.org/10.3982/ECTA10931.

Hendricks, L. (2001): "Bequests and Retirement Wealth in the United States," Working Paper.

Hubbard, R. G., J. Skinner, and S. P. Zeldes (1995): "Precautionary Savings and Social Insurance," *Journal of Political Economy*, 103, 360–399, https://doi.org/10.1086/261987.

Hurd, M. D., P.-C. Michaud, and S. Rohwedder (2017): "Distribution of Lifetime Nursing Home Use and of Out-of-Pocket Spending," *Proceedings of the National Academy of Sciences*, 114, 9838–9842, https://doi.org/10.1073/pnas.1700618114.

Joyce, M. and A. Singh (2025): "Income uncertainty, precautionary wealth, and social insurance," *European Economic Review*, 175, 105003, https://doi.org/10.1016/j.euroecorev.2025.105003.

Ko, A. (2022): "An Equilibrium Analysis of the Long-Term Care Insurance Market," *Review of Economic Studies*, 89, 1993–2025, https://doi.org/10.1093/restud/rdab075.

Kopecky, K. and T. Koreshkova (2014): "The Impact of Medical and Nursing Home Expenses on Savings," *American Economic Journal: Macroeconomics*, 6, 29–72, https://doi.org/10.1257/mac.6.3.29.

Lewis, S., J. Wilkin, and M. Merlis (2003): "Regulation of Private Long-Term Care Insurance: Implementation Experience and Key Issues," Tech. rep., Henry J. Kaiser Family Foundation.

Lin, H. and J. Prince (2013): "The Impact of the Partnership Long-Term Care Insurance Program on Private Coverage," *Journal of Health Economics*, 32, 1205–1213, https://doi.org/10.1016/j.jhealeco.2013.09.010.

Lockwood, L. M. (2018): "Incidental Bequests and the Choice to Self-Insure Late-Life Risks," *American Economic Review*, 108, 2513–2550, https://doi.org/10.1257/aer.20141651.

Maynard, A. and J. Qiu (2009): "Public insurance and private savings: who is affected and by how much?" *Journal of Applied Econometrics*, 24, 282–308, https://doi.org/10.1002/jae.1039.

Mitchell, O. S., J. M. Poterba, M. J. Warshawsky, and J. R. Brown (1999): "New Evidence on the Money's Worth of Individual Annuities," *American Economic Review*, 89, 1299–1318, http://doi.org/10.1257/aer.89.5.1299.

Mommaerts, C. (2025): "Long-Term Care Insurance and the Family," *Journal of Political Economy*, 133, 1–52, https://doi.org/10.1086/732887.

National Association of Insurance Commissioners (2017): "Long-Term Care Insurance Model Regulation," Model Regulation #641, https://content.naic.org/sites/default/files/model-law-641.pdf.

Pashchenko, S. and P. Porapakkarm (2017): "Work Incentives of Medicaid Beneficiaries and the Role of Asset Testing," *International Economic Review*, 58, 1117–1154, https://doi.org/10.1111/iere.12247.

Poterba, J. M., S. F. Venti, and D. A. Wise (2011): "Family Status Transitions, Latent Health, and the Post-Retirement Evolution of Assets," in *Explorations in the Economics of Aging*, University of Chicago Press: D. Wise, https://doi.org/10.7208/chicago/9780226903385.003.0002.

Stiglitz, J. (1977): "Monoploy, Non-linear Pricing and Imperfect Information: The Insurance Market," *The Review of Economic Studies*, 44, 407–430, https://doi.org/10.2307/2296899.

Thau, C., N. Gaspar, and C. Giese (2024): "2024 Milliman Long Term Care Insurance Survey," *Broker World*, https://brokerworldmag.com/2024-milliman-long-term-care-insurance-survey/.

US Department of the Treasury (2020): "Long-Term Care Insurance: Recommendations for Improvement of Regulation," https://home.treasury.gov/system/files/136/Report-Federal-Interagency-Task-Force-Long-Term-Care-Insurance.pdf.

Wellschmied, F. (2021): "The welfare effects of asset mean-testing income support," *Quantitative Economics*, 12, 217–249, https://doi.org/10.3982/QE1241.

7 Appendix

7.1 Monopoly versus Competition

An equilibrium in the contract market may fail to exist under perfect competition. In contrast, with a monopolist insurer, a unique optimal contract always exists. To illustrate the source of this divergence, Figure 12 compares the contracting outcomes for the same calibration under competition and monopoly.

The key difference between the competitive market and the monopolist is that in the competitive market, the optimal menu of contracts must earn zero profits. For such a menu to constitute an equilibrium, no alternative contract menu can exist that both (i) earns positive profits and (ii) is strictly preferred by both private information types. If such an alternative menu exists, an entrant can profitably offer the menu and attract both types, undermining the original zero-profit menu. Since this alternative contract earns positive profits, it cannot be part of a competitive equilibrium—implying that no competitive equilibrium exists.

In Figure 12a, the points Hce and Lce represent the optimal zero-profit contracts. However, contracts located above the dashed green line and below the indifference curve of the low-risk type yield positive profits and are preferred by both types. Pooling contracts in this region sufficiently increase insurer profits from low-risk types to offset losses incurred from attracting high-risk types. The existence of these profitable and attractive pooling contracts renders the zero-profit menu $\{\mathsf{Hce}, \mathsf{Lce}\}$ unsustainable as a competitive equilibrium.

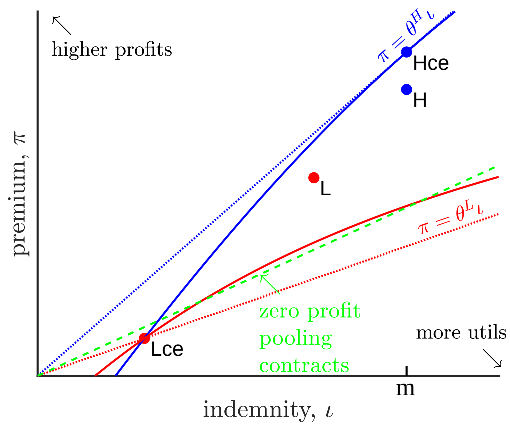
The likelihood of such pooling contracts arising is higher when the cost of pooling for low-risk types is low—either because the proportion of high-risk types is small, or because the incremental risk associated with high-risk types is modest. In these cases, insurers can profit by offering contracts with more generous coverage to low-risk types, since the cost of also attracting high-risk types is small.

By contrast, under monopoly (Figure 12b), no pooling contract exists that is strictly preferred by both types relative to the monopolist's optimal menu $\{\mathsf{H}, \mathsf{L}\}$ and earns higher profits. The only pooling contracts that yield higher profits lie northwest of the dashed green line but make the low-risk type worse off. The monopolist, by fully extracting consumer surplus subject to the participation and incentive-compatibility constraints of the individuals, leaves no room for further profitable deviations and, hence, the equilibrium always exists.

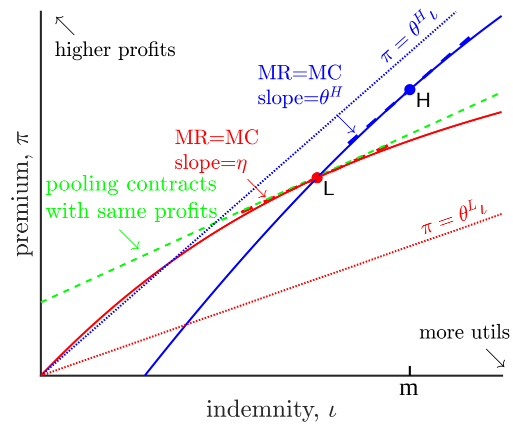
7.2 Calibration

Table 5 reports the calibrated values of the main model parameters. More details on our calibration strategy can be found in Braun et al. (2019).

Figure 12: Optimal contracts when the market is competitive



(a) Competitive Market



(b) Monopoly

Note: Points H and L are the optimal contracts for type-H and type-L individuals under monopoly. Points Hce and Lce are the optimal zero-profit contracts under competition. The parameterization used to create both figures is $\sigma = 1.1$, $\psi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w + a = 1.0$, $m = 0.8$, $\lambda = 1$, and $\underline{c}_{NH} = 0$.

Table 5: Model parameters

Description	Parameter	Value
Risk aversion coefficient	σ	2
Preference discount factor	β	0.94
Retirement preference discount factor	α	0.20
Interest rate (annualized)	r	0.00
Frailty distribution	f	BETA(1.54,6.30)
Young endowment distribution	w_y	$\ln(w_y) \sim \mathcal{N}(-0.32, 0.64)$
Copula parameter	ρ_{f,w_y}	-0.29
Demand shock distribution	κ	$1-\kappa \sim$ truncated log-normal
Demand shock mean	μ_κ	0.6
Demand shock standard deviation	σ_κ	0.071
Fraction of good types	ψ	0.709
NH cost	m	0.0931
Insurer's variable cost of paying claims	λ	1.195
Insurer's fixed cost of paying claims	γ	0.019
Medicaid consumption floor	$\underline{c}_{NH}$	0.01855
non-NH consumption floor	$\underline{c}_o$	0.01855