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Reforming Medicaid Long Term Care Insurance ☆

Elena Capatina
UNSW

Gary Hansen
UCLA

Minchung Hsu
GRIPS

Abstract

We build a life-cycle model of household consumption and saving decisions, where long term care (LTC) expenditures are endogenous. We use an LTC-state dependent utility function where regular consumption and LTC are valued differently. The model includes both married and single households, thus capturing important family dynamics that are important for precautionary savings and LTC decisions. Married individuals face the risk of a spouse needing LTC and quickly depleting joint assets. However, those needing LTC can benefit from the presence of a healthy spouse who provides informal care, lowering the costs of LTC given a fixed quality of care. We use the calibrated model to estimate the importance of family dynamics for savings and consumption decisions, and also to quantify the impacts of LTC policy reforms such as the provision of a universal public system that pays for a minimum level of LTC costs.

Keywords: Long Term Care, Medicaid Reform, Household Risk
JEL classification: D91, E21, H31, I10, I38, J14

1. Introduction

Rapid population aging poses significant challenges in terms of long term care (LTC) provision and financing. In countries that lack a universal public LTC insurance system, out-of-pocket LTC costs are high and persistent, and represent a large source of individual financial risk (see Ameriks et al. (2015)). In the United States, which has no universal LTC coverage, expenses are paid out-of-pocket, using private insurance, or, when an individual is impoverished, by Medicaid. As a result, anticipated LTC expenses account for much saving among older households, and when the accumulated funds are not needed, accidental bequests. In addition, private LTC insurance is not widely held (see (Brown and Finkelstein, 2007) and (Brown and Finkelstein, 2008)).

This paper contributes to the literature on LTC by building a life-cycle model with incomplete markets to consider two alternative scenarios relative to the current system for

☆This research has been supported by the Australian Research Council Centre of Excellence in Population Ageing Research (project number CE110001029), GRIPS Policy Research Center and JSPS Grants-in-Aid for Scientific Research (Kakenhi) project number 26780173.

funding LTC. The first would introduce basic LTC coverage of the sort currently funded by Medicaid to all households as a feature of Medicare. However, the desired level of LTC demanded by households in our model may be larger than this basic coverage, and the difference would need to be funded through private saving. Given that this environment would still lead to potential accidental bequests, we consider a second scenario where actuarially fair insurance is available to cover the difference between the desired level of LTC and that covered by Medicare. The welfare benefits of these two scenarios relative to the current system (our benchmark) are evaluated.

This paper builds on the previous literature that explores how individuals insure against this risk and how current partial LTC insurance systems affect their choices. We advance the current literature by modeling two key features in a consumption/savings life-cycle model. First, we model family dynamics to capture informal care that can be provided by a healthy spouse.[1] The risk of a spouse needing LTC and the risk of death of a spouse interact closely with an individual's own LTC risk. A spouse with LTC needs is likely to quickly run down joint financial resources. However, the presence of a spouse in old age is not only a source of risk but also a source of insurance against an individual's own LTC needs. The provision of informal care by healthy spouses greatly decreases average expenditures on formal LTC (Lakdawalla and Philipson (2002)). Family dynamics in the context of life-cycle models with risk faced by the elderly have been previously studied in Braun et al. (2014).

Second, we allow for endogenous LTC expenditures, recognizing the fact that there is a wide range of quality types of LTC that are associated with different levels of utility for individuals. Our model features an LTC state dependent utility function as in Ameriks et al. (2015). Ameriks et al. (2015) show that savings behavior is strongly influenced by people's preferences over LTC expenditures since the marginal utility from LTC expenditures is high.

The novel aspect of our paper is to study policy related to LTC in a model where these two features, family dynamics and endogenous LTC expenditures, interact. Couples where only one member needs LTC need to decide how to allocate resources between formal LTC and savings for the consumption and possible future LTC needs of the remaining healthy spouse. In addition, a couple with only one member needing LTC will require less formal care relative to a single individual given the informal care that can be provided by the healthy spouse. Hence, marital status is an important determinant of the risk associated with LTC faced by a given household, so taking this into account is important when considering any kind of policy reform affecting LTC. The model we study is a life-cycle model of consumption/saving with heterogeneous households. While our focus is on retirees, we model the working part of the life-cycle in order to capture the precautionary savings motive for LTC at all ages, and analyze how asset accumulation throughout the working life-cycle changes in response to different LTC insurance schemes.

[1] (Brown and Finkelstein, 2011) reports that estimates of the implicit value of informal care range from about 60 percent of market spending (formal care) to over 100 percent.

Households enter the economy at age 35 either single (male or female) or married and with a particular level of education and initial wealth. Single households do not marry and married households do not divorce. A married household becomes a single household upon the death of one member. Households face earnings risk, and each household member faces health and survival risk. All households, both single and married, supply labor inelastically to the labor market until the household head, assumed to be the male for married couples, retires at the exogenous age of 65.

All individuals face health risk throughout theirs lives, but after the age of 65, they also face disability risk, where disability can be mild or severe. Those with severe disabilities are classified as needing LTC. Preferences are standard over consumption for households where no member needs LTC. However, individuals in need of LTC have preferences over LTC rather than regular consumption. LTC expenditures are endogenous. An important feature is that individuals needing LTC can benefit from the presence of a healthy spouse who is assumed to be available to provide care and support, lowering the need for formal LTC to provide a given quality of care. We also model the Medicaid system and include social insurance in the form of a consumption floor.

We calibrate the model to the U.S. economy using data from the Medical Expenditures Panel Survey (MEPS) and the Health and Retirement Study (HRS).

To be continued....

2. Model

2.1. Demographics Summary

The economy is populated by overlapping generations of households that live for a maximum of J periods where a model period is two years. Households consist of either a single individual of a particular sex ($g \in \{m, f\}$) or a married couple of mixed genders. We assume there is no marriage or divorce. However, households of all ages can transition from married to single as a result of the death of a spouse. We denote marital status by $ms \in \{s, m\}$. Parameters and variables have subscripts s or m when they depend on marital status.

The first period of life for a household is age 35, which is denoted by $j = 1$. A household retires exogenously at age 65 ($j = J_r = 16$) and lives for a maximum of 109 years ($J = 38$). Individuals within households face mortality risk each period.

Single households are described by a state vector $\Phi_s = \{j, g, e, h, z, a\}$, which consists of age, gender, education status, health status, productivity and financial assets. The fraction of households that enter the model as singles is equal to γ. Hence, the fraction of households of age $j = 1$ that are married is $1 - \gamma$.

Married couples consist of a husband and wife and are described by a state vector $\Phi_m = \{j, j^*, e, h, h^*, z, a\}$, where j^* and h^* are the wife's age and health status. We assume that married households share the same education status, productivity level and asset level.

Given a husband's age j, a wife can be of age $j^* \in \{j-5, j-2, j+1\}$.[2] This enables us to capture heterogeneity in age differences between husband and wife across married couples.

The initial distribution of households at age $j = 1$ is given by $\gamma\Gamma_s(\Phi_s = (j = 1, g, e, h, z, a))$ and $(1-\gamma)\Gamma_m(\Phi_m = (j = 1, j^*, e, h, h^*, z, a))$.

2.2. Education

Households are endowed with education status at age $j = 1$ which does not change over the household's life. In particular, households are either college educated (16 years of education or more) or have less than 16 years of education. That is, $e \in \{e_l, e_h\}$.

2.3. Health

The health of each individual (either single or member of a married couple) is one of four possible states: good, bad, low disability and high disability $h \in \{h_g, h_b, ADL_l, ADL_h\}$.[3] We assume that disability states become possible at the age of 65, and no disability exists at younger ages. Good and bad health states h_g and h_b are assumed to be free of disability. ADL_l represents a state of mild disability where the individual needs help with only one or two activities of daily living (ADLs). ADL_h is a state of severe disability where an individual needs help with 3 or more ADLs. Only individuals in high disability states require LTC, so the ADL_h state is equivalent to an LTC state. The six ADLs considered are bathing, eating, dressing, walking across a room, getting in or out of bed, and using the toilet.

Health status evolves according to a Markov process that depends on marital status, sex, health, age, and education. The health transition probability matrices are given by $H_s(h', h, j, g, e)$ for singles, $H_m(h', h, j, e)$ for husbands, and $H_m^*(h^{*'}, h^*, j^*, e)$ for wives.

2.4. Survival

Survival probabilities depend on marital status, age, sex, education, and health. They are given by $\rho_s(j, g, e, h)$ for single individuals, $\rho_m(j, e, h)$ for married males, and $\rho_m^*(j^*, e, h^*)$ for married females. If a married woman survives until her spouse reaches J, an extremely unlikely event, we assume that both members of the household die together.

[2] We discretize the possible age differences between spouses into these three groups based on our analysis of the age difference distribution observed in the HRS among married couples. We divide the distribution into 3 groups: the first group contains wives who are 8 or more years younger than the husbands; the second groups contains wives who are between 1 and 7 years younger; and the third group contains wives who are the same age or older than their husbands. The first and the third groups each contains approximately 20% of couples, while the second group contains approximately 60% of couples when the husband is 65. On average, the wives' ages relative to the husbands in these three groups are approximately: (1) 10 years younger; (2) 4 years younger; and (3) 2 years older. Details on this analysis are provided in the Appendix.

[3] The health of the wife in a married couple is denoted by $h^* \in \{h_g, h_b, ADL_l, ADL_h\}$.

2.5. Productivity

All single individuals younger than 65 and all couples where the husband is younger than 65 are assumed to participate in the labor force. Labor productivity (relative earnings) z is measured at the household level. We assume that z takes one of five possible values $z \in \{z_1, ..., z_5\}$. For singles, labor productivity depends on age, sex, education and health. Given an initial value for z at age 35, productivity evolves according to the probability transition matrix $P_s(z', z, j, g, e, h)$.

For married couples, earnings evolve according to the probability transition matrix $P_m(z', z, j, e, h)$ that depends only on the age, education and health of the husband. We assume that when the husband reaches the age of 65, the married couple retires even if the wife is younger.

If a spouse dies and the surviving spouse is younger than 65 ($J_r = 16$), the survivor will participate in the labor force until they turn 65, just as any single individual. In the first period in which a spouse becomes single (a widow or widower), they draw a productivity level from the distribution $\Pi(j, g, e, h)$.

2.6. Medical Expenditures

We treat medical expenditures differently depending if $h \in \{h_g, h_b, ADL_l\}$ or if $h = ADL_h$. In the latter case, total consumption is denoted by x, which represents LTC expenditures. This is chosen by households to maximize expected lifetime utility. Note that we do not separate LTC consumption into a medical and non-medical component.

If $h \in \{h_g, h_b, ADL_l\}$, we model out of pocket (OOP) medical expenditures as exogenous wealth shocks. In working households, each individual's OOP medical expenditures are given by $ME^W(j, g, e, h, z)$, and in retired households, they are given by $ME^R(j, g, e, h)$, where these are set to zero when $h = ADL_h$. In general, they depend on the individual's age, sex, and health and on the household's education. For working households, they also depend on productivity level. Higher productivity is positively correlated with the provision of employer health insurance, implying lower OOP expenditures given everything else. A married couple's medical expenditures are the sum of the two individual's expenditures. To summarize, household medical expenditures are given by:

$$ME = \begin{cases} ME^W(j, g, e, h, z) & \text{if } ms = s,\ j < 65 \\ ME^R(j, g, e, h) & \text{if } ms = s,\ j \geq 65 \\ ME^W(j, g = m, e, h, z) + ME^W(j^*, g = f, e, h^*, z) & \text{if } ms = m,\ j < 65 \\ ME^R(j, g = m, e, h) + ME^R(j^*, g = f, e, h^*) & \text{if } ms = m,\ j \geq 65 \end{cases} \tag{1}$$

2.7. Long Term Care Expenditures

When highly disabled, individuals consume only long term care goods and services denoted by x. Total LTC consumed equals the sum of formal and informal care, denoted by x^F and x^I, respectively ($x = x^F + x^I$). Informal care, which we assume to be exogenous, depends on marital status, and for married individuals, it depends on the health state of the spouse.

$$x^I = \begin{cases} x_s^I & \text{if } ms = s \\ x_m^I(h, h^*) & \text{if } ms = m \end{cases} \tag{2}$$

It is assumed that when both spouses are highly disabled, they cannot care for each other and receive the same informal care as a single individual: $x_m^I(h = ADL_h, h^* = ADL_h) = x_s^I$.

Expenditures on formal LTC are endogenous, but we assume there is a minimum level of LTC that must be received in order to survive to the next period, denoted by x_{med}, so $x^F + x^I \geq x_{med}$. If the household cannot afford a level of x^F that satisfies this condition, social insurance is provided to ensure all individuals in an LTC state receive x_{med}. Social insurance is described in detail in Section 2.9.

2.8. Preferences

We follow Ameriks et al. (2015) and model health-dependent preferences. When not highly disabled, individuals derive utility from regular consumption goods c. When highly disabled, they consume only long term care goods and services denoted by x, and these are valued differently than c.

Preferences for singles are given by:

$$U_s(c, x^F) = \begin{cases} \frac{c^{(1-\sigma)}}{1-\sigma} & \text{if } h \neq ADL_h \\ \theta_x \frac{(x^F + x_s^I + \kappa)^{(1-\sigma)}}{1-\sigma} & \text{if } h = ADL_h \end{cases} \tag{3}$$

As noted in Ameriks et al. (2015), the two key parameters are θ_x and κ. A higher θ_x increases the marginal utility of a unit of LTC, while a higher κ indicates that LTC is valued as more of a luxury good. A negative κ can be interpreted as the expenditure being a necessity.[4]

Based on this, we specify a married couple's preferences in a similar way:

$$U_m(c, x^F) = \begin{cases} 2\frac{c^{(1-\sigma)}}{1-\sigma} & \text{if } h \neq ADL_h \text{ and } h^* \neq ADL_h \\ \frac{c^{(1-\sigma)}}{1-\sigma} + \theta_x \frac{(x^F + x_m^I(h,h^*) + \kappa)^{(1-\sigma)}}{1-\sigma} & \text{if } [h = ADL_h \text{ and } h^* \neq ADL_h] \text{ or } [h \neq ADL_h \text{ and } h^* = ADL_h] \\ 2\theta_x \frac{(x^F + x_s^I + \kappa)^{(1-\sigma)}}{1-\sigma} & \text{if } h = ADL_h \text{ and } h^* = ADL_h. \end{cases} \tag{4}$$

Household utility is obtained by adding up the utilities of the two members. If neither member is highly disabled, each household member consumes c, and when both members are highly disabled, each member consumes $x = x^F + x_s^I$. In these cases, we make the assumption that household members consume equal amounts. When one member is highly disabled and the other is not, the couple allocates consumption c to the non-LTC spouse and x^F to the LTC spouse. These do not have to equal in this case.

[4]Note that informal LTC can be interpreted as a shifter in κ, thus affecting the extent to which formal LTC is a luxury or necessity.

When a household (either a single individual or both members of a married couple) dies, any remaining wealth is left as a bequest $b = (1 + r)a$, which the household values according to a warm glow utility function as in De Nardi (2004). The utility from bequests is given by:

$$v(b) = \theta_b \frac{(b + \kappa^b)^{(1-\sigma)}}{1 - \sigma}. \tag{5}$$

2.9. Social Security and Social Insurance

All individuals 65 and over receive social security payments $SS(e)$ that depend on education. Married couples of a particular education type receive benefits equal to twice the single's benefit.[5]

The government also runs a social assistance program which guarantees a minimum level of consumption $\underline{c}$ to every individual who is not highly disabled. For singles who are not in a high disability state ($h \neq ADL_h$), when disposable income (net of required medical expenditures) falls below $\underline{c}$, a government transfer Tr is given to compensate for the difference. Similarly, married couples where neither member is in a high disability state receive a transfer Tr that allows both individuals to consume $\underline{c}$.

In addition, the Medicaid LTC program guarantees a minimum level of long-term care (x_{med}) to highly disabled individuals such that $x^F + x^I \geq x_{med}$. In the case of single individuals and married households where both members are highly disabled, if the household's financial resources do not allow it to afford x^F such that $x^F + x^I \geq x_{med}$, the government provides a transfer Tr (Medicaid LTC) to ensure x_{med} is attainable.

For a married couple where only one member is highly disabled, there are special rules that allow the disabled spouse to qualify for Medicaid LTC while the non-disabled spouse is allowed to keep joint income and assets up to a certain threshold.[6] In the case when any left over resources for the non-disabled spouse are not enough to pay for the minimum consumption $\underline{c}$, the government also gives a transfer that makes $\underline{c}$ affordable. This is described in detail in the context of the married couple's problem in Section 2.11.

2.10. Single Individual's Problem

At the beginning of each period, the state of a household consisting of a single individual is given by age, sex, education, health, productivity (when younger than 65), and assets. It is summarized by $\Phi_s = \{j, g, e, h, z, a\}$. Given Φ_s, each individual maximizes the expected discounted lifetime utility by making a consumption/saving decision. When not highly disabled, the individual chooses expenditures on regular consumption c and when the individual is highly disabled, he/she chooses expenditures on formal long term care x^F. Borrowing and negative bequests are not allowed.

[5] Using the HRS, we find that a couple's social security benefits are approximately twice the single's benefits (see Appendix).

[6] These rules are commonly known as the spousal impoverishment rules. An overview is available at http://longtermcare.gov/medicare-medicaid-more/medicaid/medicaid-eligibility/considerations-for-married-people/.

A single individual solves:

$$V_s(\Phi_s) = max_{c,x^F}\{U_s(c,x^F) + \rho_s(j,g,e,h)\beta EV_s(\Phi'_s) \\ +(1-\rho_s(j,g,e,h))\beta v(b) \tag{6}$$

subject to

$$y = \begin{cases} wz(1-\tau_l) + [1+r(1-\tau_a)]a & \text{if } j < 65 \\ SS(e)(1-\tau_l) + [1+r(1-\tau_a)]a & \text{if } j \geq 65 \end{cases} \tag{7}$$

$$Tr = \begin{cases} max\{0, \underline{c} - y + ME\} & \text{if } h \neq ADL_h \\ max\{0, x^{med} - x_s^I - y\} & \text{if } h = ADL_h \end{cases} \tag{8}$$

$$y + Tr = \begin{cases} c + ME + a' & \text{if } h \neq ADL_h \\ x^F + a' & \text{if } h = ADL_h \end{cases} \tag{9}$$

In the first period, individuals start with asset levels drawn from an initial distribution of assets at the age of 35 that depends on marital status, gender (for singles) and education, $\Lambda^A(ms, g, e)$. In every period before the age of 65, available financial resources equal the sum of after taxes labor and asset income, assets, government transfers when applicable, minus required medical expenditures. These are allocated optimally between period consumption and savings for the next period. Starting with age 65, the individual retires and earns social security and asset income. High disability states become possible at these ages. When in an LTC state, the individual optimizes between formal LTC (x^F) and next period assets. If the individual's available financial resources do not allow x^{med} to be attainable, the individual qualifies for Medicaid LTC and receives a government transfer Tr equal to what is needed to just afford $x^F = x^{med} - x_s^I$. At all ages, when the individual is not in an LTC state and cannot afford the consumption floor, the government provides a transfer Tr that allows for this minimum consumption.

2.11. Married Household Problem

A married couple's state is given by the ages of the two members, education of the husband, the health states of each member, productivity (when the husband is younger than 65), and assets. It is summarized by $\Phi_m = \{j, j^*, e, h, h^*, z, a\}$. A married household solves:

$$\begin{aligned} V_m(\Phi_m) \quad = \quad & max_{c,x^F}\{U_m(c,x^F) \\ & +(1-\rho_m)\rho_m^*\beta EV_s(j^*+1, g=f, e, h'^*, z', a') \\ & +\rho_m(1-\rho_m^*)\beta EV_s(j+1, g=m, e, h', z', a') \\ & +\rho_m\rho_m^*\beta EV_m(\Phi'_m) \\ & +(1-\rho_m)(1-\rho_m^*)\beta v(b)\} \end{aligned} \tag{10}$$

subject to

$$y = \begin{cases} wz(1-\tau_l) + [1 + r(1-\tau_a)]a & \text{if } j < 65 \\ 2SS(e)(1-\tau_l) + [1 + r(1-\tau_a)]a & \text{if } j \geq 65 \end{cases} \tag{11}$$

$$y + Tr = \begin{cases} c(1+\lambda) + ME + a' & \text{if } h \neq ADL_h \text{ and } h^* \neq ADL_h \\ c + x^F + ME + a' & \text{if } [h = ADL_h \text{ and } h^* \neq ADL_h] \\ & \text{ or } [h \neq ADL_h \text{ and } h^* = ADL_h] \\ 2x^F + a' & \text{if } h = ADL_h \text{ and } h^* = ADL_h \end{cases} \tag{12}$$

$$Tr = \begin{cases} max\{0, \underline{c}(1+\lambda) - y + ME\} & \text{if } h \neq ADL_h \text{ and } h^* \neq ADL_h \\ max\{T1, T2\} & \text{if } [h = ADL_h \text{ and } h^* \neq ADL_h] \\ & \text{or } [h \neq ADL_h \text{ and } h^* = ADL_h] \\ max\{0, 2(x_{med} - x_s^I) - y\} & \text{if } h = ADL_h \text{ and } h^* = ADL_h \end{cases} \tag{13}$$

where

$$T1 = max\{0, \underline{c} + x_{med} - x_m^I(h, h^*) - y + ME\} \tag{14}$$

$$T2 = max\{0, x_{med} - x_m^I(h, h^*) - \frac{y}{2}\} \tag{15}$$

As for singles, initial assets are drawn from the distribution $\Lambda^A(ms, g, e)$. The household receives labor income when the husband is younger than 65. When he is older than 65, both household members are assumed retired, and both earn social security income $SS(e)$. In households where neither member is highly disabled, the husband and the wife benefit from jointly consuming c. Therefore, the expenditures required for each member to enjoy a given level of c are $c(1+\lambda)$, where we assume $1 + \lambda < 2$. The parameter λ controls the degree of joint consumption.

When one spouse is highly disabled and the other is not, the household decides how to allocate resources optimally between c for the non-LTC spouse and x^F for the LTC spouse. When both members are disabled, they both consume long term care equal to $x^F + x_s^I$. Since they are both disabled, there is no joint consumption of LTC, and they cannot provide informal care to each other, so the informal care they receive is that of a single person.

When the household's financial resources fall below the threshold where they can afford the minimum consumption floor $\underline{c}$ or the minimum LTC x_{med}, the government provides a transfer Tr that makes these minimum consumption levels attainable. In the case where only one spouse is in an LTC state, the household qualifies for a transfer if (1) it cannot afford to consume $\underline{c} + x_{med} - x_m^I(h, h^*)$ (equation 14), or (2) it cannot afford the minimum LTC required $x_{med} - x_m^I(h, h^*)$ with half of the financial resources (equation 15).

2.12. Effects of LTC Risk

Consistent with the optimal behavior described in Ameriks et al. (2015), high income individuals have an incentive to self-insure against LTC risk since they can save enough to afford non-Medicaid LTC when needed, and leave a bequest. On the other hand, low income individuals would not find it optimal to save for LTC expenditures because even if they saved high fractions of their incomes and consumed very little, their savings would quickly run out in the advent of LTC needs, forcing them to rely on the Medicaid LTC and leave no bequest. In the middle, there exists a threshold of income above which it is optimal to save and accumulate wealth for LTC needs and bequests, conditional on all other state variables. Below this threshold, individuals would find it optimal to consume more and not build up precautionary savings against LTC risk due to the means-tested Medicaid LTC program.

An interesting question is how this threshold is affected by marital status.

3. Parameterization, Estimation and Calibration

Following the standard approach, some parameters are set to values common in the literature, others are estimates directly from the data, and others are calibrated within the model. The parameters taken as given are listed in Table 3. Many other parameters are external to the model and are estimated using HRS, MEPS or PSID data. These include health status transitions, survival probabilities, productivity transitions, and medical expenditures. Other parameters are internal and are calibrated so the model matches a set of aggregate and distributional moments on demographics, LTC spending, government transfers and Medicaid recipientcy. These parameters are listed in Table 4. All dollar values are CPI adjusted to 2010. The Appendix provides detailed information on all statistics obtained from the data.

3.1. Data

The main data set used in our analysis is the Health and Retirement Study (HRS). The HRS is a nationally representative panel survey of older individuals and their spouses that started in 1992 and is ongoing.[7] The survey is conducted every two years, and currently twelve waves of data are available. It contains information on more than 37,000 individuals over age 50 in 23,000 households. Detailed information is collected on demographics, income, assets, health insurance, health, ADLs, and health care expenditures. In married households, both spouses receive all individual-level questions, making the HRS an ideal data set for studying health, LTC needs, and medical expenditures in households overtime. In our analysis, we use data from waves 3 to 12, covering years 1996 to 2010 since many variables are coded differently in the first two waves.[8]

[7] The RAND Center for the Study of Aging created a user-friendly version of a subset of the HRS. We use the RAND HRS Data File (v.M) which contains 12 waves of data.

[8] We use all six cohorts of the HRS: Initial HRS, AHEAD, Children of Depression (CODA), War Baby, Early Baby Boomer and Mid Baby Boomer cohorts.

To estimate statistics at younger ages, we use data from the Medical Expenditure Panel Survey (MEPS) and the Panel Study of Income Dynamics (PSID). We use the MEPS to estimate the health status transition probabilities and the medical expenditures of non-retirees, and the PSID to estimate labor productivity transitions.

3.2. Parameters Estimated from the Data

Health status and health transitions

In the data, health status is constructed using a combination of self-reported health and answers to questions on whether the respondent receives help with ADLs. We use the MEPS to estimate health status transitions at ages 35-63 when health is either Good or Bad. In the MEPS, we categorize respondents' health based on the self-reported health measure as follows: excellent, very good and good responses are categorized as Good, and fair and poor responses are categorized as Bad. To estimate biennial health status transition probabilities, we use data from Rounds 1 and 5 which are approximately just under 2 years apart. A logit regression model is used that includes age, age squared, and marital status, estimated separately for each sex-education group.

We use the HRS to estimate health transitions at ages 65-109 when disability states are possible. In the HRS, we also categorize health as Good or Bad based on the self reported health measure. However, if a respondent reports getting help with ADLs, we reclassify him/her as disabled. Low disability states are characterized by 1-2 ADLs, and high disability states by 3-6 ADLs. To estimate health transitions, we estimate probit models that include a cubic in age, marital status, sex, education and marital status. For transitions from ADL states, the regressions exclude education and marital status due to the small number of observations.

Survival probabilities

The HRS contains information on the exact date of death of each respondent who dies during the survey period. We use the HRS to estimate biennial survival probabilities for ages 55 to 109, using logit regressions. We then use linear interpolation to obtain survival for ages 35 to 53, assuming that the survival probability is 1 at the age of 35.

Productivity Transitions

Productivity groups and productivity transitions are estimated using PSID data from years 1984 to 1993. We conduct the analysis using households where the head is between 35 and 64 years of age and has a valid education and health status.[9] We divide households into quintiles based on their labor earnings (measured over two consecutive years). The average earnings in these quintiles give the productivity levels $z1 - z5$ in the model (see Appendix). We then estimate biennial transition probabilities between these quintiles using ordered probit models.

As predicted, we find that the probabilities of staying in low productivity states ($z1$) are highest for single women, for the non-college, and for those in bad health. The probabilities

[9]Health status is constructed as in the MEPS, based on the self reported health measure.

of moving from low to high productivity states are highest for married couples and single men, college educated, and those in good health. Selected transition probabilities are plotted in the Appendix.

Medical Expenditures

We estimate out-of-pocket (OOP) medical expenditures using the MEPS for non-retired households, and using the HRS for retired households. We use the predicted values from OLS regressions of OOP expenditures (measured over 2 years) on the individual's age, sex, health, household education, and household productivity (earnings) for non-retired households.

Social Security

Using HRS data, we find that the average annual social security benefits (per individual) are 11,136 in non-college households and 12,253 in college educated households.

3.3. Calibration of remaining parameters

Demographic population structure at age 35

Since our paper is focused on ages 65 and above, it is important to have the right demographic structure at these ages in terms of the fraction of single and married households, fractions of males and females among singles, and fractions by education type within these groups. In our model, we abstract from marriage and divorce, so it is non trivial to obtain the right demographic distribution at the age of 65. If we imputed the demographic structure observed in the data at the age of 35, we would obtain a very different demographic structure at older ages than in the data. Therefore, our strategy is to calibrate an initial demographic structure at the age of 35 such that, given the estimated health transitions and survival probabilities, we obtain a demographic structure at the age of 65 that matches the data. The details and results are provided in the Appendix.

Remaining parameters: utility and social insurance

The remaining parameters that need to be calibrated are listed in Table 4. The parameter x_s^I is normalized to zero. The minimum level of LTC guaranteed by the Medicaid program x_{med} is calibrated to match the percentage of single highly disabled individuals receiving Medicaid benefits. The minimum consumption floor $\underline{c}$ is calibrated to match the fraction on non-retirees receiving government transfers.

4. Results

4.1. Benchmark

The benchmark model replicates two main features of LTC expenditures and insurance coverage that we observe in the data:
1)Out-of-pocket LTC expenditures and family structure: when LTC is necessary, a single individual spends more on formal LTC than a married individual does; a married individual with an unhealthy/disabled spouse spends more on formal LTC than a married individual

with a healthy spouse does. See Table 1 for the details.
2) Fraction of individuals with LTC needs receiving Medicaid: single individuals have a higher probability to receive Medcaid than married individuals (see Table 2).

Table 1: OOP LTC Expenditures and Family Structure

	Singles	Married (all)	Married (spouse good health)	Married (spouse bad health/disabled)
Data	60.8	29.0	23.4	43.1
Model	59.4	29.1	24.6	43.8

Note: Wealth> 100k w/o receiving Medicaid LTC.
Average expenditures over 2 years, in thousands US 2010 dollars.

Table 2: Fraction of Individuals with LTC Needs Receiving Medicaid

	Single	Married
Data	47%	28%
Model	47%	29%

Discussion

The importance of family in this context is that it serves as a form of insurance against LTC shocks – we find in our data that the existence of a spouse reduces OOP LTC expenditures. A counterfactual experiment is conducted to discover the importance the insurance function of a family. In the experiment, we assume no informal care from spouses. The result is summarized as follows:

- Households have to save more for potential LTC needs and are more likely to qualify for Medicaid if they are hit by the LTC shock.
- For married households with good health in working ages, life-time consumption decreases by 0.014% compared with the benchmark.
- For married households with bad health in working ages, life-time consumption decreases by 0.032% compared with the benchmark.
- The fraction of married individuals who require LTC and also receive Medicaid increases to 37% (from 29% in the benchmark).

4.2. Reform of Medicaid LTC – Universal Coverage

We study a reform of public LTC insurance that universally covers a basic level of LTC service x_{med} and replaces the Medicaid LTC.

Under the reform, a single individual's budget constraints become:

$$y = \begin{cases} wz(1-\tau_l) + [1 + r(1-\tau_a)]a & \text{if } j < 65 \\ SS(e)(1-\tau_l) + [1 + r(1-\tau_a)]a & \text{if } j \geq 65 \end{cases} \tag{16}$$

$$Tr = \Big\{ \max\{0, \underline{c} - y + ME\} \quad \text{if } h \neq ADL_h \tag{17}$$

$$y + Tr = \begin{cases} c + ME + a' & \text{if } h \neq ADL_h \\ \max(0, x^F - x_{med}) + a' & \text{if } h = ADL_h \end{cases} \tag{18}$$

A married couple household's budget constraints become:

$$y = \begin{cases} wz(1-\tau_l) + [1 + r(1-\tau_a)]a & \text{if } j < 65 \\ 2SS(e)(1-\tau_l) + [1 + r(1-\tau_a)]a & \text{if } j \geq 65 \end{cases} \tag{19}$$

$$y + Tr = \begin{cases} c(1+\lambda) + ME + a' & \text{if } h \neq ADL_h \text{ and } h^* \neq ADL_h \\ c + \max(0, x^F - x_{med}) + ME + a' & \text{if } [h = ADL_h \text{ and } h^* \neq ADL_h] \\ & \quad \text{or } [h \neq ADL_h \text{ and } h^* = ADL_h] \\ 2\max(0, x^F - x_{med}) + a' & \text{if } h = ADL_h \text{ and } h^* = ADL_h \end{cases} \tag{20}$$

$$Tr = \begin{cases} \max\{0, \underline{c}(1+\lambda) - y + ME\} & \text{if } h \neq ADL_h \text{ and } h^* \neq ADL_h \\ \max\{0, \underline{c} - y + ME + \max(0, x^F - x_{med})\} & \text{if } h(h^*) = ADL_h \text{ and } h^*(h) \neq ADL_h \end{cases} \tag{21}$$

4.3. Reform of Medicaid LTC – Universal Coverage + Private Option

TBA

5. Conclusion

TBA

6. Tables

Table 3: Parameters

Parameter	Description	Value
Utility		
λ	Parameter for married consumption	0.67
σ	Power of consumption $(1-\sigma)$	3
β	Time discount factor	0.9
Taxes		
τ^e	Taxes on labor and SS income	0.27
τ^a	Taxes on asset income	0.4

Notes: The value of the parameter λ is taken from Attanasio et al. (2008).

Table 4: Calibration

Parameter	Description	Target	Value
Utility			
θ_x	Weight of LTC		
κ	LTC parameter		
$x_m^I(h, h^*)$	Informal LTC, Good spouse health		
$x_m^I(h, h^*)$	Informal LTC, Bad or ADL_l spouse health		
θ_b	Bequest parameter	Wealth distribution of non-LTC households	
k^b	Bequest parameter	Wealth distribution of non-LTC households	
Social Insurance			
$\underline{c}$	Consumption floor	% receiving gov. transfers, <65	
x^{med}	Medicaid LTC level	% on Medicaid, singles (Table 5)	

Table 5: Fraction of Individuals with LTC Needs Receiving Medicaid

	Single	Married	Married, by Spouse Health		
Sample	**All**	**All**	**Good**	**Bad**/ADL_l	ADL_h
All	0.47	0.28	0.18	0.35	0.59
All, HH Wealth<120,000	0.54	0.36	0.25	0.41	0.76
All, HH Wealth<70,000	0.57	0.39	0.27	0.44	0.80

Table 6: OOP Expenditures if Highly Disabled, (excludes Medicaid and Private LTC Insurance recipients)

	Wealth = 0-70,000		Wealth =70-150,000		Wealth = 150,000+	
Age	**Singles**	**Married**	**Singles**	**Married**	**Singles**	**Married**
65-74	11.16	5.70	79.23	2.44	35.05	30.31
75-84	19.09	6.86	61.42	20.70	67.65	21.76
85+	19.98	7.87	39.88	32.60	67.78	50.12

Notes: We exclude individuals receiving Medicaid or covered by private LTC insurance. We also exclude individuals with negative or missing wealth. All amounts are in thousand 2010 US dollars.

Table 7: Average OOP Expenditures if Highly Disabled

	Single	Married	Married, by Spouse Health	
Sample	**All**	**All**	**Good**	**Bad**/ADL_l/ ADL_h
All	28.79 (533)	14.91 (441)	14.41 (267)	16.40 (165)
HH Wealth=0-70,000	18.05 (401)	6.43 (266)	7.03 (144)	6.00 (114)
HH Wealth=70-150,000	50.40 (46)	17.03 (49)	16.42 (36)	18.74 (13)
HH Wealth=150,000+	65.45 (86)	31.97 (126)	25.80 (87)	46.79 (38)

Notes: We exclude individuals receiving Medicaid or covered by private LTC insurance. We also exclude individuals with negative or missing wealth. All amounts are in thousand 2010 US dollars.

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