Welfare-enhancing public and private insurance arrangements for long-term care risk*

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Abstract

Long-term care is costly. About one in three Americans will experience a stay in a nursing home that exceeds 100 days during their lifetime, and about one in ten will incur out-of-pocket expenses of $200,000 or more. Surprisingly, only about 10% of retirees have private long-term care insurance. We consider alternative strategies for reforming US long-term care insurance arrangements in a quantitative structural model of the market. We find that individuals disagree about the scale of public insurance provided by Medicaid. Yet, despite differences in income, wealth, and LTC risk exposure, they agree that the secondary payer provision of Medicaid should be removed. Allowing people to top off means-tested Medicaid benefits with private long-term care insurance preserves the safety net provided by Medicaid while stimulating the private insurance market. Social welfare increases, and public expenditures on Medicaid fall.

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

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

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1 Introduction

Long-term care (LTC) risk is significant and costly. About one in three Americans will experience a stay in a nursing home that exceeds 100 days during their lifetime, and about one in ten will incur out-of-pocket expenses of $200,000 or more. Given the risk and cost of an adverse event, one would expect that the private market for long-term care insurance (LTCI) would be large and cover a large fraction of nursing home (NH) expenses. This is not the case. Premia are high, denials due to pre-existing conditions are common, and coverage of the insured is incomplete. Only about 10% of individuals ages 62 and over have LTCI, and the size of the private insurance market has been declining steadily over the past twenty years.

This project evaluates alternative LTCI arrangements in a general equilibrium model of the US LTCI system. The arrangements are assessed based on how they impact the welfare of different demographic groups, how they impact government expenditures, and how they affect takeup and profitability in the private LTCI market. The specific policy reforms considered are motivated by findings in Braun et al. (2019) who attribute high premia, denials, low takeup and incomplete coverage in the private market to the crowding out effects of public insurance, high administrative costs faced by private insurers, and adverse selection.

Some Americans receive free public LTCI benefits provided by Medicaid. However, Medicaid benefits are only available to individuals with low personal resources. Still, Brown and Finkelstein (2008) and Braun et al. (2019) find that Medicaid crowds out private LTCI and depresses profits of private insurers. Consequently, the first reform we consider is a large reduction in the scale of Medicaid. In our model private insurance takeup among low- and middle-income individuals increases, but their welfare declines. Reducing public insurance increases their exposure to LTCI risk. Long-term care events are large relative to their personal resources, so their demand for private insurance is relatively inelastic. Profits increase because the insurer has market power and increases premiums to these groups. Affluent individuals prefer a smaller Medicaid program. They benefit from lower taxes and they have adequate personal resources to entertain the outside option of self-insuring LTC risk and this keeps their premiums low. Welfare of a newborn declines because the first effect is larger.

Our second reform is motivated by the observations that private LTCI is costly to produce and that the market is small. Brokerage costs can exceed 3 years of premium and underwriting costs that are used to mitigate adverse selection are also larger than other life insurance product lines. In Braun et al. (2019), we show that these supply side frictions account for small takeup rates among upper middle- and high income individuals. These supply side frictions are avoided if there is a single public insurer of LTC risk. Other advanced economies such as Germany and Japan offer universal public LTC benefits, and Medicare already provides universal coverage of medical risks in the US. Consequently, the second reform we consider is offering universal public insurance against NH risk. The welfare effects of this reform are reversed from the previous one. Low- and middle-income individuals benefit, but the welfare of high-income individuals falls. The welfare gains of the first group are larger and welfare of a newborn increases.

The first two reforms illustrate the challenge faced by attempts to reform current long-term insurance arrangements. Policies that favor low and middle-income individuals harm more affluent individuals and policies that affluent individuals prefer reduce welfare of less affluent individuals.

Our third scenario is Pareto improving. Medicaid benefits are means-tested and subject to a secondary payer provision. Holders of private insurance only qualify for Medicaid benefits once their private insurance benefits are exhausted. Under our reform, benefits continue to be means-tested, but Medicaid is the primary payer. This third scenario works best. The poor continue to receive free public insurance, the middle class top up their Medicaid benefits with private insurance and enjoy higher welfare and private insurance takeup and profits also increase.

A surprising property of the Medicaid primary scenario is that aggregate public expenditures on Medicaid are lower when Medicaid is a primary payer. In our model, the secondary payer provision of the current Medicaid program depresses private LTCI takeup of middle-class individuals and also depresses their savings. When we make Medicaid the primary payer, middle-class individuals save more and use the proceeds to purchase private insurance and consume more during retirement. Fewer individuals qualify for Medicaid benefits and aggregate Medicaid expenditures per recipient fall. It follows that taxes used to fund Medicaid fall and welfare of affluent individuals also increases.

This paper fills a gap in the academic literature on long-term care risk and insurance. The focus of the previous literature on LTCI has been on understanding why the private LTCI market is small: Brown and Finkelstein (2007), Finkelstein and McGarry (2006), Hendren (2013), Braun et al. (2019). Other research analyzes the effects of historical policy reforms on the private LTCI market. Aizawa and Ko (2023) analyze how a change in the private LTCI regulatory environment influenced welfare and the market's functioning. They find that transferring aggregate risk from LTCI policyholders to insurers has a small positive impact on welfare but lowers the profits of private insurers and increases market concentration. Lin and Prince (2013), Goda (2011), Bergquist et al. (2018) assess the success of the Long Term Care Insurance Partnership (LCTIP) program, which relaxes the Medicaid asset-test for individuals who purchase conforming private LTCI, in increasing private LTCI takeup and reducing reliance on Medicaid. These analyses found that the impact on private LTCI takeup was small. However, LTCIP was initially only available in a small number of states and these papers use data from the early adopters. More recently, there has been a surge in the adoption of LTCIP by states following the enactment of the Deficit Reduction Act in 2005, and recent research that includes the newer data finds bigger impacts from the program on LTCI and Medicaid takeup. Costa-Font and Raut (2025) find that the LTCIP increases LTCI takeup by 14.7% and reduces Medicaid takeup by 13.3%. More interestingly, they find important differences in the impact of LTCIP on low, medium and higher wealth individuals. On the one hand, LTCI rises monotonically with wealth but Medicaid takeup is hump-shaped with the largest declines in takeup among the middle class.

Our general equilibrium framework accounts for many empirical properties of US LTCI arrangements and is a valuable laboratory for analyzing the impact of novel policies not yet implemented. Our results provide new insights into why the private LTCI market is small. Brown and Finkelstein (2008) and Braun et al. (2019) have previously documented that the combination of Medicaid asset-tests and its secondary payer provision have pronounced crowding-out effects on private LTCI. Brown and Finkelstein (2008) find that many low- and middle-class individuals prefer to run down their assets so as to qualify for free Medicaid LTC benefits over purchasing costly private LTCI policies that may have no impact on their level of care when they experience a NH event due to the secondary payer provision. We show that the secondary payer provision of Medicaid has a particularly pronounced crowding-out effect on private LTCI takeup and individual saving incentives. When Medicaid is made primary, many middle-class households choose to save more for retirement and purchase private insurance instead. This allows them to enjoy higher consumption if they experience a LTC event and to self-insure against other idiosyncratic risks.

More generally, a large literature has picked up on the insight of Hubbard et al. (1994), that asset-tests for public insurance distort savings incentives down. Recent examples include Wellschmied (2021) and Joyce and Singh (2025) who find that asset-tests on social insurance have a negative impact on low-income individuals' precautionary savings motives. Our results indicate that the availability of private insurance and the regulations that govern its substitutability with public insurance are also important.

The remainder of our paper is organized in the following way. Section 2 provides information about long-term care arrangements in the US. Section 3.1 provides a graphical analysis of the informational frictions that provide a rationale for public insurance, shows how administrative costs influence pricing and coverage of private insurance, and shows how the means-testing and secondary payer provisions of Medicaid influence pricing, coverage, and takeup of private LTCI. Section 3.2 describes our quantitative general equilibrium model and Section 4 provides an overview of how we parameterize the model. Our main results are reported in Section 5.

2 Long-term care arrangements in the US

To motivate our analysis we now provide more details about the probability, cost and expected duration of long-term care events and private and public insurance arrangements in the US. A long-term care (LTC) event is best thought of as a form of disability. It is a situation in which an individual requires assistance with daily activities for more than 100 but is not terminally ill. Our definition of a LTC event reflects institutional features of US public health insurance arrangements.[1] Medicare provides universal public insurance to 65+ year old Americans for medical expenses and also covers hospital and nursing home benefits for acute medical care events. However, the duration of the accommodations in care centers is 100 days or less. Medicare also offers hospice care for the terminally ill. However, Medicare does not provide insurance for a LTC event.

The risk of a LTC event increases with age. Women have higher life expectancy and are more likely to experience a LTC event than men. As of age 65, the probability of experiencing a LTC event prior to death is 0.47 for men and 0.58 percent for women and the average age of entry is 83. The average duration of a long-term care event is 4.4 years for women and 3.2 years for men. Long term care risk also varies systematically with wealth. Wealthy individuals have higher life expectancy and thus face a higher risk of experiencing a LTC event before death compared to poor individuals. The relationship between LTC events

[1] The Law (1996) defines a LTC event as either requiring assistance with two or more instrumental activities of daily living (ADLS) or requiring significant assistance due to cognitive impairment.

and health status is more complicated because poor health is also associated with higher mortality risk.

Long-term care services are expensive. According to Genworth Financial (2024), the largest private issuer of long-term care insurance, the median cost of (formal) long term care services in 2021 was $61,776 per year if the services were provided at home and $108,405 per year if they were provided in a skilled nursing facility.

Combining these observations, we see that LTC risk is significant and costly. The risk is concentrated at the end of the lifecycle and a LTC event that requires care in a skilled nursing facility can cost more than $400,000. Indeed, Kopecky and Koreshkova (2014) find that LTC risk is the primary driver of wealth accumulation by Americans during retirement.

Medicaid is the biggest public insurer of LTC events. Medicaid provides a basic level of support services in licensed long-term care facilities and more recently at home. However, Medicaid benefits are only provided to individuals with assets less than $3,000 in most states and they are also subject to a strict income test. In some cases the primary residence is exempt from the Medicaid asset-test. However, Medicaid can place a lien on the estate and claw back insured LTC expenses after the recipient passes away. Medicaid is also a secondary payer of long-term care services. Medicaid coverage only comes into effect after private long-term care insurance benefits have been exhausted.

Given the cost and risk profile of long-term care events, one might expect that the private market for LTCI would be large. However, only about 10 percent of current retirees hold a LTCI policy (Braun et al., 2019), the size of the market has been declining since 2012, and the market is currently dominated by a small number of issuers. Other features of the market are that loads on LTCI products are higher than other life insurance products and coverage is incomplete (Brown and Finkelstein, 2007 and Gruber and McGarry, 2023).[2] Finally, LTC insurers recognize that adverse selection is severe and confront it by screening and denying 30 percent of applicants in the 60-64 age group and 38.2 percent of applicants in the 65-69 age group (American Association for Long-Term Care Insurance, 2024).

Taken together, low takeup of private LTCI in conjunction with the strict means-tests and secondary payer provisions of Medicaid imply that most Americans use their savings to pay for formal long-term care services. This leaves middle-class elderly Americans particularly exposed to LTC risk. The expected size of the loss is large relative to their wealth (Kopecky and Koreshkova, 2014) and they only qualify for Medicaid benefits after they exhaust their personal financial resources.

Braun et al. (2019) confront these observations with a structural model where individuals face long-term care risk at the end of the lifecycle and insure against it by saving, purchasing private LTCI from an insurer who faces adverse selection or rely on means-tested public long-term care insurance. They find that Medicaid crowds out demand for private insurance among low and middle class individuals. Administrative costs and adverse selection are more important for understanding denials, low takeup and high premiums for insured upper middle class and affluent individuals.

Their finding that the frictions that constrain private LTCI takeup differ by income and wealth creates a challenge to reforming US LTCI arrangements that we take up here. Reforms that expand Medicaid benefit the middle class but increase the size of the negative fiscal

[2] A load is the markup over actuarily fair insurance

externalities on the affluent who pay higher taxes and have a low probability of qualifying for Medicaid benefits. Conversely, reducing the scale of Medicaid benefits affluent individuals but lowers welfare of middle class and poor individuals who lose the safety net provided by Medicaid.

3 The Model

We present the model in two steps. First, we consider the static contract design problem of an LTCI monopoly issuer that faces a single risk group. We use this framework to illustrate that adverse selection, when combined with administrative costs of providing private insurance and public insurance, produces denials. These frictions also influence coverage and premiums of insured individuals and profits of the insurer. We use the same static framework to show the pronounced crowding-out effect that Medicaid's secondary-payer provision has on the private LTCI market. Second, we present our quantitative general equilibrium model. This model has multiple periods, multiple sources of uncertainty, and heterogeneous individuals who self-insure against LTC risk and other risks faced during retirement by saving.

3.1 The one-period model

Consider a continuum of individuals each with resources $w + a$ and private type $i \in \{L, H\}$.[3] 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 $\eta \equiv \psi\theta^L + (1 - \psi)\theta^H$ individuals incur NH expenses m. 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 $\iota^i - \pi^i$.

Individuals' problem. Risk-averse individuals maximize utility subject to participation and incentive compatibility constraints and have access to public insurance that resembles NH benefits provided by Medicaid. An individual of type i solves

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

where

$$c^i = w + a - \pi^i, \tag{2}$$

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

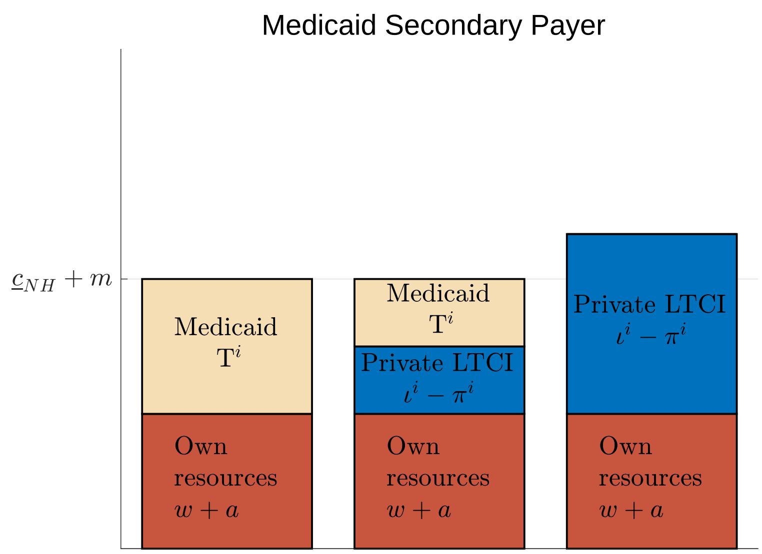
$$T^i = \max\Big\{0, \underline{c}_{NH} - \big[w + a - m + \iota^i - \pi^i\big]\Big\}, \tag{4}$$

and $u(c) = c^{1-\sigma}/(1-\sigma)$ with $\sigma > 0$. Public NH benefits, T^i, determined by equation (4), are just enough to provide their recipient with the level of consumption $\underline{c}_{NH}$. Even though

[3] We give individuals two endowments here to facilitate comparison with our quantitative model which has

equation (4) is a simplified version of how Medicaid NH benefits are determined in practice, it effectively captures the program's two key features. First, the transfer amount decreases as endowments increase—that is, benefits are means-tested. Second, Medicaid serves as a secondary payer, meaning that higher net benefits from private insurance, $\iota - \pi$, reduce public insurance transfers on a one-for-one basis. Figure 1 provides a graphic depiction of how the secondary payer provision of Medicaid works. The figure depicts the situation of an individual whose endowment satisfies $\underline{c}_{NH} + m > w + a$ and experiences a NH event. The left bar chart illustrates the Medicaid transfer if the individual doesn't purchase private insurance. The center bar chart illustrates the secondary payer provision of Medicaid. If this individual purchases private insurance, Medicaid benefits fall one for one with his net private insurance payout $\iota - \pi$. Finally, the right most bar illustrates that the only way for an individual in this situation to increase consumption in the nursing home state, is to forgo public insurance and rely entirely on private insurance.

Figure 1: Resources in the LTC state under different insurance arrangements when Medicaid is a secondary payer.



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

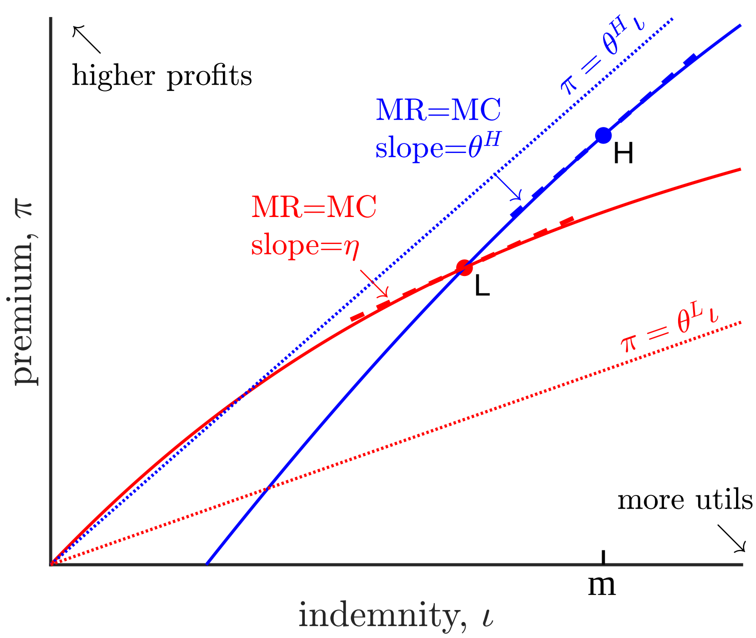
$$MRS(\theta^L, \pi^L, \iota^L) = \lambda\eta, \tag{8}$$
$$MRS(\theta^H, \pi^H, \iota^H) = \lambda\theta^H, \tag{9}$$
$$U(\theta^L \pi^L, \iota^L) - U(\theta^L, 0, 0) = 0, \tag{10}$$
$$U(\theta^H, \pi^H, \iota^H) - U(\theta^H, \pi^L, \iota^L) = 0, \tag{11}$$

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.

Figure 2: 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 parametrization 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 $\underline{c}_{NH} = 0$.

multiple periods and saving. In that model, w is the endowment and a is beginning-of-period asset holdings.

Optimal contracts with no public insurance or claims processing costs. When public insurance and claims processing (CP) costs are absent, our model is equivalent to the specification considered by Stiglitz (1977). We start with this case. Figure 2 illustrates the optimal contracts when $\theta^L < \theta^H < 1$, $\lambda = 1$, and $\underline{c}_{NH} = 0$. The solid curved lines are (indirect) indifference curves of types L and H with utility increasing to the southeast.[4] 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 participation constraint of type H is binding because his indifference curve passes through point L indicating that he is indifferent between the two contracts.

Notice that the optimal contracts provide full coverage of the loss m for high-risk (H) types and partial coverage for low-risk (L) types. Figure 2 can be used to explain why the optimal contracts are always separating. Consider a pooling contract at point L. MRS is steeper than marginal cost for type H at this point. Contracts on the high-risk type's indifference curve to the right of point L are incentive compatible and provide high-risk types with the same level of utility as point L but reduce the losses from insuring them.

The optimal contracts also feature cross-subsidization from low-risk to high-risk types. To illustrate this point, the figure reports the actuarially-fair contract rays for each type. These are the dotted straight lines that pass through the origin. Along each ray expected indemnities equal premium revenue. Thus each ray depicts the set of contracts that the firm breaks even on within the given type. Notice that point H lies below the type-H zero profit ray indicating that the insurer loses money on the optimal contract for high-risk types. The opposite is true of the optimal contract for low-risk types. The firm earns profits on the type-L contract sufficient to offset the losses on the type-H contract, and total profits are positive. Cross-subsidization becomes more costly when either the relative risk of NH entry of type-H individuals increases or the share of type-H individuals in the risk group rises. When cross-subsidization is no longer profitable, the optimal contracts feature exclusion of the low-risk types. That is, the optimal menu consists of a full coverage contract for type H and a $(0, 0)$ contract for type L.

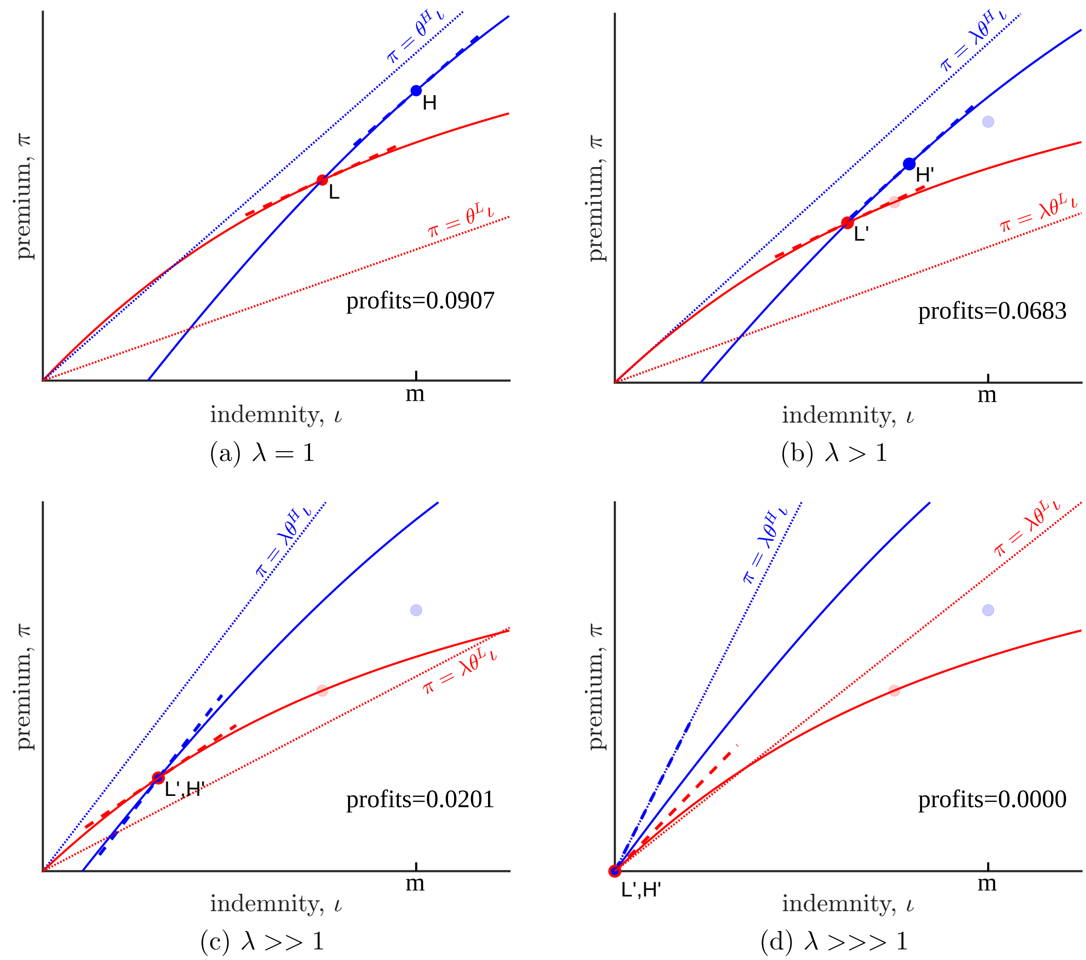
Optimal contracts with incomplete coverage of low-risk types and cross-subsidization arise because of asymmetric information. To see this, it is helpful to describe the properties of the optimal contracts under full information. When information frictions are absent, the insurer extracts the entire surplus and the participation constraint binds for both types. The optimal contracts for each type provide full coverage of the loss and lie along a vertical line passing through point $\mathbf{m}$. Utility of type H falls because he is now paying a higher premium for the same level of coverage. Type L also pays a higher premium but goes from partial coverage to a full coverage contract, and his utility is unchanged.[5]

[4] 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.

[5] Using the parameterization in Figure 2, the premium for type L rises from 0.24 to 0.29, while the premium for type H rises from 0.35 to 0.57.

Optimal contracts with administrative costs. Next we consider how administrative costs influence the profitability, pricing, and coverage of private insurance contracts. Administrative costs play a central role in our model's ability to account for rejections of applicants and high loads for insured individuals in US private long-term care insurance markets. LTCI is harder to market than other life insurance products, and broker commissions can surpass three years of premiums.[6] Hendren (2013) and Chade and Schlee (2016) provide theories about why some risk groups are denied coverage when insurers face adverse selection and administrative costs and setting λ greater than its baseline value of 1 introduces administrative costs that are proportional to indemnities. As equations (8) and (9) show, these administrative costs increase the marginal costs of providing insurance to each private type.

Figure 3: Optimal contracts with varying levels of administrative costs.



Note: Panel (a) presents the baseline case where administrative costs are zero, $\lambda = 1$. In panel (b) $\lambda > 1$ and the optimal contract menu is separating. In panel (c) $\lambda >> 1$ and the optimal contract menu is a pooling non-zero contract. In panel (d) $\lambda >>> 1$ and the optimal contract menu is a pooling zero-zero contract. The faded dots in panels (b)-(d) are the optimal contracts with no administrative costs. The parameterization used to create this figure is: $\sigma = 1.1$, $\phi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w + a = 1.0$, $m = 0.8$, $\lambda \in \{1, 1.15, 1.65, 2.5\}$, $\underline{c}_{NH} = 0$.

The four panels of Figure 3 illustrate the optimal contracts with increasingly larger values

[6] See Braun et al. (2019) for more details.

of λ starting from the baseline ($\lambda = 1$). As the slopes of the marginal cost lines increase, coverage ratios fall and the optimal contracts move down the agents' indifference curves towards the origin. The slopes of the break-even rays (the dotted lines) also increase and comparing the distances between these rays and the optimal contracts indicates that profits on type L fall and losses on type H rise.

When costs are moderate, the insurer continues to use separating contracts and cross-subsidization to confront asymmetric information. However, increasing proportional administrative costs reduces the profitability of lending to the high-risk group more rapidly than to the low-risk group, making cross-subsidization less profitable. Consequently, the optimal contracts get closer together. When costs are sufficiently high, as in panel 3c, there are no opportunities for cross-subsidization across types, and a pooling equilibrium arises. When pooling occurs, the optimal menu absent information frictions is downward sloping. At the pooling contract in panel 3c, notice that marginal cost exceeds MRS for type H. The insurer would prefer to offer type H lower coverage than type L but is constrained by incentive compatibility.

When λ is sufficiently large, coverage falls to zero as reported in panel 3d. In this panel, marginal cost exceeds MRS for both types at $(0, 0)$. Consequently, the entire risk group is denied coverage because there are no profitable insurance opportunities available to the firm.[7]

Denials can occur in other ways when $\lambda > 1$. For instance, increasing the fraction of high-risk types, $1 - \psi$, makes the overall cost of insuring the risk group larger, reducing profitability and increasing the likelihood that the entire risk group will be denied coverage. Claims processing costs increase the marginal cost of providing insurance. When $\lambda > 1$, if endowments are sufficiently high relative to the expected loss, marginal rates of substitution can be lower than marginal costs indicating that the entire risk group prefers to self-insure against LTC risk.

Optimal contracts with public insurance Medicaid benefits are means-tested, meaning the program's effects on private insurance coverage and pricing depend on individuals' income and wealth.[8] There may be little to no direct impact for the wealthiest individuals. But, for those with more moderate levels of income and wealth, the program's effects are more pronounced and will vary based on the generosity of Medicaid relative to their financial situation.

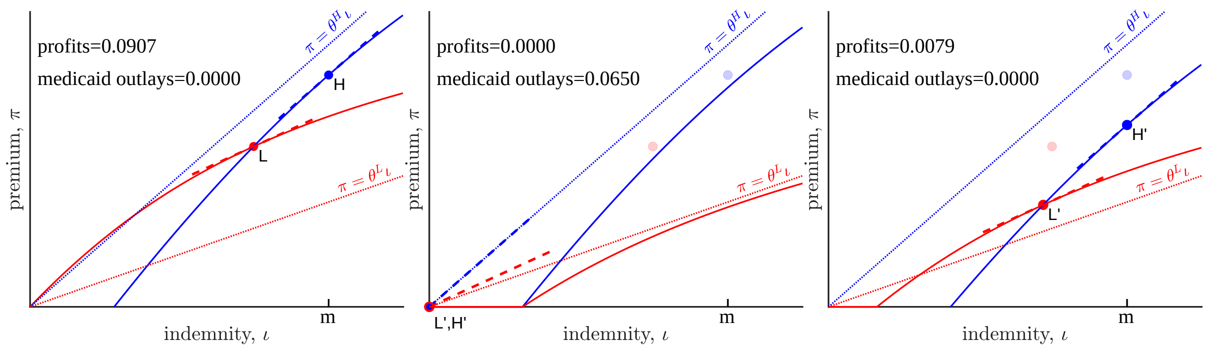
We now explore the variable effects of Medicaid NH benefits by considering two scenarios that differ in the size of the risk group's endowment relative to the size of the Medicaid NH consumption floor. The first panel of Figure 4 depicts the optimal contracts in the baseline case with no public NH insurance or claims processing costs. Optimal contracts

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

[8]Asymmetric information and administrative costs are used to motivate public insurance in the public finance literature Gruber (2022). We will analyze the welfare value of policy reforms starting from a baseline where these frictions are present and public insurance is available through a program that captures the key features of Medicaid.

with Medicaid NH benefits are illustrated in panels 4b and 4c.[9] Both panels depict risk groups in which, absent private LTCI, individuals who enter a NH would be eligible for Medicaid benefits, i.e., $\underline{c}_{NH} > w + a - m$. Panel 4b illustrates the optimal contracts when the risk group's endowment level, $w + a$, is low relative to the Medicaid guaranteed level of consumption $\underline{c}_{NH}$ and panel 4c illustrates the optimal menu when the risk group's endowment level is high relative to $\underline{c}_{NH}$.

Figure 4: Optimal contracts with varying levels of the NH consumption floor.



(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) presents the baseline case with no public NH 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 zero-zero contract. In panel (c) $w+a$ is high relative to $\underline{c}_{NH}$ and the optimal contract menu is separating. The parameterization used to create this figure is: $\sigma = 1.1$, $\phi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w + a = 1.0$, $m = 0.8$, $\lambda = 1$, $\underline{c}_{NH} \in \{0, 0.45, 0.33\}$.

In addition to being means-tested, Medicaid is a secondary payer, and this second provision of Medicaid is readily discernible in Figure 4. The secondary payer provision is responsible for the kinks and downward shifts in the indifference curves in panels 4b and 4c.[10] The changes arise because free Medicaid benefits improve individuals' outside option—tightening their participation constraint. Consequently, individuals are unwilling to pay for levels of ι 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, willingness-to-pay (WTP) for a given level of private LTCI is positive but reduced relative to the baseline. In this region, 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. If the consumption floor is high enough relative to the size of the endowment, there may be no menu of contracts that are both attractive to individuals and profitable to the insurer. This is the situation in Figure 4b. In Figure 4c the endowment is relatively higher and WTP, while lower than in the baseline, is higher than in Figure 4b. As in the baseline, the optimal contracts feature full insurance for Type H but the insurer has to give individuals a better deal, and premia and profits are significantly lower.

Figure 4 shows that the secondary payer provision of Medicaid crowds out private insurance by both reducing the number of risk groups that are profitable to insure and the profits on insurable risk groups. We will consider reforms that relax the secondary payer

[9] Claims processing costs are absent in all of the Medicaid scenarios.

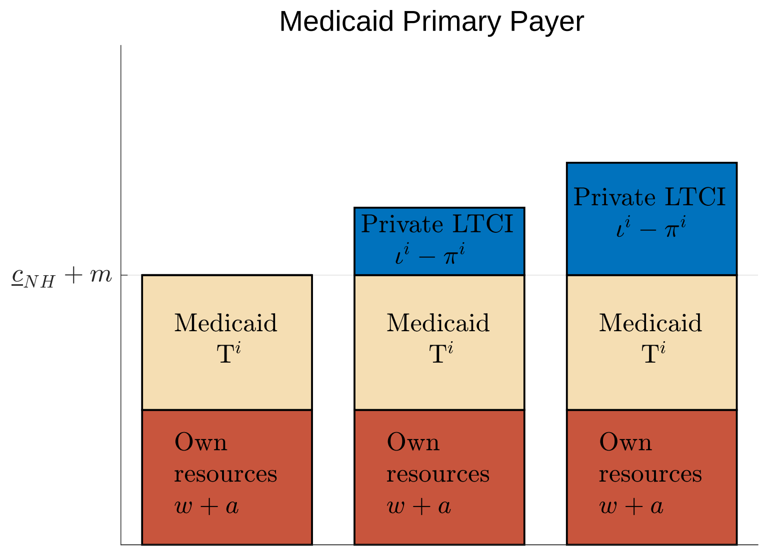
[10] Recall that these indifference curves are over contracts and not consumption.

provision of Medicaid in our quantitative model and we can illustrate some of the impacts of these reforms here by retaining Medicaid's means-test but making it a primary payer. In particular, consider a scenario where equation (4) is replaced with

$$T = \max\Big\{0, \underline{c}_{NH} - \big[w + a - m\big]\Big\}. \tag{12}$$

Public insurance is still means-tested in equation (12) because individuals with a high

Figure 5: Resources in the LTC state under different insurance arrangements when Medicaid is a primary payer.

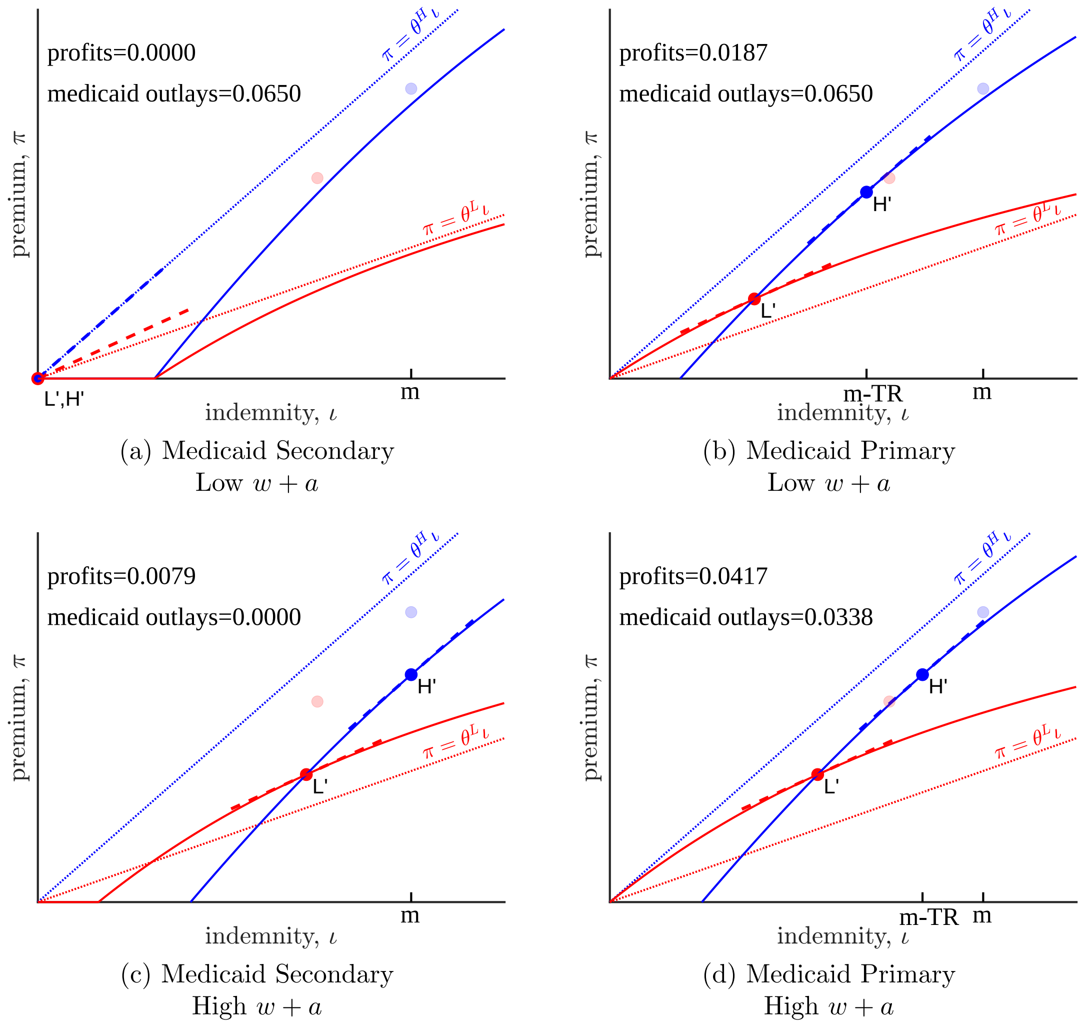


endowment relative to $\underline{c}_{NH}$ do not receive benefits. However, individuals who may qualify for Medicaid have a stronger incentive to purchase additional insurance. They receive public benefits of T and can insure part or all of the residual $m - T$ with private insurance. While their WTP to pay for a given level of private insurance is now higher, their marginal WTP for an increase in private insurance has declined because the effective size of the loss they face has declined. In other words, when Medicaid is a secondary payer it tightens individuals' participation constraint, but when Medicaid is a primary payer it instead reduces their MRS.

Figure 5 illustrates how the situation changes when Medicaid is primary for the same individual considered in Figure 1. Observe that now, the individual can increase his total coverage against a NH event if he tops up Medicaid benefits by purchasing a small private insurance policy.

Figure 6 compares the optimal contracts in the Medicaid secondary and Medicaid primary payer scenarios for the same two risk groups considered in Figure 4. Consider first the risk group with low endowments, $w + a$, relative to $\underline{c}_{NH}$. In the baseline Medicaid scenario, this group is uninsurable, and the private insurer earns zero profits. However, when Medicaid serves as the primary payer and WTP for a fixed level of private insurance is higher, both members of the risk group choose to purchase private coverage. Removing the secondary payer provision does not have an impact on Medicaid outlays for this group, but increases private insurance takeup and total coverage against the loss.

Figure 6: Optimal contracts when Medicaid is still means-tested but 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: The parameterization used to create this figure is: $\sigma = 1.1$, $\phi = 0.8$, $\theta^L = 0.2$, $\theta^H = 0.5$, $w + a = 1.0$, $m = 0.8$, $\lambda = 1$, $\underline{c}_{Nh} = 0.45$ in the upper panels and $\underline{c}_{Nh} = 0.33$ in the lower panels. Reducing the consumption floor in this model is isomorphic to increasing the endowment.

The private insurance contracts offered to the risk group with high endowments are smaller when Medicaid is primary as shown in panels 6c-6d. The high-endowment risk group receives no public insurance benefits when Medicaid is a secondary insurer because net private indemnities count against the means-test income threshold. When Medicaid is the primary payer, the net private indemnity is excluded from the means-test and members of this risk group now qualify for Medicaid benefits. Medicaid outlays for the risk group increase from 0 to 0.0338. With Medicaid covering T units of the loss, the value of an additional unit of private insurance (MRS) declines for both types and coverage and premiums fall. Despite the smaller contract size, profits are higher in this scenario than when Medicaid is a secondary payer. This is due to the relaxation of the participation constraint: individuals no longer need to pay for coverage they could otherwise receive for free through Medicaid to purchase additional protection. In this setting, private insurance becomes more valuable because the net private indemnity is excluded from the Medicaid means-test. Finally, we wish to emphasize that the high-risk individuals receive full coverage of the loss in both scenarios.

We complete our analysis of the 1-period model by summarizing its 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 costs of providing private insurance, which leads to declines in takeup rates, coverage ratios, and profits. In the presence of these costs, risk groups with high endowments relative to the size of the loss and risk groups with a high fraction of the high-risk type are more likely to be excluded, and, with multiple risk groups, aggregate LTCI takeup can decline. Third, means-tested public insurance crowds out private insurance and can create the possibility of no-trade contracts when the risk group's endowment is sufficiently low. Thus, public insurance can also depress private LTCI takeup. Fourth, crowding out is particularly strong when Medicaid is a secondary payer. When Medicaid is the primary payer, private LTCI takeup rates and Medicaid takeup rates both increase and aggregate Medicaid expenditures are higher. We will see that these final two properties of the 1-period model are not robust. In our quantitative model, Medicaid takeup rates and Medicaid expenditures fall.

Up to this point, we have abstracted from a savings decision. Hubbard et al. (1995) show that asset tests on public insurance create nonconvex constraint sets that can depress savings incentives of low-income individuals, but they abstract from private insurance. To illustrate how Medicaid influences demand for assets when agents can purchase private insurance, we extend their 2-period model in Appendix Section 7.2 by offering individuals the opportunity to purchase actuarially fair private LTCI at the beginning of period 2.[11]

When Medicaid is a secondary payer, as in Hubbard et al. (1995), individuals with low endowments consume most of their income when young and rely on Medicaid if they experience an LTC event. The secondary payer provision of Medicaid crowds out their demand for private insurance as in our 1-period model. It is not worthwhile for low-endowment individuals to purchase private insurance because it is costly and only begins to increase their consumption in the NH state when it has fully replaced Medicaid benefits. There are two costs of pursuing their preferred strategy. Medicaid provides a low level of consumption in the LTC state, and they thus are not fully insured against the loss. Additionally, some choose to reduce their savings to qualify for Medicaid benefits and this constrains their ability to smooth consumption over time. Still, the benefit of free Medicaid transfers outweighs these costs. Individuals with higher endowments prefer to forgo the Medicaid transfer and purchase private insurance for LTC risk. This policy provides them with full coverage against the loss and allows them to smooth consumption over time.

Consider now how demand for assets and private insurance change when Medicaid is the primary payer. Low-endowment households save more and purchase private insurance to top up Medicaid benefits. With higher savings, the size of their Medicaid transfer falls if they experience an LTC event, but they are fully insured against the event because Medicaid is free and private insurance is actuarially fair. Individuals with somewhat higher endowments who

[11]The 2-period model abstracts from supply-side frictions, which are essential for accounting for the quantitative features of US LTCI arrangements and provide a rationale for public LTCI.

previously didn't qualify for Medicaid now save less and purchase less private insurance. This strategy allows them to qualify for a free Medicaid transfer and reduce their expenditures on private LTC insurance, but constrains their ability to smooth consumption over time. Savings and insurance plans of individuals with the highest endowments are not affected by the change because they prefer to smooth their consumption over time and purchase private LTCI.

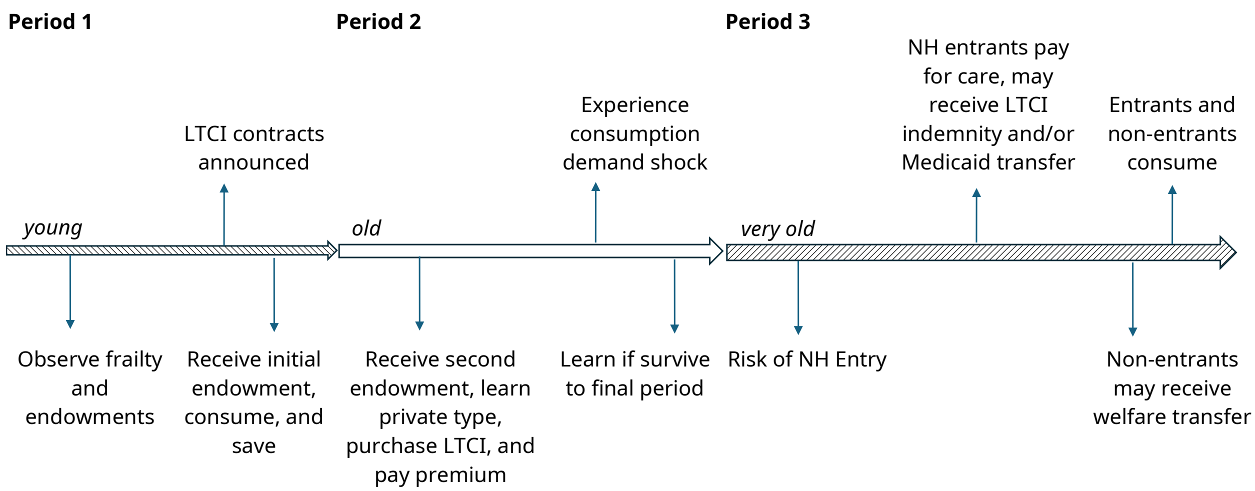
This 2-period model admits the possibility that aggregate expenditures on Medicaid can fall when Medicaid is the primary payer depending on the asset distribution in period 2. However, Medicaid takeup rates are always higher when Medicaid is primary as in the 1-period model. In our quantitative model, individuals face uncertainty about their likelihood of needing LTC and idiosyncratic consumption demand risk. Consequently, when they make their savings decision, asset holdings at the time of the long-term care event are uncertain. With this uncertainty, aggregate Medicaid takeup rates can also decline when Medicaid is primary.

3.2 The Quantitative Model

Our quantitative model extends the one-period model in several ways. Most Americans pay for long-term care expenses using their personal savings. We adopt a multi-period framework with incomplete information about LTC risk and other risks faced during retirement, and allow individuals to self-insure by saving. At birth, individuals observe a public indicator of their health and labor productivity, and make a savings decision. Individuals are forward-looking and understand that they will have the opportunity to purchase private LTCI in the future. They also recognize that, when making their purchase decision, they will have an informational advantage over the insurer regarding their health status but may be denied coverage. In other words, they recognize that, based on their observable characteristics, there may be no contract that both they are willing to purchase and that is profitable for the insurer to offer. Individuals understand that private insurance is expensive and that Medicaid provides free benefits, but those benefits are means-tested and subject to a secondary-payer provision. Finally, individuals face mortality and consumption expenditure risk during retirement which means that they are uncertain about their asset levels in the final stage of life when the LTC event is realized.

In the U.S., the average age of private LTCI purchase is 60, while the average age of NH entry is 83. During this period, individuals face a variety of risks, such as the risk of acute medical expenses or the risk of a spousal death event. Moreover, the timing of an NH event is uncertain, and individuals who experience a NH event very late in life are likely to have consumed a larger fraction of their lifetime endowment beforehand. Consequently, at LTCI purchase age, individuals likely face uncertainty about their resources at the time of NH entry. In the quantitative model, we capture this uncertainty in a tractable way. We assume that individuals experience a consumption demand shock that occurs after LTCI purchase. Eligibility for Medicaid at NH entry depends on the realization of this shock: individuals become eligible only under sufficiently large shocks that deplete their resources. As a result, private LTCI that insures against states where the demand shock is small can be valuable. However, unlike the simple model without post-purchase uncertainty, individuals will not want a full coverage private LTCI contract since Medicaid provides them with partial

Figure 7: Timeline of events in the baseline model.



protection against NH risk in expectation.

Our objective is to propose welfare-enhancing reforms to private and public insurance arrangements for long-term care risk. While our one-period model includes claims processing costs on the private insurer, it abstracts from additional costs of insurance provision including those incurred by the public insurer. It also abstracts from public insurance financing. In the quantitative model, we assume that Medicaid is funded through income taxation. Our quantitative model also recognizes the broader range of administrative costs faced by private insurers, as well as the fact that public LTCI also incurs administrative costs. The costs of producing private insurance in the quantitative model consist of a variable-cost component (claims processing cost) that is proportional to indemnities and a per-capita fixed-cost component that is proportional to the fraction of individuals who purchase private insurance. The variable-cost component captures commissions paid to insurance agents and brokers. The fixed-cost component captures both underwriting costs and costs of paying claims. Medicaid does not pay commissions. However, Medicaid incurs fixed costs of paying claims. In particular, Medicaid must assess applicants' benefit eligibility and transfer amounts. These costs are captured by assuming that the public insurer in the model also incurs per-capita fixed costs, which are proportional to the fraction of individuals receiving Medicaid benefits.

3.2.1 Individual's problem

Figure 7 shows the timing of events in the model. At birth, an individual draws 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. A working-aged individual then decides how to divide his earnings, w_y, between consumption c_y and savings a. Individuals are forward-looking, and their savings decisions are influenced by Medicaid and pricing and coverage levels of private LTCI contracts. Medicaid benefits are means-tested and Medicaid is a secondary payer. These features create incentives for low-income individuals to save less to qualify for Medicaid and refrain from purchasing private LTCI. Private LTCI contracts are also not actuarially fair and offer incomplete coverage which also depresses willingness to pay by high-income individuals who have the option of saving more and self-insuring against NH risk.

In period 2, the individual receives a pension w_o and observes his true risk of entering a 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. We assume that NH entry probabilities also depend on f and $\mathbf{w}$. The individual then chooses a LTCI contract from the menu offered to him by the private insurer.[12] The insurer observes and conditions the menu of contracts offered to each individual on their frailty status, endowments, and assets. We assume that the insurer observes assets because, as we discussed above, LTC insurers are required by regulators in many states to ascertain that the LTCI product sold to an individual is suitable (affordable).[13] Each menu contains two incentive-compatible contracts: 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 the NH event occurs.

After purchasing LTCI, individuals experience a demand shock that induces them to consume a fraction κ of their young endowment where $\kappa \in [\underline{\kappa}, \overline{\kappa}] \subseteq [0, 1]$ with density $q(\kappa)$. The demand shock creates uncertainty about the size of wealth at the time of NH entry and is important if the model is to account for the observation that Medicaid only provides partial coverage of NH expenses for many individuals.

Period 2 ends with the death event. With probability $s_{f,w}$ individuals survive until period 3 and with probability $1 - s_{f,w}$ they consume their wealth and die.[14] 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 and those who enter a NH pay the cost m and receive the private LTCI indemnity. NH entrants may also receive benefits from the public means-tested LTCI program (Medicaid). Medicaid is a secondary insurer in that it guarantees a consumption floor of $\underline{c}_{NH}$ to those who experience a NH shock and have low wealth and low levels of private insurance.

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,

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

[12]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% 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).

[13]The reference in footnote 2 contains a model worksheet for reporting financial assets that is used to determine suitability. Lewis et al. (2003) reports that 31 States had adopted some form of suitability guidelines by 2002 and Chapter 5 of "Wall Street Instructors Long-term Care Partnerships online training course" https://www.wallstreetinstructors.com/ce/continuing_education/ltc8/id32.htm explains how suitability is assessed in the state of Florida.

[14]There is evidence that individuals anticipate their death. Poterba et al. (2011) have found that most

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

$$\begin{aligned} &c_y = w_y - T(w_y) - a, \\ &c^{i,\kappa}_o + \kappa w_y = y_o - T(y_o) + a - \pi^i(a), \\ &c^{i,\kappa}_{NH} + \kappa w_y = y_o - T(y_o) + a - m + \iota^i(a) - \pi^i(a) + TR(y_o, a, \pi^i(a), \iota^i(a), m, \kappa), \end{aligned} \tag{13}$$

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

$$y_o \equiv w_o + ra + d_{\mathbf{w}} \Pi, \tag{14}$$

where Π 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,

$$T(y) = \tau \max(y - \tau_0, 0),$$

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

$$TR(y_o, a, \pi, \iota, m, \kappa) = \max\left\{0, \underline{c}_{NH} - \left[y_o - T(y_o) + a - m + \iota - \pi - \kappa w_y\right]\right\}. \tag{15}$$

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

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

and the individual's problem is found by replacing TR with TR^P in equation (13).

U.S. retirees with low means receive income transfers from the Supplemental Security Income (SSI) program and other medical expense assistance from Medicaid. We capture these other programs in a simple way. We start by solving the individual's problem above which assumes that there is only a single consumption floor in the NH state. 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 savings and private LTCI coverage to zero.[15]

retirees die with very little wealth and Hendricks (2001) finds that most individuals receive very small or no inheritances. Our assumption eliminates any desire for agents to use LTCI to insure survival risk.

[15]Modeling SSI in this way helps us to generate the low levels of savings of individuals in the bottom

3.2.2 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. We believe that this is realistic because most people purchase private LTCI relatively late in life. Note that the demand shock, κ, is realized after the LTCI is contracted.

The insurer chooses a menu of contracts $\left(\pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a)\right)$, $i \in \{g, b\}$ for each group of observable types that maximizes expected revenues, taking into account that individuals face survival risk after insurance purchase. As in the simple model, the insurer incurs a variable cost of paying claims with constant of proportion $\lambda - 1 \geq 0$. In addition, he incurs a per-capita fixed cost of paying claims $\gamma \geq 0$. His maximization problem is

$$\Pi(h, \mathbf{w}, a) = \max_{(\pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a))_{i\in\{g,b\}}} \psi\Big\{\pi^g_{f,\mathbf{w}}(a) - s_{f,\mathbf{w}}\theta^g_{f,\mathbf{w}}\left[\lambda\iota^g_{f,\mathbf{w}}(a) + \gamma I(\iota^g_{f,\mathbf{w}}(a) > 0)\right]\Big\} \tag{16}$$

$$+ (1-\psi)\Big\{\pi^b_{f,\mathbf{w}}(a) - s_{f,\mathbf{w}}\theta^b_{f,\mathbf{w}}\left[\lambda\iota^b_{f,\mathbf{w}}(a) + \gamma I(\iota^b_{f,\mathbf{w}}(a) > 0)\right]\Big\}$$

subject to the incentive compatibility and participation constraints

$$(IC_i) \quad u_2(a, \theta^i_{f,\mathbf{w}}, \pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a)) \geq u_2(a, \theta^i_{f,\mathbf{w}}, \pi^j_{f,\mathbf{w}}(a), \iota^j_{f,\mathbf{w}}(a)), \quad \forall i, j \in \{g, b\}, i \neq j \tag{17}$$

$$(PC_i) \quad u_2(a, \theta^i_{f,\mathbf{w}}, \pi^i_{f,\mathbf{w}}(a), \iota^i_{f,\mathbf{w}}(a)) \geq u_2(a, \theta^i_{f,\mathbf{w}}, 0, 0), \quad \forall i \in \{g, b\}. \tag{18}$$

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

$$\Pi = \sum_{\mathbf{w}} \sum_{f} \sum_{a} \Pi(f, \mathbf{w}, a)\tilde{h}(f, \mathbf{w}, a). \tag{19}$$

3.3 Government's problem

In period 1 the government taxes the income of workers and saves the proceeds, earning an interest rate of $1+r$. Then in period 2, it taxes old individuals' income and uses its resources to finance the two means-tested welfare programs. Like the private insurer, the government incurs administrative costs of running both of these programs.[16] These costs are assumed to be per capita fixed costs and, hence, 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

$$REV = \sum_{\mathbf{w}} \sum_{f} \left[TR^{f,\mathbf{w}} + \gamma_{gov} fracTR^{f,\mathbf{w}}\right] h(f, \mathbf{w}), \tag{20}$$

wealth quintile without introducing additional nonconvexities into the insurer's maximization problem.

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

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

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

where the tax function $T(\cdot)$ is defined in equation (15) and income in old age y_o is defined in equation (14).

3.4 Equilibrium

We solve for a competitive equilibrium under the assumption that the real interest rate is exogenous. The U.S. economy has strong international financial linkages and it is unlikely that changes in LTCI arrangements would have a large effect on U.S. real interest rates. Medicaid is financed with an income tax that distorts savings incentives, and Medicaid incurs administrative costs that depend on private insurance market contracts. We thus solve a fixed point problem that ensures that the government budget constraint is satisfied, that insurance markets clear, and that total dividend income received by individuals equals total profits generated by the private LTC insurer, i.e., $\sum_{\mathbf{w}}\sum_{f} d_{\mathbf{w}}\Pi h(f,\mathbf{w}) = \Pi$.

Definition 1. Competitive Equilibrium. Given a distribution of individuals by frailty and endowments $h(f,\mathbf{w})$, a real interest rate r, and consumption floors $\{\underline{c}_{NH},\underline{c}_o\}$, 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 Π; 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 savings policy $a^{h,\mathbf{w}}$ such that the consumption allocations and saving policy solve the individuals' problems and the insurance contracts solve the insurer's problem, total dividend income is equal to total profits of the insurer, 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 holds.

4 Parametrization

A key feature of U.S. long-term care insurance arrangements that our framework captures is that people have heterogeneous exposures to LTC risk and demand for private insurance. In our model, the likelihood of an individual requiring long-term care, along with his ability to manage this risk, is influenced by the individual's frailty, mortality risk, and permanent earnings. Individuals in the model also have private information about their true NH entry probability, and parameterizing our model requires us to resolve some subtle identification issues. Our identification strategy and specific data targets for most model parameters are the same as in Braun et al. (2019). However, the model here is a general equilibrium framework, and there are consequently new parameters that we need to parameterize.

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

We assume that public insurance benefits are financed through taxation and that public insurance requires per-capita fixed costs of administration. 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 (20), holds, yielding an income tax rate of 1.53%. The tax exemption, τ_0, is set to $7,200 per year or 27.44% of the average earnings per adult aged 18–64 in year 2000.[17] 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% 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% of total program outlays. This results in a value of γ_{gov} of 0.0022.

Consistent with the way the U.S. long-term care insurance system works in practice, the public LTC insurance program in the baseline economy is significantly less costly to administer than private insurance. 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% of present-value premium on average in the year 2000.[18] 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% of present-value premium on average in 2000. The resulting values of λ and γ are 1.195 and 0.019, respectively. Private LTC insurers incur larger administrative costs because they pay large commissions to brokers and conduct extensive medical underwriting. Medicaid, in contrast, pays no commissions to brokers and does not conduct medical underwriting.

Additionally, 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 compared to others. In the policy 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 due to the fact that this group is generally healthier, prefers to self-insure against LTC risk, and is highly unlikely to receive Medicaid LTCI benefits.

The remaining parameters of our model are set in the same way as in Braun et al. (2019).[19] 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

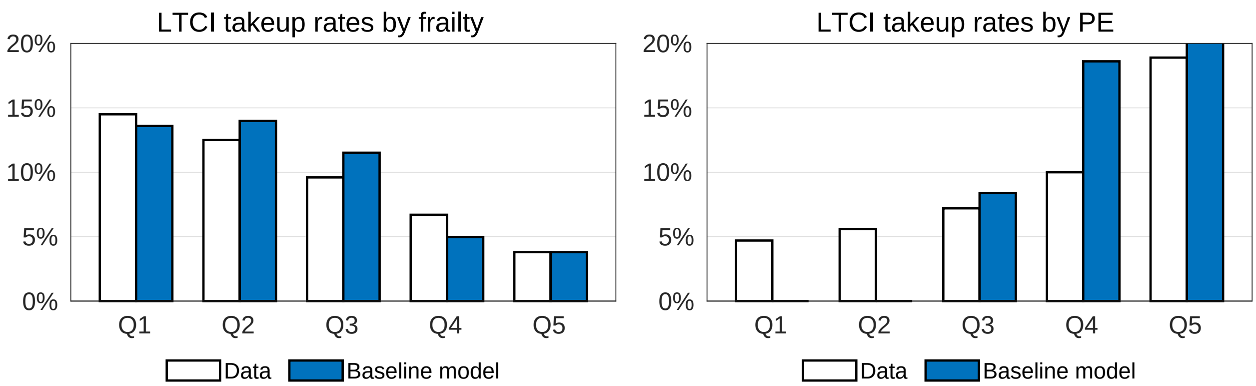
[17] In the model, endowments to the young are calibrated to permanent earnings. We normalize the mean young endowment to 1. This is equivalent to a mean permanent earnings of $1,049,461 in 2000, or the average earnings per adult aged 18–64 in 2000 multiplied by 40 years.

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

[19] Table 5 in the Appendix reports many of the baseline parameter values.

the distance between data moments and model counterparts. Most data statistics are based on an HRS data sample period that runs from 1992 to 2012. 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. In the parameterization, the consumption floor provided by Medicaid, c_{NH}, and the consumption floor for those who do not enter a NH, c_o, are both set to 1.855% of mean permanent earnings in the economy or $6,540 a year. This value consists of a consumption allowance of $30 per month and housing and food expenses of $515 per month. These numbers are consistent with Medicaid and SSI transfer amounts to a single elderly individual in 2000.

Figure 8: LTCI Takeup rates by frailty and PE quintiles in the Model and US data.



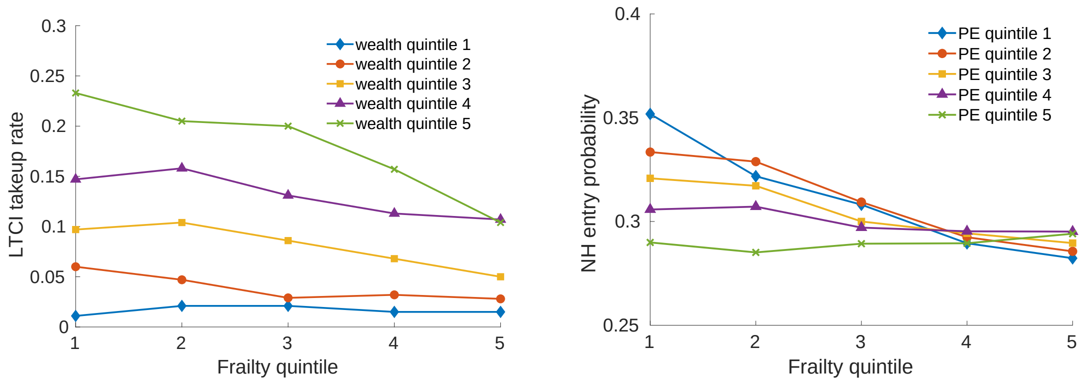
Note: Data source is 62–72 year olds in our HRS sample. Frailty and PE increase across quintiles.

We now compare statistics from our general equilibrium model with US data statistics on LTCI takeup rates and lifetime NH entry risk estimated in Health and Retirement Study (HRS) data. Figure 8 reports the private LTCI takeup rates in our HRS data sample and the model. The left panel reports LTCI takeup rates by frailty quintile. Our frailty index is constructed so that less frail individuals have a low value of an index. PE quintiles are organized to increase in PE. Thus, the individuals with the highest earnings appear in Q5. Observe that private LTCI takeup rates decline with frailty in the data and in our model while LTCI rates increase with PE in both the data and in our model.

These results are puzzling because lifetime NH entry risk is slightly decreasing in frailty and doesn't vary much with PE (Figure 9). According to our model, the dispersion of private NH entry risk has to increase in frailty, f, and decline in PE/wealth, if the model is to account for the empirical patterns of LTCI takeup and NH entry. In particular, we set ψ, the overall fraction of individuals of type g to reproduce the overall dispersion in the self-reported NH entry probabilities in our HRS data. Then we vary the probabilities of NH entry $\{\theta^L_{f,\mathbf{w}}, \theta^H_{f,\mathbf{w}}\}$ by $(f, \mathbf{w})$ to reproduce the LTCI takeup rates and the NH entry rates by frailty and wealth/PE quintiles.

We do not directly target the dispersion of private information by frailty and PE quintile; 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 and decreases with PE in both the data and our model.

Figure 9: 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% of people in frailty quintile 1 are in wealth quintile 1, while 33% are in wealth quintile 5.

5 Results

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

5.1 The Contributions of Medicaid, Administrative Costs and Asymmetric Information to Low Takeup and Low Coverage Rates.

Our analysis of the 1-period model suggests that administrative costs and Medicaid have a potentially large impact on the private LTCI market. However, that analysis only considers the situation of a single risk group. Our quantitative model is a considerably more detailed model of public and private LTCI that reproduces some of the main features of US LTCI arrangements. We now use it to assess the quantitative significance of administrative costs, Medicaid, and asymmetric information for takeup and coverage rates of private LTCI.

Figure 10 reports LTCI takeup rates by PE quintile for the baseline and three alternative economies and Figure 11 reports coverage rates. The 'No Medicaid' economy sets the consumption floor provided by Medicaid to NH entrants, c_{NH}, to 0.001 of mean permanent earnings or approximately \$350 per year.[20] The 'No Administrative Costs' economy sets the fixed administrative costs to zero and the variable costs, λ, to one and the 'Full Information' economy assumes that the insurer can directly observe each individual's NH entry probability, θ.

A comparison of the Baseline and 'No Medicaid' economies in Figure 10 indicates that

[20]We do not reduce c_{NH} to zero because then some individuals would experience negative consumption.

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.

Medicaid has a pronounced crowding out effect on private LTCI takeup. Removing Medicaid increases private LTCI takeup from 9.6% to 90.6%. Takeup increases in all five PE quintiles and even in the top 10 percentiles of PE. There is essentially no basis for private insurers to trade with individuals in PE Q1–Q2 in the Baseline. Even at higher PE levels, Medicaid depresses LTCI takeup because it provides an outside option to individuals that tightens their participation constraints. When Medicaid is absent, all individuals in PE Q2–Q4 purchase private LTCI and nearly all in PE Q1.[21] 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.

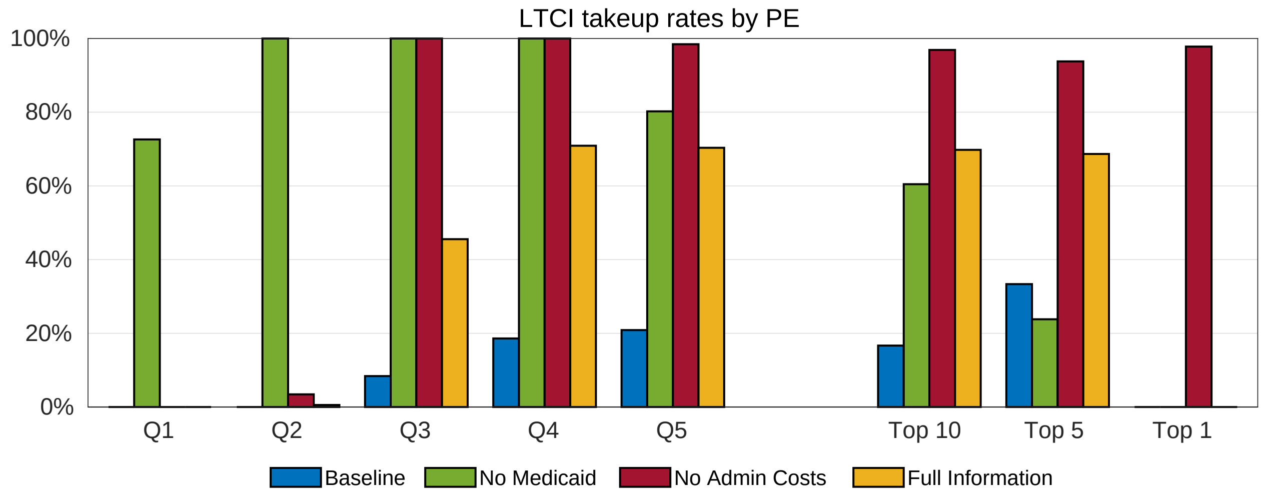
Figure 11 shows that removing Medicaid also impacts coverage rates, but the effects are smaller and more nuanced. Recall that, in the baseline economy, individuals do not want full private insurance contracts because Medicaid partially insures them against NH risk. Depending on the size of their consumption demand shock, they may or may not receive Medicaid benefits. Since they are partially insured in expectation against NH entry risk by Medicaid, they prefer partial insurance coverage from the private insurer. Consequently, removing Medicaid should increase private LTCI coverage levels. However, this is not necessarily the case due to two offsetting effects. First, removing Medicaid increases incentives to save. As saving rates go up, the willingness to pay for a marginal increase in private insurance declines, reducing coverage levels. Second, the composition of individuals who purchase private LTCI changes. Absent Medicaid, a larger share of private insurance purchasers are from the lower part of the PE distribution, where the ability to self-insure LTC risk with savings is lower and demand for private insurance is more inelastic. The net impact of these different effects is a small increase in the average coverage rate from 60% in the baseline to 66.2% in the 'No Medicaid' economy.

We next compare private LTCI takeup and coverage rates in the Baseline economy to those in the 'No Administrative Costs' economy. Removing administrative costs leads to a

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

Figure 10: LTCI Takeup Rates in Alternative Model Scenarios.

	Baseline	No Medicaid	No Admin Costs	Full Information
LTCI takeup rate (%)	9.6	90.6	60.4	37.5



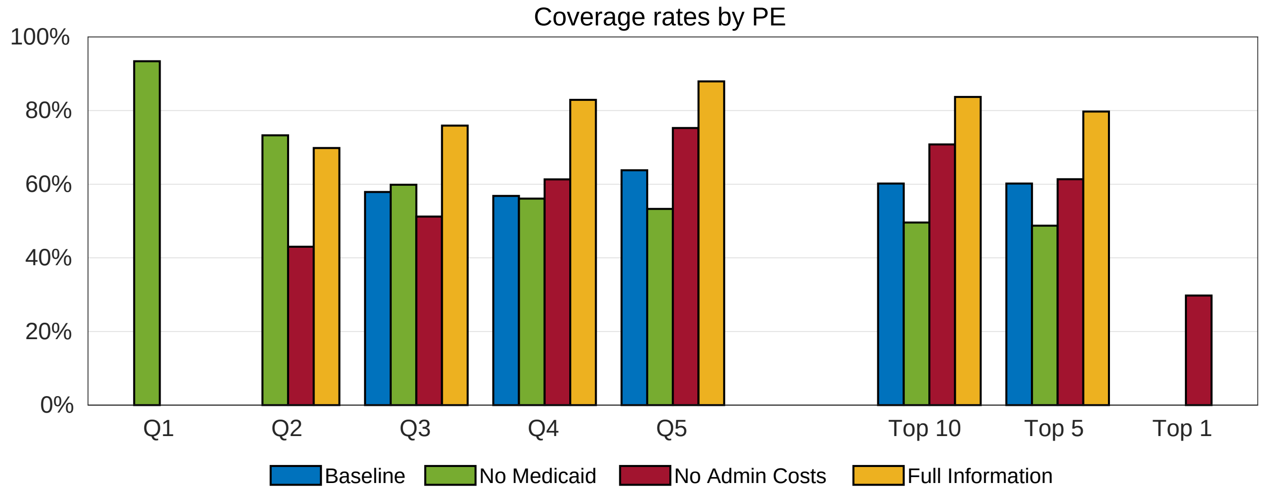
marked increase in takeup, from 9.6% to 60.4%. This overall increase is due to a sharp rise in takeup among affluent individuals in PE quintiles 3 through 5, including those in the top 10th, 5th, and 1st percentiles. In the absence of administrative costs, over 90% of individuals in these higher PE groups purchase private LTCI.

Coverage rates also go up slightly on average, rising from 60% to 62.3%. Coverage rates increase the most for individuals with PE around the 85th percentile. These individuals are the most exposed to LTC risk in the baseline. They have a relatively low probability of qualifying for Medicaid but are not wealthy enough to easily self-insure through savings. As PE falls, and the likelihood of qualifying for Medicaid benefits rises, individuals prefer less coverage from the private insurer. As explained above, this is true even though Medicaid is a secondary payer and private insurance replaces (as opposed to tops up) Medicaid benefits, because as income falls, the probability of being eligible for Medicaid goes up. Consequently, lower-income individuals' expected NH costs are smaller, and the amount of coverage they want from the private insurer is also smaller. Individuals in the top percentiles of PE also prefer less coverage compared to those with lower PE because they are better able to self-insure through savings.

Finally, removing private information also has a large impact on private LTCI takeup and coverage levels. When the insurer has full information, take-up rates increase to 37.5% and the average coverage rate increases to 83.1%. Private insurance takeup rates in PE Q4–Q5 and the top 10 and top 5 percentile exceed 60 percent, with coverage rates of 80 percent or higher. The increases in take-up are due to a large increase in take-up rates of low-risk types, whose take-up rises from 9.5% to 52.1%. In contrast, take-up rates of high-risk types decline from 9.7% to 1.7%. Since the insurer directly observes each individual's risk type, he no longer has to design menus that satisfy incentive compatibility. As a result, high-risk types no longer cross-subsidize low-risk types or become excluded. Instead, the insurer offers them

Figure 11: Coverage Rates in Alternative Model Scenarios.

	Baseline	No Medicaid	No Admin Costs	Full Information
Coverage rate (%)	60.0	66.2	62.3	83.1



more coverage with a lower load. By the same token, the insurer also offers more coverage to high-risk types, but the loads on these contracts go up, as do denial rates.

The overall message that emerges from this analysis is that all three frictions depress private insurance markets. But Medicaid is most important for lower PE groups.

5.2 Policy Reforms

We have established that our quantitative model accounts for the empirical distributions of private LTCI takeup rates and the dispersion in self-reported NH entry probabilities.[22] We have also shown that Medicaid, administrative costs, and adverse selection depress takeup and coverage rates in distinct ways. Medicaid crowds out private insurance at all five PE quintiles and is particularly important for understanding takeup and coverage rates of individuals with low personal resources. Administrative costs and adverse selection, in contrast, are important contributing factors to low takeup and coverage rates of affluent individuals.

We now use our quantitative model to consider the aggregate and distributional consequences of three distinct policy reforms. We will assess each reform based on how it impacts the fiscal situation of the government, the functioning of the private market for LTCI, and individual and aggregate welfare. The ensuing analysis assumes that the government adjusts the income tax rate to balance its budget each period and that the private insurer's profits are distributed to individuals in the top 1 percent of PE. How profits get distributed across PE groups can influence our welfare conclusions, and it is well known that equity holdings of US companies are concentrated among high-income individuals. Our assumption implies that, for the most affluent individuals in the economy, LTCI reforms primarily impact household

[22] Braun et al. (2019) provides a more detailed analysis of the empirical fit of the model.

wealth via the LTCI profits channel.

The 'No Medicaid' economy. Our baseline specification has two forms of public insurance. Individuals with low resources receive means-tested public LTCI benefits if they enter a NH. Poor elderly individuals can also qualify for means-tested social insurance if they don't experience the NH event. In the 'No Medicaid' economy the consumption floor guaranteed to NH entrants, c_{NH} is set to 0.001 of mean permanent earnings or approximately \$350 per year. The consumption floor provided to poor elderly individuals that do not experience a NH event, c_o, remains at its baseline value. Lowering the Medicaid LTC consumption floor close to zero produces large fiscal savings. The fraction of individuals receiving public transfers falls from 49.3 to 5.4 percent, public outlays on social insurance decline by 88.2 percent, and tax revenues fall from 0.016 to 0.002 as a share of mean PE.

Reducing the scale of publicly funded LTCI results in a large increase in demand for private LTCI (Table 3). All individuals in PE Q2–Q4 purchase private LTCI because the cost of a nursing home stay is large relative to their means. Private LTCI takeup increases to 72.6 percent in Q1 and is less than 100 percent because some individuals in PE Q1 still qualify for Medicaid. Takeup rates are also less than 100 percent in the highest PE quintiles, because some of these individuals prefer to self-insure LTC risk. Aggregate LTCI takeup rates rise from 10 to 91 percent. The insurer, recognizing that demand for private LTCI is now inelastic, responds by offering policies with higher premiums. Profits as a percentage of premium revenue are highest in PE Q1 (49.4 percent) and then fall monotonically with permanent earnings. Higher PE groups have the outside option of self-insuring LTCI and this is why profits decline. Aggregate profits increase from 0.07 to 31.5 percent of premium revenue and the aggregate fraction of NH costs covered increases from 60 percent in the baseline to 66.2 percent.

Our 1-period model has the property that Medicaid constrains the private insurer's ability to use selection to extract type-specific differences in demand. The quantitative model has this same property. The average load for bad risk types increases from -0.016 in the baseline to 0.167 here and the average coverage level increases from 77.4 percent to 90.6 percent. For good types, the average load increases from 0.528 to 0.595 and average coverage levels only increase from 52.8 percent to 59.5 percent.

Welfare of a newborn declines when Medicaid is essentially removed and a 23 percent supplement to consumption is required to make a newborn individual who does not yet know her initial income and health status indifferent between the 'No Medicaid' and the baseline economy. We have seen that profits are particularly high on contracts offered to low-income individuals because these groups no longer qualify for (free) Medicaid benefits. It follows that these same groups experience the biggest welfare losses. For instance, the compensating variation for individuals in the lowest PE quintile is 45.3 percent. High PE groups, in contrast, prefer the 'No Medicaid' economy to the baseline. They are not very likely to qualify for Medicaid benefits, and when Medicaid is scaled back, they benefit from lower taxes. This is the reason why compensating variations in PE quintiles four and five are negative. Individuals in the top 1 percent own the private insurer and also benefit from higher dividends on their shares.

Table 3: Welfare and indicators of the private and public LTCI in the Baseline, 'No Medicaid', 'Universal Medicaid' and 'Medicaid Primary' economies

Scenario	Baseline	No Medicaid	Universal Medicaid	Medicaid Primary
Welfare (newborn)	-2.757	-3.390	-2.704	-2.749
Compensating variations (%)		22.96	-1.92	-0.29
Average:				
Medicaid outlays (% change from baseline)		-88.2	185.5	-3.32
Govt tax revenue	0.016	0.002	0.035	0.015
NH entrants on Medicaid (%)	49.29	5.42	100.0	47.94
Profits/Premium revenue (%)	0.072	31.508	0.000	5.438
LTCI takeup rate	0.096	0.906	0.000	0.633
Fraction of NH costs covered	0.600	0.662	0.000	0.370
Load	0.407	0.558	0.000	0.504
LTCI takeup rate by PE Quintile				
1	0.000	0.726	0.000	0.000
2	0.000	1.000	0.000	0.314
3	0.084	1.000	0.000	0.989
4	0.186	1.000	0.000	1.000
5	0.209	0.802	0.000	0.863
High PE				
top 10	0.167	0.605	0.000	0.726
top 5	0.333	0.238	0.000	0.452
top 1	0.000	0.000	0.000	0.000
Profits/Premium revenue (%) by PE Quintile				
1	0.000	49.37	0.000	0.000
2	0.000	37.56	0.000	0.747
3	0.057	22.84	0.000	3.030
4	0.109	16.83	0.000	5.879
5	0.046	9.97	0.000	8.469
High PE				
top 10	0.115	4.23	0.000	6.436
top 5	0.115	3.01	0.000	7.223
top 1	0.000	0.000	0.000	0.000
Compensating Variations (%) by PE Quintile				
1		45.32	0.370	-0.001
2		12.47	-4.106	-0.081
3		2.614	-4.943	-1.061
4		-0.170	-2.844	-0.737
5		-1.981	-0.099	-0.353
High PE				
top 10		-2.964	0.752	-0.296
top 5		-4.531	1.471	-0.223
top 1		-16.25	2.709	-1.027

Note: Results are reported by permanent earnings (PE) quintiles and for the top 10, 5, and 1 percentiles of the PE distribution.

The Universal Medicaid economy. Americans are aging and the demand for long-term care services is rising, yet the US private insurance market is small and declining. Private insurers are hampered by adverse selection and high marketing and underwriting costs. These frictions disappear when the government provides universal public LTCI. We now analyze an economy in which the medical expenses associated with an NH stay are fully covered by universal public insurance. In this economy, the private market for LTCI becomes dormant

Table 4: Baseline vs Medicaid Primary

Descriptor	Baseline	Med Primary PE	% change	Med Primary GE	% change
Wealth at retirement including dividends:					
Average	0.2306	0.2305	-0.07	0.2306	-0.02
PE1	0.0000	0.0000			
PE2	0.0337	0.0393	16.62	0.0398	18.20
PE3	0.1530	0.1615	5.59	0.1613	5.43
PE4	0.2911	0.2846	-2.21	0.2850	-2.08
PE5	0.6754	0.6669	-1.26	0.6668	-1.28
Top 10	0.8804	0.8737	-0.76	0.8737	-0.76
Top 5	1.1188	1.1154	-0.30	1.1148	-0.36
Top 1	2.3366	2.3366	0.00	2.3397	0.13
Medicaid outlays inc AdminCost by PE:					
Average	0.0120	0.0116	-3.06	0.0116	-3.32
PE1	0.0308	0.0308	0.00	0.0308	0.00
PE2	0.0237	0.0227	-4.47	0.0225	-5.10
PE3	0.0045	0.0032	-29.96	0.0032	-29.49
PE4	0.0007	0.0012	61.46	0.0012	57.61
PE5	0.0001	0.0003	101.21	0.0003	100.26
Top 10	0.0001	0.0001	76.00	0.0001	71.22
Top 5	0.0000	0.0000	1486.72	0.0000	1537.33
Top 1	0.0000	0.0000	0	0.0000	0
Medicaid outlays inc AdminCost per recipient by PE					
Average	0.0547	0.0547	0.06	0.0546	-0.17
PE1	0.1022	0.1022	0.00	0.1022	0.00
PE2	0.0853	0.0870	2.00	0.0865	1.44
PE3	0.0356	0.0295	-17.16	0.0295	-17.01
PE4	0.0264	0.0293	10.88	0.0291	10.19
PE5	0.0240	0.0257	7.08	0.0257	6.92
Top 10	0.0216	0.0243	12.41	0.0240	10.90
Top 5	0.0129	0.0155	20.24	0.0147	13.62
Top 1	0	0	0	0	0
Fraction NH entrants got MTSI (%)			p.p. change		p.p. change
Average	48.80	47.49	-1.31	47.45	-1.35
Frac MTSI PE1	99.96	99.96	0.00	99.96	0.00
Frac MTSI PE2	90.72	84.97	-5.74	84.87	-5.85
Frac MTSI PE3	42.02	35.45	-6.57	35.62	-6.40
Frac MTSI PE4	9.41	13.60	4.19	13.36	3.95
Frac MTSI PE5	1.88	3.46	1.58	3.45	1.57
Frac MTSI Top 10	1.02	1.60	0.57	1.58	0.55
Frac MTSI Top 5	0.06	0.64	0.59	0.70	0.65
Frac MTSI Top 1	0.00	0.00	0.00	0.00	0.00

and government LTC expenditures increase by nearly 186 percent, to a level equivalent to approximately 1.2 percent of GDP (or about 20 percent of US Social Security outlays in 2023). This reform increases ex ante welfare and increases redistribution from wealthy individuals to low- and middle-class individuals. A deduction of 1.92 percent of consumption makes a newborn individual indifferent between this economy and the baseline. Middle-class individuals are the biggest beneficiaries of universal public LTCI. Compensating variations are negative for PE quintiles 2 through 5 and are particularly significant for PE quintile 3 (-4.94 percent). Interestingly, PE quintile 1 prefers the baseline. For these individuals, public insurance of LTC risk is similar in both economies, but some members of this group are now paying higher income taxes. All three high PE groups prefer the baseline too. Individuals in these groups are relatively healthy and have the resources to self-insure LTC risk. They prefer not to pay higher income taxes to finance a public insurance program whose primary beneficiaries are low- and middle- class individuals. The top PE group experiences the largest welfare loss. Their tax burden is highest and their profit income is now zero because the private LTCI market is dormant.

The Medicaid primary economy. Recall that the secondary payer provision of Medicaid depresses private LTCI takeup in the 1-period model presented in Section 3.1 and the 2-period model presented in Appendix Section 7.2. Making Medicaid the primary payer increases LTCI takeup rates, but at the same time increases Medicaid takeup rates in both simple models. Aggregate Medicaid expenditures also increase in the 1-period model, but their response is ambiguous in the 2-period model because Medicaid transfers fall for some individuals and increase for others. We now explore how switching Medicaid to a primary payer impacts the magnitude and direction of private LTCI takeup and Medicaid outlays in our quantitative model. Column 4 of Table 3 reports results for this scenario.

Making Medicaid the primary payer has a large positive impact on the functioning of the private insurance market. The average LTCI takeup increases from 9.6 percent in the baseline to 63.3 percent when Medicaid is primary, and the increases are broadly based across the PE distribution. Private insurance takeup rates increase in Q2–Q5 and in the top 10 and top 5 percentile PE groups. Profitability increases for all insured groups, even though the average coverage rate of private insurance policies declines from 60% to 37%. The intuition for why private LTCI rates increase in the quantitative model is the same as in the 1-period and 2-period models. For instance, some previous non-holders of private LTCI who qualified for Medicaid now have a higher WTP for private insurance because their Medicaid benefits don't cover the entire loss, and, when Medicaid is primary, private insurance no longer reduces their Medicaid transfers. When Medicaid is primary, they purchase small private policies that top up their free Medicaid benefits.

The most surprising result is that Medicaid outlays are 3.3 percent lower in the Medicaid primary economy as compared to the baseline. The fiscal savings are concentrated in PE quintiles 2 and 3 (Table 4) with outlays falling by 5.1 percent in Q2 and 29.5 percent in Q3. Like in the 2-period model, when Medicaid is a primary payer, individuals in PE quintiles 2 and 3 save more when young to purchase private LTCI at the start of period 2. Wealth at the start of retirement, before they receive their second-period endowment and purchase private LTCI, is 18% higher in PE Q2 and 5% higher in PE Q3. Yet, in contrast to the 2-period model, in the quantitative model, individuals incur a consumption demand shock after purchasing private LTCI but before the NH event is realized. Consequently, resources and Medicaid eligibility at the time of the LTC shock are uncertain. Given this uncertainty, their higher level of wealth at the start of retirement reduces their likelihood of receiving Medicaid transfers in the NH state.[23] It follows that the fraction of PE Q2 and PE Q3 individuals qualifying for Medicaid benefits at the time of the NH shock falls by 5.9 and 6.4 percent respectively. These fiscal savings are partially offset by higher fiscal outlays in higher PE groups who enter period 2 with lower wealth and qualify for Medicaid benefits in more states of nature. Wealth for these groups declines (Table 4) for three reasons. Private insurance is more attractive to them and their takeup rates increase. The second and related factor is that these groups can now qualify for free Medicaid benefits in more states of nature. Their overall coverage against a LTC event is higher, and this reduces their precautionary savings motive (See the partial equilibrium results in Table 4. The third and final factor is a GE effect that arises because taxes are lower.[24] The magnitudes of the increase in Medicaid expenditures is relatively small, and aggregate Medicaid expenditures decline by 3.3 percent.

Finally observe that aggregate Medicaid benefits per recipient decline by a small amount (-0.02 percent). This result is due to a large decline in benefits per recipient in PE quintile 3, which declines by 17 percent. Medicaid expenditures per recipient increase in PE quintiles 2, 4, and 5.

Welfare of a newborn is higher in the Medicaid primary scenario compared to the baseline. The increase is not as large as the 'Universal Medicaid' scenario, but that scenario exhibited considerable disagreement between high PE and other PE groups. There is no conflict in this scenario. Welfare increases in all PE quintiles as well as in the three High PE groups in Figure 3. In fact, this reform is Pareto improving; welfare is weakly higher for all individuals in the model. Most PE groups benefit because they have higher total insurance coverage compared to the baseline for LTC risk. The top 1 percentile PE group still prefers to self-insure LTC risk, but they benefit from higher dividend income (insurer profits increase) and lower taxes. Individuals in PE quintile 1 also benefit from lower taxes, but the magnitude of this benefit is small because in many cases their income is below the exemption threshold for income taxation.

6 Conclusion

The United States and other advanced economies are aging, and associated with aging is higher demand for LTC services. Yet, private LTCI insurance markets are shrinking, and most Americans find themselves paying for expensive long-term care 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 the LTCI market.

Our results explain why it is difficult to build a consensus behind large-scale reductions or increases in public LTCI. A smaller public LTCI program increases the welfare of affluent individuals because their tax bill falls and they have the resources to pay their own LTC expenses. However, it has a large negative impact on the welfare of the poor who are the main beneficiaries of the US Medicaid program. A larger public LTCI program benefits

[23]This result can't occur in our 2-period model. It occurs here because the consumption demand shock creates uncertainty about asset holdings in period 3. Households have a precautionary savings motive that is absent in the 2-period model.

[24]Dividends for the top 1 percentile group are also higher.

middle-class individuals who are too wealthy to be well covered by Medicaid but too poor to easily self-insure. But, it results in welfare losses for the rich and very poor who are paying higher taxes but experiencing no changes in their public insurance coverage levels. Even though individuals in our model have very different views about how to reform Medicaid, we are able to produce a Pareto improving reform. Making Medicaid the primary payer for LTC insurance while retaining the means-test increases private LTCI takeup rates, increases the profitability of insurers, and increases the welfare of low-, middle-, and high-income individuals.

References

Aizawa, N. and A. Ko (2023): "Dynamic Pricing Regulation and Welfare in Insurance Markets," Working Paper 30952, National Bureau of Economic Research.

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.

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.

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

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.

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

Chade, H. and E. Schlee (2016): "Insurance as a Lemons Market: Coverage Denials and Pooling," Working Paper.

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

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

Finkelstein, A. and K. McGarry (2006): "Multiple Dimensions of Private Information: Evidence from the Long-Term Care Insurance Market," *American Economic Review*, 96, 938–958.

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.

Gruber, J. (2022): *Public Finance and Public Policy*, Macmillan.

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.

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

Hubbard, R. G., J. Skinner, and S. P. Zeldes (1994): "The Importance of Precautionary Motives in Explaining Individual and Aggregate Saving," *Carnegie-Rochester Conference Series on Public Policy*, 40, 59–125.

——— (1995): "Precautionary Savings and Social Insurance," *Journal of Political Economy*, 103, 360–399.

Joyce, M. and A. Singh (2025): "Income uncertainty, precautionary wealth, and social insurance," *European Economic Review*, 175, 105003.

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

Law, P. (1996): "Health Insurance Portability and Accountability Act of 1996," Public Law 104-191, 104th Congress, Public Law 191.

Lewis, S., J. Wilkin, and M. Merlis (2003): "Regulation of Private Long-Term Care Insurance: Implmentation 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.

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.ed. D. Wise, University of Chicago Press: D. Wise.

Stiglitz, J. (1977): "Non-Linear Pricing and Imperfect Information: The Insurance Market," *The Review of Economic Studies*, 44, 407–430.

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

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.

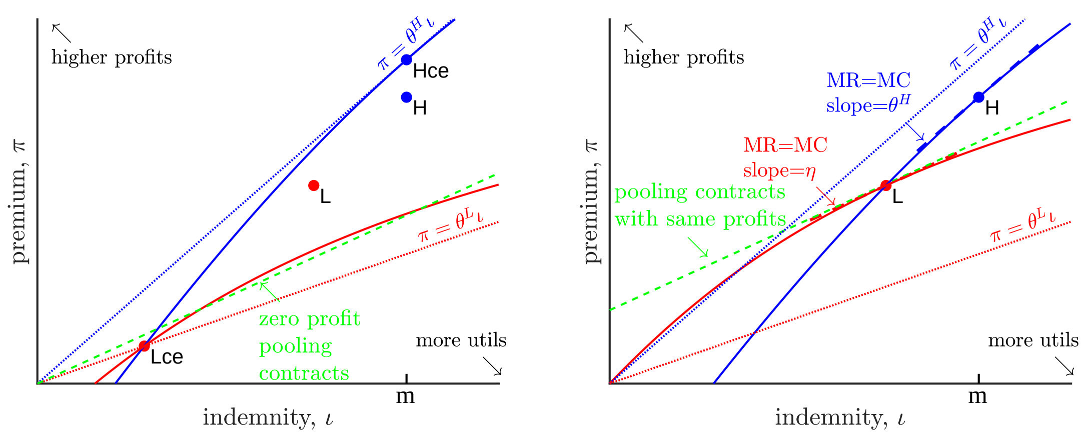
The key difference between the competitive market and the monopolist is that in the competitive market, the optimal menu of contracts must earn zero profits. For such a menu to constitute an equilibrium, no alternative contract menu can exist that both (i) earns positive profits and (ii) is strictly preferred by both private information types. If such a menu exists, an entrant could profitably offer a pooling contract that attracts 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 equilibrium exists.

In Figure 12a, the points Hce and Lce represent the optimal zero-profit contracts. However, contracts located above the green dashed 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 {Hce, 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 {H, L} and earns higher profits. The only pooling contracts that yield higher profits lie northwest of the green dashed 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.

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 parametrization 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 $\underline{c}_{NH} = 0$.

7.2 Medicaid's Impacts on Savings in a Simple 2-Period Model

Here we use a simple 2-period model with Medicaid and private insurance to illustrate how switching Medicaid from a secondary-payer to a primary-payer impacts savings.

7.2.1 The two-period model with Medicaid Secondary

Consider an individual who lives for 2 periods: young and old. Resources when young are w_y and when old are w_o. The risk of entering a nursing home (NH) in period 2 and incurring NH expenses $m > 0$ is $\theta \in (0, 1)$. Assume the discount factor and interest rate are such that $\beta = 1 + r = 1$. The individual can purchase actuarially fair private insurance for the NH event at the beginning of period 2. Medicaid also provides insurance by guaranteeing a consumption floor of $\underline{c}_{NH}$ in the NH state. Medicaid is a secondary payer, which means that private insurance payments reduce the Medicaid transfer T dollar-for-dollar. Assume $w_o - m < \underline{c}_{NH} < w_o$, which means that if the agent's savings are low enough and he does not purchase private insurance, he will be eligible for Medicaid benefits, but Medicaid coverage is incomplete.

The individual chooses how much to consume, c_y, and save, a, in period 1 and how much private insurance to purchase, $q \geq 0$, at unit price p at the beginning of period 2 by solving

$$\max_{c_y, a, q \geq 0} u(c_y) + \theta u(c_{NH}) + (1 - \theta) u(c_o), \tag{21}$$

where

$$c_y + a = w_y, \tag{22}$$

$$c_o = w_o + a - p, \tag{23}$$

$$c_{NH} = w_o + a - m + q + T, \tag{24}$$

$$T = \max\Big\{0, \underline{c}_{NH} - \big[w_o + a - m + q\big]\Big\}, \tag{25}$$

$$p = \theta q / (1 - \theta), \tag{26}$$

and $u(c) = c^{1-\sigma}/(1 - \sigma)$ with $\sigma > 0$.

The first-order condition for savings is

$$u'(c_y) = (1 - \theta) u'(c_o) + \theta u'(c_{NH}) I_{T=0}, \tag{27}$$

and the first-order condition for private insurance is

$$[u'(c_o) - u'(c_{NH}) I_{T=0}] q = 0. \tag{28}$$

Two types of local maxima exist. One where the agent relies on Medicaid and does not purchase private insurance and one where he purchases private insurance and does not receive Medicaid transfers. If the agent is receiving Medicaid transfers, the marginal value of private insurance is zero because all this insurance will do is reduce Medicaid transfers dollar-for-dollar. It is easy to see that when Medicaid transfers $T > 0$, the amount of private insurance, q, must be 0 for equation (28) to hold. Equation (28) also shows that if the agent is not receiving Medicaid transfers, he will purchase the amount of private insurance needed to equate consumption in the NH and non-NH state. Agents with lower levels of the endowments w_y and w_o are more likely to rely on Medicaid, while higher endowment agents are more likely to purchase private insurance.

7.2.2 The two-period model with Medicaid Primary

If Medicaid is instead a primary payer then

$$T = \max\Big\{0, \underline{c}_{NH} - \big[w_o + a - m\big]\Big\}. \tag{29}$$

Under this arrangement, the first-order condition for savings, equation (27), does not change. The first-order condition for private insurance becomes

$$u'(c_o) - u'(c_{NH}) = 0. \tag{30}$$

Note that when either $q = 0$ (no private insurance) or $T = 0$ (no Medicaid), there is no difference between the Medicaid secondary and primary scenarios.

7.2.3 Case 1: Low-endowment agent who relies on Medicaid when it is a secondary payer

Consider the case of a low-endowment agent who prefers to rely on Medicaid when Medicaid is a secondary payer. Let Medicaid transfers at the optimal allocations be given by $T^S > 0$. Since $T^S > 0$, for equation (28) to hold it must be that $q^S = 0$ and consequently $p^S = 0$. The first-order condition for savings, equation (27), becomes

$$u'(w_y - a) = (1-\theta)u'(w_o + a). \tag{31}$$

Now consider the same agent when Medicaid is a primary payer. By revealed preference, the agent will still prefer to rely on Medicaid ($T^P > 0$), but may top-up Medicaid by purchasing some private insurance. To see this, note that since $q^S = 0$, the optimal allocation under Medicaid secondary gives the agent the same level of utility under Medicaid primary. At the optimum, this level of utility is higher than the level of utility the agent would get if Medicaid transfers were zero ($T = 0$), which is also independent of Medicaid's payer status. Thus, when Medicaid is a primary payer, the agent is always better off at the Medicaid secondary optimum where $T > 0$ and $q = 0$ over any choice that results in $T = 0$ and $q > 0$.

While relying solely on Medicaid is preferred to relying solely on private insurance, the agent can achieve even higher utility by purchasing some private insurance and relying on both. Since Medicaid is a primary payer, his optimal quantity of private insurance, q^P, is determined by equation (30). This equation is satisfied when $c_o = c_{NH}$ or when

$$q^P = (1-\theta)(w_o + a - \underline{c}_{NH}) > 0, \tag{32}$$

which implies that

$$p^P = \theta(w_o + a - \underline{c}_{NH}) > 0. \tag{33}$$

In other words, it was not optimal for the agent to purchase private insurance when Medicaid was a secondary payer, but it is optimal when Medicaid is a primary payer. Medicaid as a primary payer allows the agent to use private insurance to increase consumption in the NH state above the level provided by Medicaid. This increases the value of resources in period

2, and the first-order condition for savings, equation (27), becomes

$$u'(w_y - a) = (1-\theta)u'(w_o + a - p^P), \tag{34}$$
$$= (1-\theta)u'(w_o + a - \theta(w_o + a - \underline{c}_{NH})). \tag{35}$$

Since

$$w_o + a - \theta(w_o + a - \underline{c}_{NH}) < w_o + a, \tag{36}$$

the marginal benefit of saving is higher when Medicaid is primary compared to Medicaid secondary, i.e.,

$$(1-\theta)u'(w_o + a - \theta(w_o + a - \underline{c}_{NH}) > (1-\theta)u'(w_o + a). \tag{37}$$

While the marginal benefit of savings is higher under Medicaid primary, the marginal cost remains the same. Consequently, the optimal level of savings must be higher: $a^P > a^S$.

Figure 13: The marginal cost (MC) and benefit (MB) of saving, utility, indemnity, and Medicaid transfer by asset choice for the low-endowment agent.

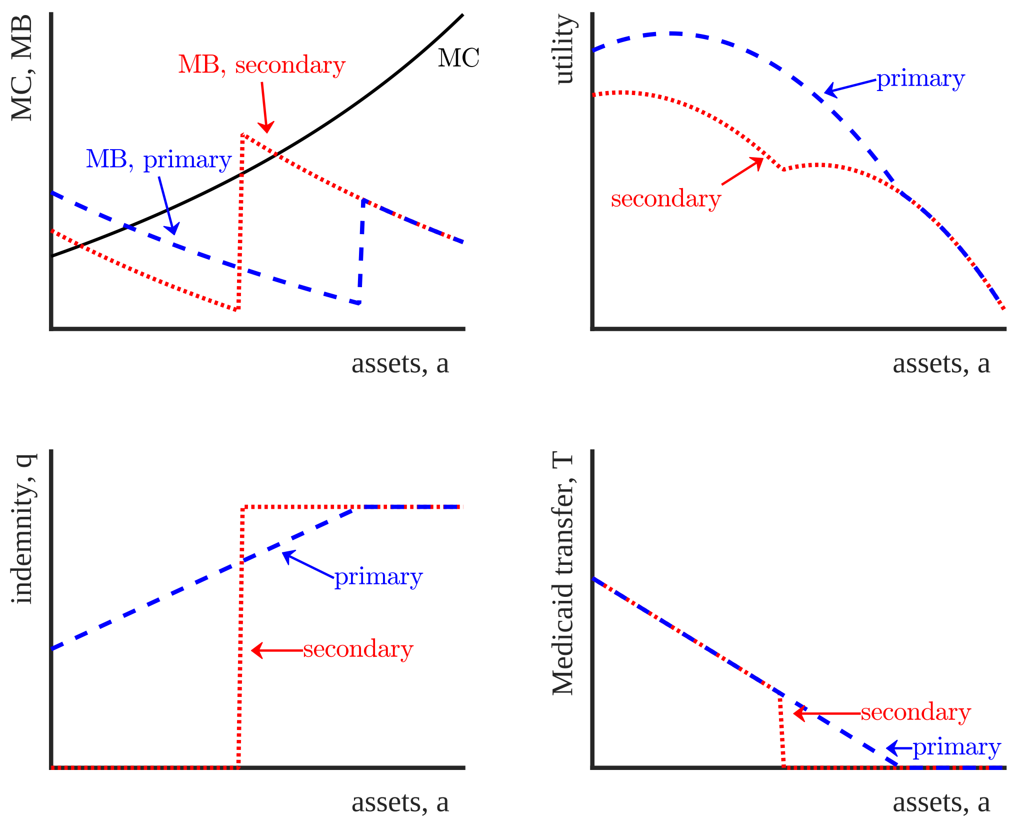


Figure 13 illustrates how changing Medicaid from a secondary payer to a primary payer impacts the marginal benefits of savings, utility, the private insurance indemnity, and Medicaid transfers for the low-endowment agent. Two local maxima can be observed when Medicaid is a secondary payer. Utility is maximized at the local maximum with lower savings, no private insurance, and positive Medicaid transfers. When Medicaid is a primary payer, the marginal benefit of savings is higher when receiving Medicaid transfers as now savings can be used to top-up Medicaid with private insurance. The optimal level of savings increases, utility goes up, and private insurance take-up becomes positive.

7.2.4 Case 2: High-endowment agent who purchases private insurance when Medicaid is a secondary payer

Now consider the case of a higher-endowment agent who, even though when Medicaid is a secondary payer he is eligible for Medicaid if he saves nothing and purchases no private insurance, prefers to purchase private insurance and receives zero Medicaid transfers, i.e. $T^S = 0$. Since $T^S = 0$, for equation (28) to hold it must be that $c_o = c_{NH}$ which occurs when

$$q^S = (1-\theta)m > 0, \tag{38}$$

and

$$p^S = \theta m > 0. \tag{39}$$

Consumption in period 2 will be

$$c_o = c_{NH} = w_o + a - \theta m. \tag{40}$$

The FOC for savings, equation (27) becomes

$$u'(w_y - a) = (1-\theta)u'(w_o + a - \theta m). \tag{41}$$

Now consider the same agent when Medicaid is a primary payer. By revealed preference, since the agent prefers to purchase private insurance when Medicaid is secondary ($q^S > 0$), he will prefer to purchase it when Medicaid is primary ($q^P > 0$). Suppose the agent chooses the same level of savings a^S and private insurance q^S when Medicaid is primary as when it was secondary. Under Medicaid secondary, $T^S = 0$ at this point and by equation (29), $T^P = T(a^S, q^S) \geq 0$. Thus, the optimal allocation under Medicaid secondary gives the agent the same or a higher level of utility under Medicaid primary. As the optimum, this level of utility is higher than the level of utility the agent would get if the agent does not purchase private insurance ($q^P = 0$), which is independent of Medicaid's payer status. Thus, when Medicaid is a primary payer, the agent is always better off at the Medicaid secondary optimum where $q > 0$ and $T \geq 0$ than at any point where $q = 0$.

With Medicaid primary, q must satisfy equation (30). This equation is satisfied when $c_o = c_{NH}$. There are two possibilities: the agent gets Medicaid transfers at the optimum, and the agent doesn't. If the agent doesn't get Medicaid transfers at the optimum, then the optimal allocation is the same as in the Medicaid secondary case and $T^P = T^S = 0$, $q^P = q^S$, and savings don't change ($a^P = a^S$). If the agent gets Medicaid transfers at the optimum, then q^P and p^P are given by equations (32) and (33), and the first-order condition for savings is given by equation (35). Since $T^P > 0$ if must be that $\underline{c}_{NH} > w_o + a - m$ which means that $m > w_o + a - \underline{c}_{NH}$ which means that

$$w_o + a - \theta(w_o + a - \underline{c}_{NH}) > w_o + a - \theta m, \tag{42}$$

which means that the marginal benefit of savings is lower when Medicaid is primary compared to Medicaid secondary:

$$(1-\theta)u'(w_o + a - \theta(w_o + a - \underline{c}_{NH})) < (1-\theta)u'(w_o + a - \theta m). \tag{43}$$

Since the marginal benefit of savings is lower under Medicaid primary, while the marginal cost remains the same, savings must be lower, i.e., $a^P < a^S$.

Figure 14: The marginal cost (MC) and benefit (MB) of saving, utility, indemnity, and Medicaid transfer by asset choice for the high-endowment agent.

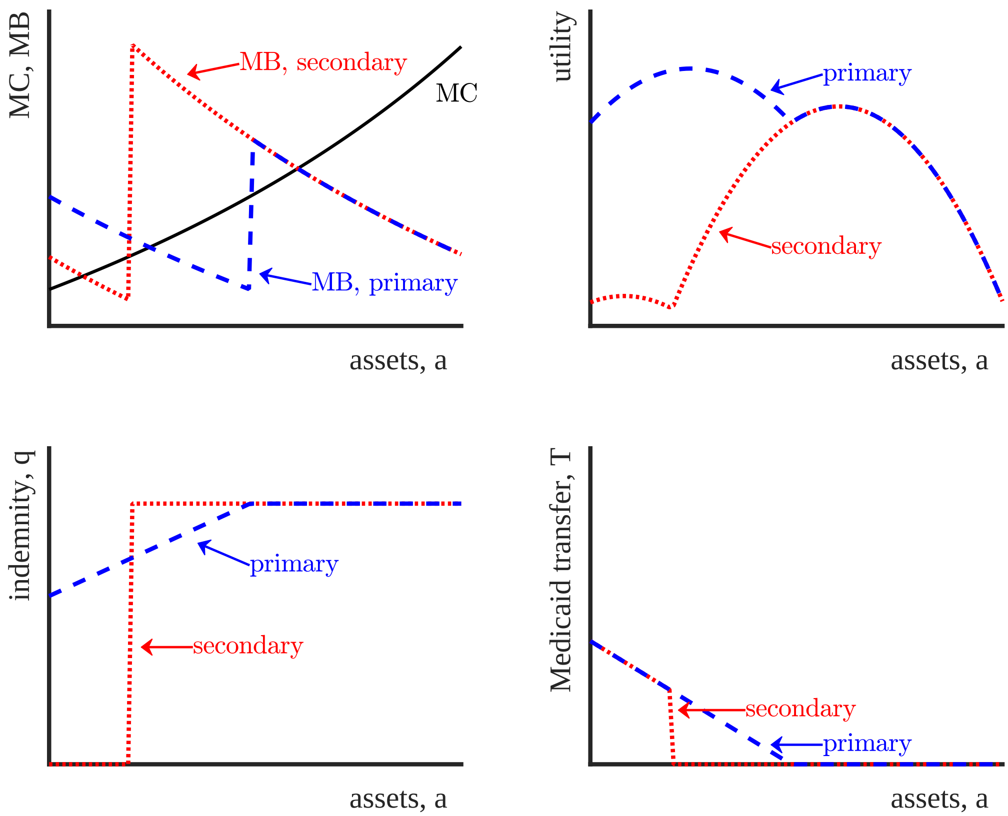


Figure 14 illustrates how changing Medicaid from a secondary payer to a primary payer impacts the marginal benefits of savings, utility, the private insurance indemnity, and Medicaid transfers for the high-endowment agent. Two local maxima can be observed when Medicaid is a secondary payer. Utility is maximized at the local maximum characterized by higher savings, no Medicaid transfers, and positive private insurance. Notice that if the agent makes no change to his savings, then he achieves the same level of utility under Medicaid primary as under Medicaid secondary. However, he can achieve higher utility by reducing his savings. Lowering savings allows him to qualify for Medicaid benefits, which, under Medicaid primary, he can top up with private insurance. At the optimal level of savings with Medicaid primary, the agent purchases less private insurance, instead relying in part on free Medicaid benefits.

To summarize, the overall impact on aggregate savings of switching Medicaid from a secondary payer to a primary payer is ambiguous. The savings behavior of individuals whose resources are so limited that they can't afford to top up Medicaid with private insurance does not change. Nor does the savings behavior of the most affluent individuals, who have little chance of ever qualifying for Medicaid. Individuals with some but limited resources who choose to forgo private insurance and rely on Medicaid when it is a secondary payer behave like the low-endowment agent above. With Medicaid as a primary payer, they increase their savings and purchase private insurance to top up Medicaid benefits. Individuals with higher levels of resources who purchase private insurance when Medicaid is a secondary payer, but, absent private insurance, could have received Medicaid benefits, behave like the high-endowment agent. With Medicaid as the primary payer, they do not need to purchase as much private insurance to achieve the same level of consumption in the NH state. This reduces the value of saving, and they save less. Since some individuals save more and others less, the net effect on aggregate savings is likely small but could go either way.

7.3 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).

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
Nursing home 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
Welfare consumption floor	$\underline{c}_o$	0.01855