

# Social Insurance, Private Health Insurance and Individual Welfare\*

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## Abstract

This paper studies the impact of social insurance on individual choices and welfare in a dynamic general equilibrium model with uncertain medical expenses and individual health insurance choices. I find that social insurance (modeled as the combination of a minimum consumption floor and the Medicaid program) does not only distort saving and labor supply decisions, but also has a large crowding out effect on the demand for private health insurance. However, despite the distorting effects, the net welfare consequence of eliminating social insurance is still negative in most cases. In addition, the large crowding out effect on private health insurance suggests that the existence of social insurance programs may be one reason why some Americans do not buy any health insurance.

**Keywords:** Saving, Uncertain Medical Expenses, Health Insurance, Means Testing.

**JEL Classifications:** E20, E60, H30, I13

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## 1. Introduction

Means-tested welfare programs in the United States, such as Medicaid, TANF and SNAP, provide American households with a social “safety net” that guarantees a minimum consumption floor and provides public health insurance for the poor.<sup>1</sup> Total spending on these programs is large and it has been the fastest growing component of US government spending over the past few decades. Making up only 1.2% of GDP in 1964, by 2004 it had grown to approximately 5% of GDP, more than the cost of any other single public program (e.g., Social Security, Medicare). Meanwhile, policy makers have often proposed to reform the means-tested programs.<sup>2</sup> Despite this, there are relatively few studies that quantitatively evaluate the impact of means-tested social insurance on individual choices and welfare, compared to the large literature that uses dynamic life-cycle models to quantitatively examine other public programs such as Social Security.<sup>3</sup> This paper attempts to fill this gap in the literature.

Does the US social insurance system improve individual welfare? Conventional wisdom says that social insurance can improve individual welfare because it insures poor households against large negative shocks. However, some economists have argued that the social insurance programs may discourage work and thus reduce labor supply (e.g. Moffitt, 2002), and other economists find that social insurance discourage private saving and thus reduce capital accumulation (Hubbard, Skinner, and Zeldes, 1995). Furthermore, some recent empirical studies suggest that the social insurance programs may have crowded out the demand for private insurance.<sup>4</sup> Therefore, the net welfare consequence of social insurance depends on the relative importance of the above-described mechanisms.

In this paper, I develop a dynamic general equilibrium model with heterogenous agents and incomplete markets to formalize all these relevant mechanisms and study the net welfare consequence of social insurance. Different from standard incomplete markets models, which usually do not model health insurance or assume exogenous health insurance coverage, I endog-

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<sup>1</sup>TANF is the Temporary Assistance for Needy Families program, which replaced the existing Aid to Families with Dependent Children (AFDC) program in 1996. The Food Stamps program was recently renamed as the Supplemental Nutrition Assistance (SNAP) program. Please see Moffitt (2002) for a detailed description of the means-tested programs in the US.

<sup>2</sup>An important motivation of their proposals is the large number of Americans without any health insurance. One example is the recent health care reform proposed by President Obama which significantly expands the Medicaid program.

<sup>3</sup>The quantitative literature on Social Security was started by Auerbach and Kotlikoff (1987), and it includes Imrohoroglu, Imrohoroglu, and Joines (1995), Conesa and Krueger (1999), Fuster, Imrohoroglu, and Imrohoroglu (2007), Zhao (2014), etc.

<sup>4</sup>For example, Cutler and Gruber (1996a,1996b), Brown and Finkelstein (2008).

enize the individual choices of health insurance coverage. As a result, the model can capture the crowding out effect of social insurance on the demand for private health insurance. In the model, agents face medical expense shocks, labor income shocks, and survival risks over the life cycle. In each period, agents endogenously determine their labor supply, and decide whether to take up employer-sponsored health insurance if it is offered and whether to purchase individual health insurance from the private market. Different from some earlier studies on social insurance (such as Hubbard et al., 1995), I separate Medicaid from other social insurance programs in the model, that is, the social insurance system is modeled as a combination of a minimum consumption floor and a means-tested public health insurance program (like the US Medicaid program).<sup>5</sup> This modelling choice is motivated by the fact that after the 1996 welfare reform, the Medicaid program was separated from the other major means-tested programs such as TANF/AFDC, and was allowed to impose different eligibility criteria. In addition, the model includes a pay-as-you-go Social Security program and a Medicare program.

I use the Medical Expenditure Panel Survey (MEPS) dataset to calibrate the model such that the model economy replicates the key features of the US economy, in particular the US health insurance system. I then use the calibrated model to quantitatively assess the impact of social insurance on individual choices and welfare. I find that social insurance does not only distort saving and labor supply decisions, but also significantly crowds out the demand for private health insurance. That is, when the social insurance system is removed in the model, the share of working-age individuals with employer-sponsored health insurance increases by about 8 percentage and the share of those with individual health insurance increases by approximately 19 percentage. However, despite the distorting effects on individual choices, social insurance is still welfare-improving in most cases studied in the paper. In addition, I find that the welfare implications of social insurance are sensitive to how accidental bequests are treated in the model. With different assumptions made about how accidental bequests are redistributed among alive agents, the welfare consequence of eliminating social insurance ranges from a small gain (i.e. 2.1% of consumption) to large welfare losses (i.e., 8.6%-13.4% of consumption) in the model.<sup>6</sup>

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<sup>5</sup>A concurrent paper by Pashchenko and Porapakkarm (2013b) also models the social insurance system as a combination of the minimum consumption floor and Medicaid. While they focus on the work incentives of Medicaid, this paper focuses on the crowding out effect of social insurance programs on the demand for private health insurance, and their welfare implications. Another related paper is De Nardi, French, and Jones (2013) who study the insurance role of Medicaid in old-age. However, they do not look at the crowding out effect of public insurance on private health insurance as their model features exogenous private health insurance coverage.

<sup>6</sup>Here the welfare measure used is the equivalent consumption variation (ECV) which refers to the change in consumption each period required to make a new born to achieve the same expected lifetime utility.

It is worth noting that means-tested social insurance programs do not only affect individuals who are already qualified for the programs. They also affect any individual who will potentially become qualified for these programs after being hit by large negative shocks. As a result, the crowding out effect on private health insurance can be potentially much larger than one for one, which implies that the existence of social insurance may even increase the fraction of individuals without any health insurance. It is well known that there are a large number of Americans lacking any health insurance (approximately 47 million persons according to Gruber (2008)). This fact is in particular puzzling because many uninsured Americans are median income people who can afford health insurance but choose not to purchase it. Furthermore, this fact has recently motivated many policy proposals aiming to reduce the number of uninsured. However, as argued by Gruber (2008), we need to first understand why so many Americans are without any health insurance in order to design any sensible policy to address the problem of uninsured. After reviewing the literature, he concludes that the lack of health insurance is still puzzling, at least quantitatively. The quantitative results of this paper show that the percentage of uninsured working population would drop by more than half if the social insurance system is completely removed. This finding implies that the existence of social insurance may be an important reason why many Americans do not have any health insurance. It also implies that many Americans are in fact better off being without any health insurance as they are implicitly insured by social insurance.

This paper is most related to the seminal work by Hubbard et al.(1995) who model social insurance as a minimum consumption floor and study its impact on precautionary saving. They find that means-tested social insurance has a large crowding out effect on precautionary saving and it is the reason why a significant fraction of individuals do not accumulate any wealth over the life cycle. I extend their model to a general equilibrium setting and incorporate endogenous labor supply and endogenous health insurance choices. In addition, I separate the Medicaid program from other means-tested programs, motivated by the fact that the Medicaid program was delinked from other major means-tested programs such as TANF/AFDC after the 1996 welfare reform in the US. That is, I model the social insurance system as a combination of a minimum consumption floor and a means-tested public health insurance program (that likes the US Medicaid). It is worth noting that I find a significantly smaller saving effect of social insurance than Hubbard et al.(1995). The reason for that is simple. In the model with endogenous health insurance choices, social insurance crowds out private health insurance coverage and

thus increases the out-of-pocket medical expenses facing individuals. The higher out-of-pocket medical expenses encourage private saving and partially offset the negative effect of social insurance on capital accumulation.

This paper belongs to the literature studying incomplete market models with heterogeneous agents.<sup>7</sup> In particular, it is closely related to a number of recent studies that endogenize the demand for health insurance.<sup>8</sup> Jeske and Kitao (2009) use a similar model to study the tax exemption policy on employer-sponsored health insurance. Pashchenko and Porapakkarm (2013a) use an environment similar to that in this paper to evaluate the welfare effect of the 2010 PPACA reform. Hansen, Hsu, and Lee (2012) study the the impact of a Medicare Buy-In policy in a dynamic life-cycle model with endogenous health insurance. In contrast to these studies, this paper studies the welfare effect of social insurance with the special attention to the crowding out effect of the partial insurance provided by social insurance programs on private health insurance choices.

This paper is also related to the public finance literature that studies the crowding out effects of the partial public insurance from means-tested programs on private insurance decisions. Cutler and Gruber (1996a,1996b) find empirical evidence suggesting that Medicaid crowds out the coverage from employer-based health insurance. Brown and Finkelstein (2008) use a partial equilibrium dynamic programming model to show that Medicaid crowds out the demand for a specific type of individual health insurance: long term care insurance. In a dynamic general equilibrium model with uncertain medical expenses and endogenous health insurance choices, I quantitatively examine the crowding out effect of social insurance on private health insurance. In contrast to what have been found and suggested in previously mentioned studies, I find that the crowding out effect is mainly from the minimum consumption floor but not the Medicaid program.

The rest of the paper is organized as follows. I specify the model in section 2 and calibrate it in section 3. I present the results of the main quantitative exercise in section 4 and provide further discussion on related issues in section 5. I conclude in section 6.

## 2. The Model

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<sup>7</sup>Huggett (1993), Aiyagari (1994), Hubbard et al.(1995), Livshits, MacGee, and Tertilt (2007), De Nardi, French, and Jones (2010), and Kopecky and Koreshkova (2014), etc.

<sup>8</sup>Jeske and Kitao (2009), Pashchenko and Porapakkarm (2013a), Hansen, Hsu, and Lee (2012), Zhao (2015), etc.

## 2.1. The Individuals

Consider an economy inhabited by overlapping generations of agents whose age is  $j = 1, 2, \dots, T$ . Agents are endowed with one unit of time in each period that can be used for either work or leisure. They face survival probabilities  $P$  and medical expense shocks  $m$  in each period over the whole life cycle, and idiosyncratic labor productivity shocks  $\epsilon$  in each period up to the retirement age  $R$ . The agents' state in each period can be characterized by a vector  $s = \{j, a, m, e_h, h, \epsilon, m_d, \eta\}$ , where  $j$  is age,  $a$  is assets,  $m$  is medical expense shock,  $e_h$  indicates whether employer-provided health insurance is offered,  $h$  is the type of health insurance currently held,  $\epsilon$  is labor productivity shock,  $m_d$  indicates whether the agent is qualified for Medicaid, and  $\eta$  is the cumulated earnings which will be used to determine future Social Security payments. In each period, agents simultaneously choose consumption, labor supply, and the type of health insurance to maximize their expected lifetime utility, and this optimization problem (P1) can be formulated recursively as follows:

$$V(s) = \max_{c, l, h'} u(c, l) + \beta P_j E[V(s')] \quad (1)$$

subject to

$$\begin{cases} \frac{a'}{1+r} + c + (1 - \kappa(h, m_d))m + p_{h'} - \tau p_3 I_{h'=3} = \tilde{w}\epsilon l(1 - \tau) + a + Tr & \text{if } j \leq R \\ \frac{a'}{1+r} + c + (1 - \kappa(h, m_d))(1 - \kappa_m)m + p_{h'} = SS(\eta) + a + Tr, & \text{if } j > R \end{cases} \quad (2)$$

$$a' \geq 0,$$

$$l \in \{0, 1\},$$

$$h' \in \{1, 2, 3\} \text{ if } e_h = 1 \text{ and } l = 1, \text{ otherwise } h' \in \{1, 2\}.$$

Here  $V$  is the value function, and  $u(c, l)$  is the current period utility flow which is a function of consumption  $c$  and labor supply  $l$ . There are three private health insurance statuses, no private insurance ( $h = 1$ ), individual health insurance ( $h = 2$ ), and employer-provided health insurance ( $h = 3$ ).  $e_h$  is the indicator function for whether employment-provided health insurance is offered in the current period with  $e_h = 1$  indicating it is available and  $e_h = 0$  indicating otherwise. The health insurance copay rate is represented by  $\kappa(h, m_d)$ , the price of that insurance policy is denoted by  $p_h$ . Note that  $\tilde{w} = w - c_e$  if  $e_h = 1$ , and  $\tilde{w} = w$  otherwise, where  $w$  is the wage rate and  $c_e$  is the amount collected by the firm to cover a fraction of employer-sponsored health in-

insurance premiums. As shown in the worker's budget constraint, the employer-sponsored health insurance premiums are exempted from taxation, which is an important feature of the US tax policy.<sup>9</sup>  $\beta$  is the subjective discount factor and  $I$  is an indicator function.

On the government side,  $Tr$  is the transfer from social insurance, which guarantees a minimum consumption floor and will be specified further in the following.  $SS(\eta)$  is the Social Security payment after retirement, and  $\kappa_m$  is the coinsurance rate of the Medicare program. All these programs are financed by proportional payroll tax rates.

Note that in this economy agents may die with positive assets, i.e. accidental bequests, which are assumed to be equally redistributed to the new-born cohort. Thus, in each period, a new cohort of agents is born into the economy with initial assets determined by the last period's accidental bequests. For simplicity, the population growth rate is assumed to be constant and equal to zero in the benchmark model.

The log of the idiosyncratic labor productivity shock  $\epsilon$  is determined by the following equation,

$$\ln \epsilon = a_j + y,$$

where  $a_j$  is the age-specific component, and  $y$  follows a joint process with the probability of being offered employer-sponsored health insurance, that will be specified in the calibration section. The medical expense shock  $m$  is assumed to be governed by a 6-state Markov chain which will be calibrated using the Medical Expenditure Panel Survey (MEPS) dataset. Medical expense shocks are assumed to be independent of labor productivity shocks.<sup>10</sup>

The distribution of the individuals is denoted by  $\Phi(s)$ , and it evolves over time according to the equation  $\Phi' = R_\Phi(\Phi)$ . Here  $R_\Phi$  is a one-period operator on the distribution, which will be specified in the calibration section.

## 2.2. The Government

Social insurance guarantees a minimum consumption floor  $\underline{c}$  and provides means-tested public health insurance, and it is financed by the payroll tax  $\tau_w$ . The minimum consumption floor is

<sup>9</sup>For a detailed analysis of this issue, please see Jeske and Kitao (2009), Huang and Huffman (2010).

<sup>10</sup>This assumption significantly simplifies the analysis here. In addition, this assumption is supported by some empirical evidence. For instance, Daniel Feenberg and Jonathan Skinner (1994) find a very low income elasticity of catastrophic health care expenditures, suggesting that expenditure (at least for large medical shocks) does not vary much with income. Livshits, MacGee, and Tertilt (2007) find in the MEPS 1996/1997 dataset that income does not significantly decrease in response to a medical shock.

provided via the transfer  $Tr$  which can be simply determined by the following equation,

$$\begin{cases} Tr = \max\{0, \underline{c} + (1 - \kappa(h, m_d))m - a - \tilde{w}\epsilon l(1 - \tau)\}, & \text{if } j \leq R \\ Tr = \max\{0, \underline{c} + (1 - \kappa(h, m_d))(1 - \kappa_m)m - a - SS(\eta)\}, & \text{if } j > R \end{cases}$$

The means-tested public health program is specified as follows. The agent is qualified for this program (i.e.  $m_d = 1$ ) if his income and assets (net of out of pocket medical expenses) are below certain thresholds and he does not have any private health insurance. That is, for  $j \leq R$ , the agent is automatically enrolled into the Medicaid program if  $\tilde{w}\epsilon l \leq \Theta_{income}$ ,  $a - m \leq \Theta_{asset}$  and  $h = 1$ . For  $j >$ , the conditions are  $SS(\eta) \leq \Theta_{income}$ ,  $a - (1 - \kappa_m)m \leq \Theta_{asset}$  and  $h = 1$ .

The Social Security program provides annuities to agents after retirement, and the Medicare program provides health insurance to agents after retirement by covering a  $\kappa_m$  portion of their medical expenses. The Social Security benefit formula  $SS(\eta)$  is modeled as in Fuster, Imrohorglu, and Imrohorglu (2007) so that it matches the progressivity of the current US Social Security program. These two programs are financed by payroll tax rates,  $\tau_s$  and  $\tau_m$ , respectively. By construction,  $\tau = \tau_w + \tau_s + \tau_m$ .

The budget constraints for each of these three government programs can be written respectively as follows,

$$\int Tr(s)d\Phi(s) + \int m_d \kappa(h, m_d)[(1 - \kappa_m)mI_{j \geq R} + mI_{j < R}]d\Phi(s) = \int \tau_w(\tilde{w}\epsilon l(s) - p_3 I_{h'(s)=3})d\Phi(s) \quad (3)$$

$$\int SS(\eta)d\Phi(s) = \int \tau_s(\tilde{w}\epsilon l(s) - p_3 I_{h'(s)=3})d\Phi(s) \quad (4)$$

$$\int \kappa_m m I_{j \geq R} d\Phi(s) = \int \tau_m(\tilde{w}\epsilon l(s) - p_3 I_{h'(s)=3})d\Phi(s) \quad (5)$$

### 2.3. The Production Technology

On the production side, I assume that the production is taken in competitive firms and is governed by the following standard Cobb-Douglas function,

$$Y = K^\alpha (AL)^{1-\alpha}. \quad (6)$$

Here  $\alpha$  is the capital share,  $A$  is the labor-augmented technology,  $K$  is capital, and  $L$  is labor. Assuming capital depreciates at a rate of  $\delta$ , the firm chooses  $K$  and  $L$  by maximizing profits



$Y - wL - (r + \delta)K$ . The profit-maximizing behaviors of the firm imply,

$$w = (1 - \alpha)A\left(\frac{K}{AL}\right)^\alpha \quad (7)$$

$$r = \alpha\left(\frac{K}{AL}\right)^{\alpha-1} - \delta \quad (8)$$

## 2.4. Private Health Insurance Markets

There are two types of private health insurance policies: employment-provided health insurance and individual health insurance. The employer-provided health insurance is community-rated and provided by the employer, but the individual health insurance is traded in the private market and usually not community-rated. In the model, I assume that the price of the individual health insurance is conditioned on age  $j$  and the current health shock  $m$ , and the health insurance companies for both types of insurance are operating competitively.<sup>11</sup> As a result, the prices for these insurance policies can be expressed respectively as follows,

$$p_1 = 0. \quad (9)$$

$$p_2(j, m) = (1 + \lambda_2)\kappa(2, )P_j \frac{\int Em'(s)I_{m,j}I_{h'(s)=2}d\Phi(s)}{1 + r}, \forall m, j. \quad (10)$$

$$P_3 = \pi(1 + \lambda_3)\kappa(3, ) \frac{\int P_j Em'(s)I_{h'(s)=3}d\Phi(s)}{1 + r}. \quad (11)$$

Here  $I_{m,j}$  is the indicator function for having medical expense shock  $m$  and being at age  $j$ . Since  $h = 1$  means no private health insurance, the first price equation  $p_1 = 0$  is simply by construction.  $\lambda_2$  and  $\lambda_3$  represent the part of insurance premium that covers the administrative cost of insurance companies. Note that  $p_3$  is the price individuals directly pay for employer-sponsored health insurance, which is only a  $\pi$  fraction of its total cost. The rest of the cost is paid by the firm with  $c_e$ , that is,

$$\int c_e \ell(s) d\Phi(s) = (1 - \pi)\lambda_3 \frac{E \int P_j m'(s) I_{h'(s)=3} d\Phi(s)}{1 + r}. \quad (12)$$

<sup>11</sup>In the market for individual health market, agents could have private information about their expected medical expenses, e.g. family medical history, personal health-related behaviors. In that case, the individual health insurance market would feature some adverse selection issues. While it is conceptually straightforward to incorporate these elements into the model, doing so would significantly expand the state space and thus be computationally challenging. Here I refer to Einav, Finkelstein, and Cullen (2010) and Bundorf, Levin, and Mahoney (2012) who study the welfare implications of pooled pricing and private information in health insurance markets.

Since agents can only live up to  $T$  periods, the dynamic programming problem can be solved by iterating backwards from the last period.

## 2.5. Market Clearing Conditions

The market clearing conditions for the capital and labor markets are respectively as follows,

$$K' = \int a'(s)d\Phi(s) \quad (13)$$

$$L = \int \epsilon l(s)d\Phi(s) \quad (14)$$

## 2.6. Stationary Equilibrium

A stationary equilibrium is defined as follows,

**Definition:** A **stationary equilibrium** is given by a collection of value functions  $V(s)$ , individual policy rules  $\{a', l, h'\}$ , the distribution of individuals  $\Phi(s)$ ; aggregate factors  $\{K, L\}$ ; prices  $\{r, w, \tilde{w}\}$ ; Social Security, Medicare, social insurance; private health insurance contracts, such that,

1. Given prices, government programs, and private health insurance contracts, the value function  $V(s)$  and individual policy rules  $\{a', l, h'\}$  solve the individual's dynamic programming problem (P1).
2. Given prices,  $K$  and  $L$  solve the firm's profit maximization problem.
3. The capital and labor markets clear, that is, conditions (13-14) are satisfied.
4. The government programs, social insurance, Social Security, and Medicare are self-financing, that is, conditions (3-5) are satisfied.
5. The health insurance companies are competitive, and thus the insurance contracts satisfy conditions (9-11).
6. The distribution  $\Phi(s)$ , evolves over time according to the equation  $\Phi' = R_\Phi(\Phi)$ , and satisfies the stationary equilibrium condition:  $\Phi' = \Phi$ .
7. The amount of initial assets of the new born cohort is equal to the amount of accidental bequests from the last period.

I focus on stationary equilibrium analysis in the rest of the paper. Since analytical results are not obtainable, numerical methods are used to solve the model.

### 3. Calibration

#### 3.1. Demographics and Preferences

One model period is one year. Individuals are born at age 21 ( $j = 1$ ), retire at age 65 ( $R = 45$ ), and can live up to age 85 ( $T = 65$ ). The survival probability  $P_j$  over the life cycle is calibrated using the 2004 US life table.<sup>12</sup>

The utility function is assumed to take the following form,  $u(c, l) = \frac{c^{1-\sigma}}{1-\sigma} - \zeta l$ . The risk aversion parameter  $\sigma$  is set to 2, which is the commonly used value in the macro literature. The disutility parameter for labor supply  $\zeta$  is calibrated to match the employment rate in the data, and the discount factor  $\beta$  is set to match an annual interest rate of 4%.

#### 3.2. Production

The capital share  $\alpha$  in the production function is set to 0.33, and the depreciation rate  $\delta$  is set to 0.06. Both are commonly-used values in the macro literature. The labor-augmented technology parameter  $A$  is calibrated to match the output per person in 2004.

Table 1: Income and Health Expenditure Grids

Labor productivity shock	1	2	3	4	5	
	0.34	0.67	1	1.47	2.88	
Medical exp. shock (\$)	1	2	3	4	5	6
Age 21-35	0	143	775	2696	6755	17862
Age 36-45	5	298	1223	4202	9644	29249
Age 46-55	46	684	2338	6139	12596	33930
Age 56-65	204	1491	3890	9625	20769	58932
Age 66-75	509	2373	5290	11997	21542	50068
Age 76-85	750	2967	7023	16182	30115	53549

Note: I normalize the 3rd labor productivity shock to 1.

<sup>12</sup>See Table 16 in the online appendix.

Table 2: The Transition Matrix for Income and Employer-sponsored Health Insurance

		Offered					Not offered				
		1	2	3	4	5	1	2	3	4	5
Offered	1	0.348	0.089	0.030	0.014	0.004	0.328	0.119	0.034	0.021	0.012
	2	0.250	0.379	0.196	0.088	0.032	0.026	0.015	0.007	0.007	0.000
	3	0.116	0.151	0.430	0.215	0.060	0.008	0.004	0.012	0.005	0.000
	4	0.080	0.066	0.179	0.485	0.172	0.004	0.003	0.005	0.004	0.002
	5	0.036	0.025	0.050	0.162	0.715	0.001	0.001	0.002	0.002	0.008
Not offered	1	0.348	0.089	0.030	0.014	0.004	0.328	0.119	0.034	0.021	0.012
	2	0.178	0.109	0.064	0.017	0.011	0.162	0.287	0.123	0.042	0.008
	3	0.149	0.113	0.108	0.057	0.010	0.103	0.129	0.222	0.082	0.026
	4	0.072	0.051	0.080	0.101	0.036	0.080	0.116	0.138	0.225	0.101
	5	0.160	0.012	0.037	0.062	0.222	0.062	0.074	0.123	0.025	0.222

### 3.3. Labor Productivity Shock, Medical Expense Shock, and Employment-sponsored Health Insurance

I use the Medical Expenditure Panel Survey (MEPS) dataset to calibrate the labor productivity process, the medical expense process, and the probabilities of being offered employer-sponsored health insurance. Since the probability of being offered employer-sponsored health insurance varies significantly across the income distribution, I calibrate the labor productivity process jointly with the probability of being offered employer-sponsored health insurance.

The age-specific deterministic component  $a_j$  in the labor productivity process is calibrated using the average wage income by age in the MEPS dataset. I use the data on the wage income distribution of individuals to construct 5 states with five bins of equal size for the random labor productivity component  $y$ . The data on total health expenditures is used to calibrate the distribution of medical expenses and 6 states are constructed with the bins of the size (25%, 50%, 75%, 90%, 95%) for the medical expense shock  $m$ . To capture the life-cycle profile of medical expenses, I assume that the medical expense shock  $m$  is age-specific and calibrate the distribution of medical expenses for each 10 or 15 years group. The income grids and health expenditure grids are reported in Table 1. The joint transition matrix for income and employer-sponsored health insurance is also calculated from the MEPS dataset and is reported in Table 2. The age-specific deterministic income components, and the transition matrices for medical expense shocks are reported in the online appendix.

### 3.4. Government

The US social insurance system includes a variety of means-tested programs, such as Medicaid, AFDC/TANF, SNAP (formerly food stamps), SSI, etc. It insures poor Americans against large negative shocks by guaranteeing a minimum consumption floor and providing them public health insurance. As argued previously, the Medicaid program was separated from other major welfare programs after the 1996 welfare reform, and was allowed to impose different criteria. Thus, here I model the social insurance system as a combination of two programs, i.e., a minimum consumption floor and a means-tested public health insurance program. The existing estimates of the value of the minimum consumption floor approximately range from 10% to 20% of average earnings of full-time workers, so in the benchmark calibration I set  $\underline{c}$  to \$7000 which is approximately 15% of average earnings of the workers in the model.<sup>13</sup> The income and assets testing criteria for Medicaid directly affect the fraction of people enrolled in the program and they may affect different age groups differently. Thus, they are calibrated to match the life-cycle profile of the fraction of people enrolled in Medicaid.<sup>14</sup> The resulting values are,  $\Theta_{income} = \$12750$  and  $\Theta_{asset} = \$20000$ , which are fairly reasonable values compared to the values used in other existing studies in the literature.

Social Security in the model is designed to capture the main features of the US Social Security program. The Social Security payroll tax rate is set to 12.4%, according to the SSA (Social Security Administration) data. Following Fuster, Imrohorglu, and Imrohorglu (2007), the Social Security benefit formula  $SS(\eta)$  are chosen so that the Social Security program has the marginal replacement rates listed in Table 3. I rescale every beneficiary's benefits so that the Social Security program is self-financing.

The Medicare program provides health insurance to every individual aged 65 and above. According to the CMS data, approximately 50% of the elderly's medical expenses are paid by Medicare, thus I set the Medicare coinsurance rate  $k_m$  to 0.5.<sup>15</sup> The Medicare payroll tax rate  $\tau_m$  is endogenously determined by Medicare's self-financing budget constraint, and the resulting value is 4.9%.

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<sup>13</sup>The existing estimates include Hubbard et al (1994), Moffitt (2002), Scholz et al. (2006), De Nardi et al. (2010), Kopecky and Koreshkova (2014). The value of the floor used here is consistent with most of these existing estimates. One exception is De Nardi, et al. (2010) who find a much lower consumption floor (i.e. \$2663) by estimating their model. However, their model is significantly different from the model studied here, e.g. they do not model the Medicaid program, hence their estimate is not directly comparable to the minimum consumption floor used in this model.

<sup>14</sup>This calibration strategy is also adopted by Pashchenko and Porapakarm (2013b).

<sup>15</sup>See Attanasio, Kitao, and Violante (2008) for a detailed description of Medicare.

Table 3: The Social Security Benefit Formula  $SS(\eta)$ .

	Marginal Replacement Rate
$\eta \in [0, 0.2\bar{\eta})$	90%
$\eta \in [0.2\bar{\eta}, 1.25\bar{\eta})$	33%
$\eta \in [1.25\bar{\eta}, 2.46\bar{\eta})$	15%
$\eta \in [2.46\bar{\eta}, \infty)$	0

Note:  $\bar{\eta}$  is the population average of  $\eta$ .

### 3.5. Health Insurance

The values of  $\kappa(2, )$  and  $\kappa(3, )$  represent the fraction of medical expenses covered by the individual health insurance policy and employer-sponsored health insurance policy. I set their values to 0.75 in the benchmark calibration because the coinsurance rates of most private health insurance policies in the US fall in the range from 65% – 85%.<sup>16</sup> In addition, the coinsurance rate provided by Medicaid  $\kappa(, 1)$  is assumed to be the same as in private health insurance policies. Following Jeske and Kitao (2009), I set the fraction of total employer-sponsored health insurance premiums paid by employees,  $\pi$ , to 0.2. This value is consistent with the empirical evidence provided in Sommers (2002) who finds that the average fraction of total employer-sponsored health insurance premiums paid by employees varies from 11% to 23%. I calibrate  $\lambda_2$ , the individual insurance premium mark-up, to match the share of working population purchasing individual health insurance in the data, that is, 4.6%. The value of  $\lambda_3$  is calibrated to match the average take-up rate for employment-based health insurance in the data, that is, 93.8% according to Pashchenko and Porapakarm (2013a).

The key results of the calibration are summarized in Table 4.

## 4. Quantitative Analysis

In this section, I first describe the key statistics of the calibrated benchmark economy, and show that the benchmark economy captures the key features of the current US economy, especially the current US health insurance system. I then study the effects of social insurance on labor supply, saving, private health insurance decisions, and individual welfare by running counterfactual computational experiments in the calibrated model, i.e., comparing the benchmark economy

<sup>16</sup>Note that  $\kappa_1$  is equal to 0 by construction, since  $h = 1$  means no private health insurance.

Table 4: The Benchmark Calibration

Parameter	Value	Source/Moment
$\sigma$	2	Macro literature
$\alpha$	0.33	Macro literature
$\delta$	0.06	Macro literature
$\beta$	0.95	4% annual interest rate
$\tau_s$	12.4%	US Social Security tax rate
$\kappa_m$	0.5	Attanasio, et al (2008)
$\underline{c}$	\$7000	15% of ave. earnings
$A$	25000	GDP per capita: \$40293
$\lambda_2$	0.09	Popu. share with individual HI: 4.6%
$\lambda_3$	0.02	ESHI take-up rate: 93.8%
$\pi$	0.2	Sommers(2002)
$\zeta$	0.25E-4	Employment rate: 73%

with counterfactual economies with different social insurance policies.

#### 4.1. The Benchmark Economy

Table 5 summarizes the key statistics of the benchmark economy. As can be seen, the model does a good job matching the key moments of the US economy. In addition, Table 6 presents the fractions of individuals enrolled in Medicaid by age group. The trend in these fractions also matches the MEPS data reasonably well. For example, the young and elderly groups are more likely to be enrolled in Medicaid than the prime-age groups.

Figure 1 plots the life-cycle profiles of consumption and saving. Both profiles are hump-shaped, and are fairly standard results compared to what have been found in life-cycle models of consumption and saving. Figure 2 plots the employment rates and employment-sponsored health insurance coverage rates by age groups. The employment rates generated in the model are fairly consistent with their counterparts in the MEPS data except that they may be on the high side for those in their 20s. This is largely because in the model agents want to build up precautionary wealth quickly to insure against medical expense shocks. On the other hand, due to the high employment rates and the lack of precautionary wealth, agents in their 20s in the

Table 5: Key Statistics of the Benchmark Economy

Statistics	Model	Data
Interest rate	4.0%	4.0%
Employment rate	74%	73%
Output per person	\$38640	\$40293
ESHI take-up rate	91.5%	93.8%
% of working popu. with		
Individual HI	4.0%	4.6%
ESHI	52.2%	55.1%
public HI	8.9%	8.9%
No HI	34.9%	31.4%

model also have higher employment-sponsored health insurance coverage than in the data.<sup>17</sup>

Table 6: Fraction of Individuals on Medicaid by Age Group

Age Group	Model	Data
21-35	6.4%	10.4%
36-45	8.2%	8.8%
46-55	5.8%	7.0%
56-65	5.2%	6.4%
66-75	13.0%	12.9%
76-	23.4%	12.3%

To understand how the social insurance programs affect individual choices and welfare, I adopt the steady-state comparison strategy.<sup>18</sup> That is, I compare the benchmark economy to a counterfactual economy with no Medicaid program and a minimal consumption floor of \$1000.<sup>19</sup>

<sup>17</sup>The model-data difference for individuals in their 20s is likely due to that the model abstracts from several elements that are relevant for the labor supply and health insurance decisions in the early years of life, such as human capital investment decisions, and intergenerational supports from parents that may loosen the liquidity constraint. I do not include them as they are less relevant for the main theme of the paper. However, one may wonder whether the main results of the paper are sensitive to the overestimated labor supply and health insurance decisions for the 20-30 age group in the model. As robustness checks, in the appendix I consider an alternative calibration that allows the model to better match employment rates and ESHI coverage rates over the life cycle, and I find that the main results of the paper remain similar.

<sup>18</sup>In Section 5, I also explore the implications of social insurance policy changes along the transition path.

<sup>19</sup>It is well known in the literature with exogenous expense shocks that the economy without a consumption floor is not well-defined, because there are always a tiny fraction of population who are extremely unlucky (hit by a series of



Table 7: Benchmark and Counterfactual Economies

Statistic	Benchmark	Counterfactual I (No SI)	II (\$1000 Floor)	III (No Medicaid)
Utility	-1.138E-3	-1.122E-3	-1.128E-3	-1.136E-3
<b>Welfare (ECV)</b>	n.a.	2.1%	1.2%	0.3%
% of working popu. w/				
Individual HI	4.0%	23.3%	11.3%	8.9%
ESHI	52.2%	60.0%	57.2%	55.9%
Medicaid	8.9%	0%	5.7%	0%
No HI	34.9%	16.7%	15.8%	35.2%
ESHI take-up rate	91.5%	99.9%	95.6%	97.3%
ESHI premium	\$2928	\$2827	\$2914	\$2801
Employment rate	74.5%	79.0%	78.4%	74.7%
SI tax rate $\tau_w$	2.4%	$\leq 0.2\%$	1.2%	1.9%
Aggr. accidental bequests	\$1070	\$1174	\$1134	\$1079

To construct this counterfactual economy, I remove the Medicaid program and reduce the value of  $\underline{c}$  to \$1000 and then reset the payroll tax rate  $\tau_w$  to make the social insurance system self-financing while keeping the rest of the parameter values constant, and then compute the new stationary equilibrium. In addition, to decompose the effects of Medicaid and the consumption floor, I construct two additional counterfactual economies, one with only Medicaid and the other with only the consumption floor. The key statistics of these counterfactual economies are presented together with those of the benchmark economy in Table 7.

## 4.2. Private Health Insurance

In this section, I first examine the impact of the social insurance programs on private health insurance coverage. Several empirical studies found that social insurance programs can crowd out the demand for private health insurance decisions. For example, Cutler and Gruber (1996a,1996b) found that Medicaid discourages individuals from taking up employer-based health insurance. Brown and Finkelstein (2008) show that Medicaid crowds out the demand for a specific type of

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bad income and medical expense shocks) and do not have enough resources to cover their medical expenses. Here I follow Hubbard et al. (1995) and consider the counterfactual with a consumption floor of \$1000. As robustness check, I also explore other values and find that the main results do not significantly change.

Table 8: Crowding Out Effects by Labor Productivity

Labor Productivity Shock (from low to high)	1	2	3	4	5
Individual HI					
Benchmark	7.4%	4.2%	2.4	1.5%	2.0%
Counterfactual	46.1%	28.2%	12.6%	6.3%	3.2%
Employer-sponsored HI					
Benchmark	13.0%	44.5%	68.4	80.3%	88.6%
Counterfactual	33.9%	51.7%	69.1	80.2%	88.7%

individual health insurance: long term care insurance.

The results reported in Table 7 suggest that crowding out effect is quantitatively large. When the social insurance system is completely removed, the share of working-age individuals with employer-sponsored health insurance increases from 52.2% to 60.0%, and the share of those with individual health insurance increases from 4.0% to 23.3%. It is worth mentioning that the crowding out effect on employer-sponsored health insurance comes from two sources. First, social insurance reduces the take up rate for the workers with employer-sponsored health insurance offers. Second, it discourages work, thus lowering the number of individuals being offered employer-sponsored health insurance. As can be seen, when social insurance is eliminated, the take-up rate increases from 91.5% to 99.9%, meanwhile the employment rate increases from 74.5% to 79.0%. A simple decomposition calculation suggests that over half of the change in employer-sponsored health insurance is from the labor supply channel, while the rest is attributed to the increase in take-up rate.

The two additional counterfactual experiments decompose the effects of the minimum consumption floor and the Medicaid program, and show that the crowding out effect from the minimum consumption floor is as large as that from the Medicaid program. As shown in the 4th and 5th columns of Table 7, when only the minimum consumption floor is reduced to \$1000, the share of working-age individuals with employer-sponsored health insurance increases from 52.2% to 57.2%, and the share of those with individual health insurance increases from 4.0% to 11.4%. However, when only the Medicaid program is eliminated, the private health insurance coverage only increases slightly, that is, from 52.2% to 55.9% for employer-sponsored health insurance, and from 4.0% to 8.9% for individual insurance.

In Table 8, I break down the crowding out effects by labor productivity, and find that the crowding out effect of social insurance is larger among individuals with lower labor productivity. For example, for individuals with the lowest labor productivity, eliminating social insurance increases the population share with individual health insurance from 7.4% to 46.1%, and increases the population share with employer-sponsored health insurance from 13.0% to 33.9%. For individuals with the highest labor productivity, however, eliminating social insurance only changes their private health insurance coverage slightly. The intuition for the different results by labor productivity is simple. Poorer individuals are more likely to rely on social insurance, therefore their health insurance choices are affected more by the social insurance programs.

It is noteworthy that the results in Table 8 show that social insurance does not only affect poor individuals. It also has a significant effect on individuals with median labor income. This is because these individuals will potentially become qualified for social insurance after being hit by a series of large negative shocks, even though they are currently well above the welfare criteria. This is also the reason why the crowding out effect in the model is quantitatively large, much larger than one for one.

### **4.3. Labor Supply**

Social insurance also discourages work and thus reduces labor supply. As also shown in Table 7, if social insurance is eliminated, the employment rate increases from 74.5% to 79.0%. Here the labor supply effect is from two channels. First, since social insurance is means-tested, it imposes implicit taxes on some workers. For instance, for workers already on the consumption floor, receiving additional one dollar income simply reduces the welfare transfer by one dollar. That is, they face 100% implicit income tax rate. For those who are potentially qualified for social insurance, additional labor income also reduces their future opportunity of receiving welfare transfers. Second, the corresponding payroll tax rate lowers the after-tax wage and thus also reduces labor supply via substitution effect.

To understand the relative importance of the above two channels, I conduct a computational experiment in which I eliminate the social insurance system but keep the payroll tax rate constant (at 2.4%). I find that the labor supply effect now becomes slightly smaller, that is, the employment rate increases from 74.5% to 78.5%. This suggests that the payroll tax channel only accounts for a small part of the labor supply effect, and majority of the labor supply effect is due to the means-testing feature of social insurance.

It is worth noting that the impact of taxation on labor supply is not insensitive to the individual preferences assumed in the model. The utility function assumed in the paper implies that individuals have separable preferences on consumption and leisure. As Heathcote, Storesletten, and Violante (2008) pointed out, while the separable preferences are widely used in the literature, they also have some limitations such as the incompatibility with balanced growth.<sup>20</sup> In this regard, Cobb-Douglas preferences, another type of standard preferences, may also be interesting to study as they are consistent with balanced growth, which I leave for future research.

#### 4.4. Precautionary Saving

The seminal work by Hubbard, Skinner and Zeldes (1995) shows that social insurance reduces precautionary saving, and it is the reason why many relatively poor individuals do not accumulate any wealth over the life cycle. In this section, I investigate whether this result also holds true here. In Figure 3, I present the level of wealth at the 10th, 50th, and 90th percentiles of the wealth distribution by age over the life cycle. As can be seen, for the individuals at the 50th and 90th percentiles of the wealth distribution, the life cycle profiles of wealth are the standard hump shape. However, for individuals on the bottom of the distribution, wealth is near zero for all ages over the life cycle. This result is consistent with the data and the finding in Hubbard et al.(1995). The intuition behind this result is the following. As argued by Hubbard et al.(1995), the minimum consumption floor provides partial insurance against large negative shocks, and thus reduces private saving. Since the consumption floor is larger fraction of lifetime income for poor individuals, the negative saving effect is larger for them. This point can be confirmed by comparing the life cycle profiles of wealth in the benchmark model and in the counterfactual model without social insurance. As shown in Figure 4, when the social insurance programs are eliminated, the poor individuals (at the 10th percentile of the distribution) start to accumulate much more wealth. The shape of their life cycle wealth profile becomes hump-shaped, not significantly different from the profiles for other individuals. On the other hand, eliminating social insurance affects richer individuals much less, and it almost does not affect the wealth profile for individuals at the 90th percentile of the distribution.

It is worth mentioning that the saving effect of social insurance in the model is quantitatively smaller than in Hubbard et al.(1995), although they are qualitatively the same as discussed

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<sup>20</sup>In addition, the separability implies that it cannot capture any labor supply effects directly through the consumption-leisure margin.

above. The reason for that is as follows. In the model with endogenous private health insurance choices, social insurance crowds out private health insurance coverage and thus increases the out-of-pocket medical expenses facing individuals, which encourages private saving and partially offsets the negative saving effect of social insurance. To verify this point, I compare the effect of eliminating social insurance on aggregate capital in the two model economies, the benchmark economy, and the economy with exogenous health insurance. I find that in the benchmark economy, eliminating social insurance increases the aggregate capital by 14%. However, in the economy with fixed private health insurance coverage, eliminating social insurance can increase the aggregate capital by 18%. The different results suggest that the effect of social insurance on capital accumulation in Hubbard et al.(1995) may be biased upward because their model does not feature endogenous private health insurance.

#### **4.5. Individual Welfare**

As shown previously, social insurance does not only distort saving and labor supply decisions, but also has a significant crowding out effect on private health insurance. In this section, I examine the net welfare implications of the social insurance programs. To quantify the welfare results, I use the equivalent consumption variation (ECV) as the welfare criteria. That is, the change in consumption each period required for a new born to achieve the same expected lifetime utility. As also shown in Table 7, the expected lifetime utility of a new born slightly increases when the social insurance system is completely removed. In term of ECV, an increase of 2.1% in consumption each period is required to make a new born in the benchmark economy to achieve the same expected lifetime utility as in the counterfactual economy without social insurance. The welfare implications of social insurance vary dramatically across the income distribution. Table 9 presents the welfare consequences of eliminating social insurance by labor productivity. The welfare gain is only 0.8% for a new born with the lowest labor productivity, and it rises significantly as the productivity increases. For agents with the highest productivity, the welfare gain is 2.6%. This different welfare results by income simply reflects the fact that poorer individuals are more likely to use social insurance programs because these programs are means-tested.

As is standard in the literature, accidental bequests are assumed to be redistributed equally to the new-born cohort in each period in the benchmark model. While this assumption has been a convention in the literature, it is important to note that several studies have pointed out that public insurance policies may crowd out accidental bequests in general equilibrium models,

and the welfare implications of public insurance policies may be sensitive to how accidental bequests are redistributed in equilibrium.<sup>21</sup> Therefore, in the rest of this section I also investigate the welfare implications of social insurance in cases with alternative redistribution strategies for accidental bequests.

Table 9: Welfare Effect of Eliminating Social Insurance by Income

Labor Productivity (from low to high)	1	2	3	4	5
Welfare gain/loss	0.8%	1.8%	2.2%	2.5%	2.6%

#### 4.5.1. Alternative Redistribution Strategies for Accidental Bequests

Following Imrohoroglu, Imrohoroglu, and Joines (1995), I consider three alternative strategies that are commonly assumed in the literature. First, it is assumed that all accidental bequests are destroyed. Second, it is assumed that accidental bequests are redistributed in a lump-sum fashion to everyone in the economy. Third, I consider the case with a perfect annuity market, in which no accidental bequest occurs. The results from these alternative cases are presented in Table 10. I find that the welfare implications of social insurance are sensitive to how accidental bequests are treated in the model. While the elimination of social insurance generates a small gain in the case with all accidental bequests being equally redistributed to the new-born, it generates large welfare losses (8.6-13.4%) in cases with the alternative redistribution strategies. In addition, I find that while the welfare effects of the consumption floor are sensitive to different redistribution strategies for accidental bequests, the impact of Medicaid remains similar in most cases.

The findings here suggest that the elimination of social insurance generates welfare losses in most cases, and the welfare implications of social insurance are sensitive to the choice of the redistribution strategy for accidental bequests in equilibrium. As most conventional strategies to deal with accidental bequests in the literature do not necessarily generate a realistic distribution of bequests by age, these findings also suggest that future studies of this type should take the timing of leaving and receiving bequests more seriously. One possible approach is to follow

<sup>21</sup>See Imrohoroglu, Imrohoroglu, and Joines (1995), Caliendo, Guo, and Hosseini (2014), etc. In the benchmark economy, the amount of aggregate accidental bequests is approximately \$1070 (see in Table 7). When the social insurance programs are eliminated, the amount of accidental bequests increases by about 10%.

De Nardi and Yang (2014) who capture the realistic distribution of bequests over the life cycle by carefully modelling the timing of leaving/receiving bequests and the family structure. As adopting this approach would substantially change the structure of the model, I leave this interesting extension for my future research.

Table 10: Alternative Redistribution Strategies for Accidental Bequests

Statistic	Benchmark	Counterfactual I (No SI)	II (\$1000 Floor)	III (No Medicaid)
<b>Perfect Annuity Market</b>				
Utility	-1.32E-3	-1.48E-3	-1.46E-3	-1.31E-3
Welfare (ECV)	n.a.	-13.4%	-12.4%	0.5%
<b>Acc. Bequests to Everyone</b>				
Utility	-1.29E-3	-1.38E-3	-1.38E-3	-1.28E-3
Welfare (ECV)	n.a.	-8.6%	-8.5%	0.6%
<b>Acc. Bequests Wasted</b>				
Utility	-1.34E-3	-1.48E-3	-1.45E-3	-1.34E-3
Welfare (ECV)	n.a.	-8.6%	-8.5%	0.6%

## 5. Further Discussions

### 5.1. Why Are So Many Americans Uninsured?

As is well known in the data, a large number of Americans are currently without any type of health insurance in the US (approximately 47 millions according to Gruber (2008)). This fact has attracted growing attention from both academics and policy-makers, and it has motivated a variety of policy proposals aiming to reduce the number of uninsured. What is the right policy to solve this problem? As argued by Gruber (2008), the answer to this question really depends on why these Americans are uninsured in the first place. However, after reviewing the literature, Gruber (2008) concludes that it is still a puzzle why so many Americans choose to be uninsured (at least quantitatively).

I argue that the model provides a possible explanation for this puzzle. That is, many Americans do not purchase any private health insurance because of the existence of social insurance. The intuition behind this argument is simple. Social insurance affects individuals who are cur-

rently qualified for social insurance programs. In addition, it impacts any individual who will potentially qualify for social insurance if hit by a series of negative shocks. As can be seen in Table 7, the share of the uninsured drops by more than a half (i.e. from 34.9% to 16.7%) when the social insurance system is eliminated. This quantitative result suggests that the existence of social insurance may explain over half of the uninsured population's decision to not obtain health insurance. It also provides an upper bound on the quantitative importance of other potential explanations, such as uncompensated care and the market frictions in the health insurance markets (see Gruber (2008) for a detailed review of these explanations). In addition, this result implies that many individuals are better off without any health insurance, as they are implicitly insured by social insurance.

## 5.2. Alternative Counterfactual Consumption Floors

In the benchmark case, I follow Hubbard et al. (1995) and set the counterfactual minimal consumption floor to \$1000 to study the impact of consumption floor. Here I explore the sensitivity of the results with respect to alternative counterfactual floors. I consider a wide range of values from \$10 to \$3000. The results from these cases are reported in Table 11. As this table clearly shows, the impact of the minimal consumption floor on individual welfare is not monotone. As the minimal consumption floor decreases from its current value to around \$500, individual utility gradually increases. However, after the floor drops below \$500, the impact of consumption floor on individual welfare is reversed. For instance, when the minimal consumption floor is set to \$10, individual utility becomes significantly lower than in the case with a floor of \$500. These results suggest that while the current consumption floor in the U.S. may be too high, completely eliminating the consumption floor is also not optimal. According to the results in Table 11, the optimal consumption floor is around \$500.

## 5.3. Alternative Tax Financing Schemes for Social Insurance

The US social insurance system consists of a large number of means-tested programs, and its actual financing structure is complicated. In the benchmark case, I assume that the social insurance system is completely financed a payroll tax rate (on labor income),  $\tau_w$ . In this section, I explore alternative tax financing schemes for the social insurance programs. I consider two cases. In the first case, I assume that the social insurance system is financed by a flat income tax rate (on both labor income and capital income). In the second case, I assume the income tax



Table 11: Alternative Counterfactual Consumption Floors

Statistic	Utility	Welfare (ECV)
Benchmark (\$7000)	1.138E-003	n.a.
Counterfactual floors		
\$10	1.133E-003	0.8%
\$50	1.130E-003	1.1%
\$100	1.129E-003	1.1%
\$250	1.128E-003	1.2%
\$500	1.128E-003	1.2%
\$750	1.128E-003	1.2%
\$1000	1.128E-003	1.2%
\$2000	1.129E-003	1.2%
\$3000	1.131E-003.	0.9%

rate (on both labor and capital income) is progressive. To capture the progressivity of the US tax system, I use the functional form studied by Gouveia and Strauss (1994). That is, the tax payment as a function of income  $T(y)$  is given as  $T(y) = a_0[y - (y^{-a_1} + a_2)^{-1/a_1}]$ . Roughly speaking, here  $a_0$  and  $a_1$  determine the degree of progressivity while  $a_2$  is a scaling parameter. Therefore, I directly use the estimates from Gouveia and Strauss for  $a_0$  and  $a_1$  ( $\{a_0, a_1\} = \{0.258, 0.768\}$ ) and calibrate the value of  $a_2$  to balance the budget.<sup>22</sup>

The results from these two cases with alternative tax financing schemes are presented in Table 12. As can be seen, the results remain qualitatively similar as different financing schemes for social insurance are assumed.

#### 5.4. Transitional Welfare Implications

The main focus of the paper is on the long-term welfare implications of social insurance policies, and the quantitative strategy so far is to compare steady states with different social insurance programs. While the steady-state comparison strategy is transparent and computationally less demanding, it is worth noting that this strategy does not capture any welfare implications during the transition path. Therefore, the welfare results presented previously cannot directly apply to the current people in the economy. To shed some lights on the transitional welfare implications

<sup>22</sup>This strategy was adopted in Jeske and Kitao (2009).

Table 12: Alternative Tax Financing Schemes for Social Insurance

Statistic	Benchmark	Counterfactual I (No SI)	II (\$1000 Floor)	III (No Medicaid)
Flat income tax				
Utility	-1.139E-3	-1.121E-3	-1.128E-3	-1.136E-3
Welfare (ECV)	n.a.	2.2%	1.4%	0.3%
Progressive income tax				
Utility	-1.134E-3	-1.122E-3	-1.125E-3	-1.132E-3
Welfare (ECV)	n.a.	1.5%	1.1%	0.3%

of social insurance programs, I compute the transition paths for the three main counterfactual cases considered in the steady state analysis. Specifically, I study the impact of eliminating social insurance on the current population while taking into account the whole transition path toward the new steady state. The results are presented in Table 13. As can be seen, while eliminating social insurance may be welfare-improving in the long run, it is always welfare-reducing for the current population.

Table 13: Transitional Welfare Implications

Statistic	Benchmark	Counterfactual I (No SI)	II (\$1000 Floor)	III (No Medicaid)
Utility	-1.138E-3	-1.122E-3	-1.128E-3	-1.136E-3
<b>Welfare (ECV)</b> (steady-state)	n.a.	2.1%	1.2%	0.3%
Utility	-1.138E-3	-1.122E-3	-1.128E-3	-1.136E-3
<b>Welfare (ECV)</b> (transition)	n.a.	-9.1%	-8.5%	-7.2%

Table 14: Wealth Distribution

	1st Quintile	2nd Q	3rd Q	4th Q	5th Q	Top 5%	Top 1%
Data	1.1%	5.0%	12.2%	12.6%	69.1%	57.8%	34.7%
Model	0.3%	4.4%	11.5%	25.7%	58.1%	15.9%	4.7%

Data source: from De Nardi and Yang (2015).

## 5.5. Wealth Distribution

It is interesting to look at the wealth distribution generated in the model. As is well known in the literature, the U.S. wealth distribution features two puzzling facts: (1) a large number of households at the bottom of the distribution hold little wealth, and (2) a major portion of the total wealth is held by a small number of households at the top of the distribution. Table 14 displays the wealth distribution implied in the model together with the data. As can be seen, the benchmark model matches the wealth distribution in the data fairly well except the very top of the distribution. In particular, the model generates a large fraction of the population with little wealth, consistent with fact (1). The reason for this result is simply that mean-tested social insurance crowds out private saving for relatively poor people. It is worth noting that as social insurance is most relevant for people at the bottom of the distribution, it is a favorable feature of the model that it matches the bottom of the wealth distribution.

## 6. Conclusion

In this paper, I examine the social insurance programs in a dynamic general equilibrium with endogenous health insurance choices. I find that social insurance (modeled as the combination of a minimum consumption floor and the Medicaid program) does not only distort saving and labor supply decisions, but also crowds out private health insurance coverage. However, despite the distorting effects, the net welfare consequence of removing social insurance is still negative in most cases studied in the paper. In addition, I find that the crowding out effect of social insurance on private health insurance is quantitatively large because means-tested social insurance programs do not only affect individuals who are already qualified for the programs, but also influence the decisions of individuals who will potentially become qualified after being hit by a series of large negative shocks. This finding implies that the existence of social insurance programs may be one of the reasons why many Americans do not buy any health insurance.

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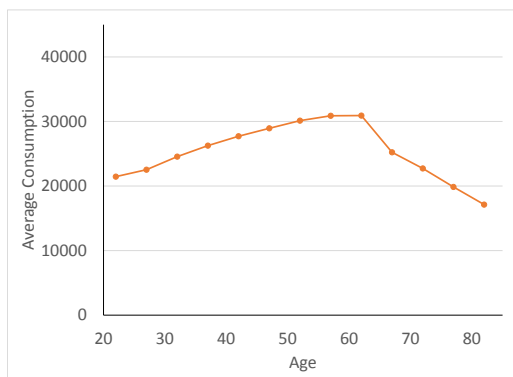
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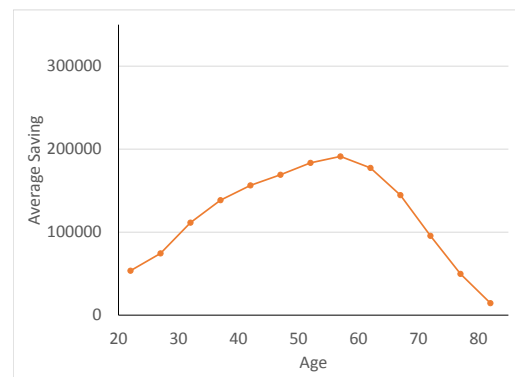
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Figure 1: Average Consumption and Saving over the Life Cycle

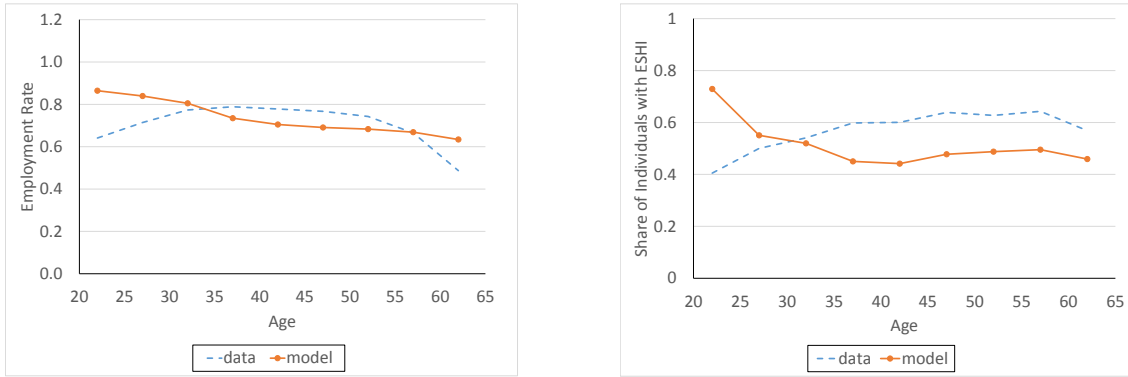


(a) Average Consumption



(b) Average Saving

Figure 2: Employment and Employment-based HI over the Life Cycle



(a) Employment Rate

(b) Employment-based Health Insurance

Data source: MEPS

Figure 3: Wealth over the Life Cycle By Percentile

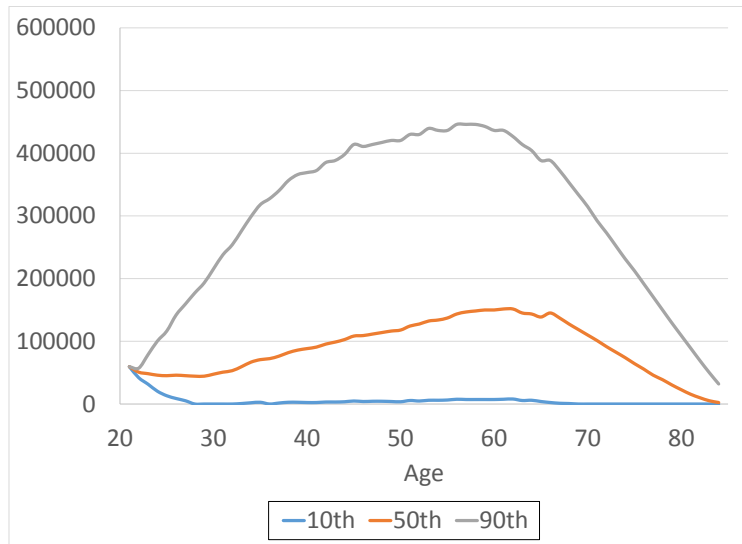
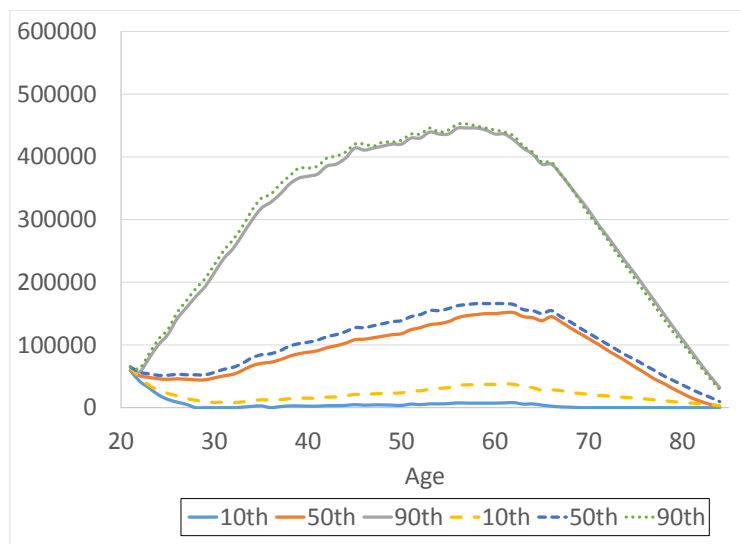


Figure 4: Wealth over the Life Cycle: Benchmark vs. a \$1000 floor

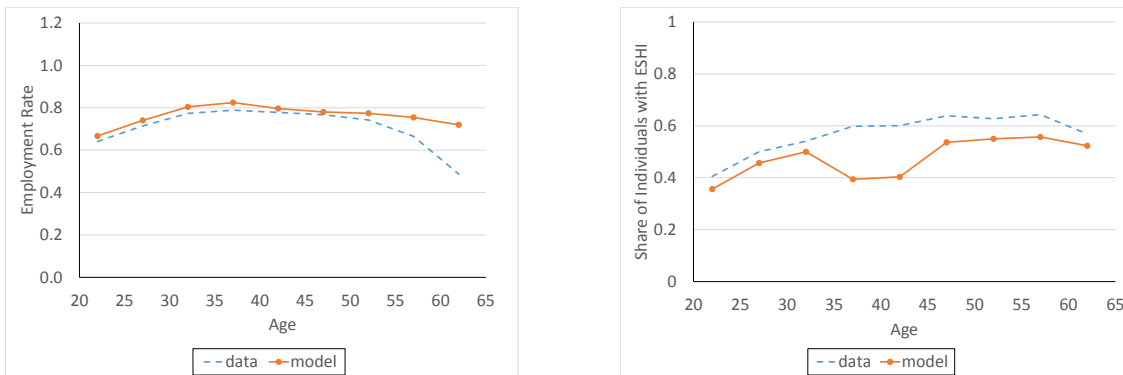




## 7. Online Appendix (not for publication)

The benchmark model overestimates the employment rates and the employment-based health insurance coverage rates for individuals in their 20s. One may wonder whether the main results of the paper are sensitive to the overestimation of labor supply and health insurance decisions for these individuals in the model. As robustness check, now I consider an alternative calibration that allows the model to better match employment rates and ESHI coverage rates for this age group. Specifically, I scale up the values of the disutility parameter for agents aged 35 and below so that the model matches the employment rates among these age groups.<sup>23</sup> In addition, I scale down the medical expenses during the first ten year of life in the model so that the model implications are consistent with the ESHI coverage rates among individuals in their 20s. As shown in Figure 5, the employment rates and ESHI coverage rates by age are much closer to their data counterparts in this version of the calibrated model. I repeat the main exercises with this calibration, the comparison between the economies with different social insurance policies. The results from this robustness check are shown in Table 15. As can be seen, the effects of eliminating social insurance on private health insurance coverage, labor supply, saving, and individual welfare remain similar in this alternative version of the model.

Figure 5: Alternative Calibration: Employment Rate and ESHI by Age Group



(a) Employment Rate

(b) Employment-based Health Insurance

Data source: MEPS

<sup>23</sup>I also recalibrate the value of  $\zeta$  so that the average employment rate is still consistent with the data.

Table 15: Alternative Calibration

Statistic	Benchmark	Counterfactual (with No SI)
Utility	-1.46E-3	-1.29E-3
Welfare (ECV)	n.a.	2.1%
Employment rate	76.7%	81.8%
Individual HI Coverage	4.2%	21.4%
ESHI Coverage	48.0%	62.1%
Aggr. accidental bequests	\$1128	\$1252

Table 16: Survival Probabilities over the Life Cycle

Age	Age-specific Productivity	Survival Probability	Age	Age-specific Productivity	Survival Probability
21	0.66	0.9991	56	1.33	0.9932
22	0.78	0.9990	57	1.31	0.9927
23	0.81	0.9990	58	1.31	0.9921
24	0.92	0.9990	59	1.26	0.9914
25	1.01	0.9990	60	1.30	0.9905
26	0.93	0.9990	61	1.22	0.9896
27	0.97	0.9990	62	1.06	0.9886
28	1.00	0.9990	63	1.16	0.9876
29	1.14	0.9990	64	1.07	0.9866
30	1.18	0.9990	65	1.26	0.9855
31	1.11	0.9990	66		0.9843
32	1.26	0.9989	67		0.9829
33	1.31	0.9989	68		0.9814
34	1.21	0.9988	69		0.9797
35	1.06	0.9987	70		0.9779
36	1.19	0.9986	71		0.9760
37	1.27	0.9985	72		0.9738
38	1.19	0.9984	73		0.9713
39	1.13	0.9982	74		0.9684
40	1.15	0.9981	75		0.9656
41	1.24	0.9979	76		0.9626
42	1.19	0.9977	77		0.9592
43	1.26	0.9975	78		0.9552
44	1.32	0.9973	79		0.9506
45	1.14	0.9970	80		0.9455
46	1.24	0.9968	81		0.9402
47	1.24	0.9965	82		0.9346
48	1.23	0.9962	83		0.9284
49	1.24	0.9959	84		0.9215
50	1.41	0.9956	85		0.9141
51	1.28	0.9953			
52	1.39	0.9949			
53	1.27	0.9945			
54	1.32	0.9941			
55	1.41	0.9937			

Table 17: The Transition Matrix for Medical Expense Shock

Age 21-35		1	2	3	4	5	6
	1	0.366	0.366	0.166	0.065	0.018	0.018
	2	0.366	0.366	0.166	0.065	0.018	0.018
	3	0.200	0.200	0.314	0.158	0.072	0.055
	4	0.114	0.114	0.283	0.258	0.096	0.136
	5	0.165	0.165	0.278	0.205	0.063	0.125
	6	0.089	0.089	0.253	0.190	0.115	0.264
Age 36-45		1	2	3	4	5	6
	1	0.656	0.209	0.084	0.032	0.008	0.010
	2	0.290	0.382	0.210	0.087	0.024	0.006
	3	0.134	0.272	0.333	0.204	0.037	0.019
	4	0.084	0.149	0.259	0.314	0.111	0.084
	5	0.056	0.065	0.121	0.371	0.194	0.194
	6	0.073	0.122	0.073	0.220	0.130	0.382
Age 46-55		1	2	3	4	5	6
	1	0.662	0.223	0.073	0.029	0.007	0.007
	2	0.296	0.406	0.187	0.082	0.013	0.015
	3	0.103	0.251	0.386	0.174	0.046	0.040
	4	0.065	0.090	0.281	0.329	0.135	0.101
	5	0.059	0.092	0.193	0.261	0.160	0.235
	6	0.102	0.102	0.076	0.169	0.110	0.441
Age 56-65		1	2	3	4	5	6
	1	0.718	0.168	0.068	0.023	0.013	0.013
	2	0.234	0.406	0.212	0.105	0.025	0.017
	3	0.120	0.272	0.347	0.167	0.050	0.045
	4	0.066	0.158	0.270	0.307	0.112	0.087
	5	0.038	0.063	0.188	0.288	0.238	0.188
	6	0.138	0.025	0.150	0.250	0.113	0.325
Age 66-75		1	2	3	4	5	6
	1	0.656	0.163	0.077	0.059	0.027	0.018
	2	0.204	0.353	0.281	0.113	0.014	0.036
	3	0.127	0.262	0.303	0.222	0.041	0.045
	4	0.038	0.180	0.241	0.301	0.083	0.158
	5	0.068	0.045	0.159	0.318	0.159	0.250
	6	0.068	0.045	0.182	0.182	0.068	0.455
Age 76-85		1	2	3	4	5	6
	1	0.539	0.195	0.162	0.065	0.019	0.019
	2	0.200	0.361	0.265	0.110	0.026	0.039
	3	0.065	0.226	0.400	0.219	0.039	0.052
	4	0.065	0.108	0.247	0.398	0.032	0.151
	5	0.065	0.097	0.065	0.484	0.129	0.161
	6	0.097	0.032	0.161	0.258	0.161	0.290