Economics Bulletin

Volume 31, Issue 1

Social Insurance and Wealth Distribution

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Abstract

This paper aims to determine whether and, if so, how the existence of a means-tested, asset-based social insurance program and the potential reform thereof impacts wealth distribution in the United States. A dynamic equilibrium model that could generate several features of the current state of wealth distribution in the United States was developed to investigate to the extent to which social insurance programs affect wealth distribution in the United States. The results of several experiments and robustness tests performed using this model suggest that entirely eliminating the U.S. social insurance system would decrease the Gini coefficient from its current value of approximately 0.8 to less than 0.6. However, the results also indicate that reforming the social insurance system, whether by expanding or contracting it by 20%, would have no significant impact on wealth distribution.

Citation: Minchung Hsu, (2011) "Social Insurance and Wealth Distribution", *Economics Bulletin*, Vol. 31 no.1 pp. 687-698.
Submitted: Sep 02 2010. **Published:** February 26, 2011.

1 Introduction

Social insurance programs are designed to ensure social fairness and provide a safety net for poor or disadvantaged individuals. By offering cash transfers and/or subsidies to individuals falling below a certain income or poverty threshold, these programs have a redistribution effect within an economy. However, these programs may impact wealth distribution in a negative rather than a positive manner. As has been discussed in the literature, when individuals, especially lower-income individuals, believe that they can rely on the benefits received by social insurance programs, they are encouraged to engage in fewer precautionary saving behaviors. In such a manner, the availability of social insurance programs may impact household saving in a negative manner. In addition, the means tests required and asset restrictions imposed by some social programs further discourage savings, especially to those close to the poverty threshold.[1]

Indeed, in an examination of social insurance programs, Hubbard et al. (1995) indicated that the asset-based, means-tested nature of the U.S. social insurance system discourages many Americans from accumulating wealth. Jeske and Kitao (2009) also incorporated a similar framework of social insurance in a Bewley-type model such that the model could generate the nature of asset holdings among individuals represented at the bottom of the wealth distribution, who do not accumulated assets. As wealth distribution has not been the focus of previous research into social insurance programs, two important factors remain poorly understood: 1) the extent to which a means-tested, asset-based social insurance system affects wealth distribution and 2) the impact of reforming (e.g., expanding or contracting) a social insurance system on wealth distribution.

To study the quantitative impact of a social insurance system on wealth distribution, this study employs a dynamic stochastic general equilibrium model characterized by incomplete markets and heterogeneous agents (i.e., a Bewley-type model). Recognizing that the basic dynastic Bewley models display a significantly lower level of wealth concentration than do the relevant U.S. data,[2] this study introduces two factors to improve the model's performance. First, it attributes the thick left tail of the wealth distribution to the fact that the means-testing and asset-based nature of the social insurance system

[1] Several U.S. social programs require means testing and impose asset restrictions, such as Aid to Families with Dependent Children (AFDC), Medicaid, Supplemental Security Income (SSI), and the food stamp program.

[2] In their classic works, Bewley (1986), Imrohoroglu (1989), Huggett (1993), and Aiyagari (1994) pioneered the literature regarding this type of model. Almost all the current general equilibrium, quantitative models of wealth inequality are versions of Bewley models. See the discussion in Quadrini and Rios-Rull (1997) and Cagetti and De Nardi (2005).

discourages savings among households at the bottom of the wealth distribution. Second, to match the long right tail of the wealth distribution, it adopts Krusell and Smith (1998)'s explanation, which allows for slight heterogeneity regarding utility discount factors (e.g., time preference).[3]

To investigate the impact of social insurance programs as well as the potential impact of policy changes thereof on wealth distribution, this study adopted the strategy of (1) developing a model of a social insurance system that can generate a level of wealth distribution consistent with that of the current U.S. level and then (2) performing counterfactual experiments to investigate differences in wealth distribution among economies that differ in terms of the size of their social insurance system.[4]

The experiment results suggest that entirely eliminating the means-tested, asset-based social insurance system would increase the share of wealth among the bottom 40% of households from less than 1% to 9% and decrease the Gini coefficient from .80 to .56. It would do so by prompting these households to increase their level of precautionary savings in recognition that they could no longer rely on the distribution of social insurance benefits to meet their basic needs. However, the results also indicate that reforming the social insurance system, such as by expanding or contracting it by 20%, would have only a negligible impact on wealth distribution.

This version of the paper, to provide a first investigation, uses a dynastic framework that abstracts from life-cycle features, ignores the social security (public pension) system, and highly simplifies the health insurance system. As these institutional factors have important implications for saving behaviors, they should be accounted for to allow for a more precise investigation as an extension. As such, the simplified calibration described in section 3 must be improved in a manner corresponding to the extended model.

The remainder of this paper is organized as follows. Section 2 introduces the model before section 3 describes the calibration of the model. After section 4 presents the results of the benchmark simulation and the policy experiments, section 5 presents the conclusions drawn from the study findings.

[3] Mukoyama and Sahin (2006) and Krusell et al. (2009) also attribute the nature of wealth distribution in the United States to these factors.

[4] Fuster, Imrohoroglu and Imrohoroglu (2007) adopted a similar strategy to study the effects of eliminating the Social Security system (the U.S. public pension system) on welfare.

2 Model Environment

The model economy is populated by a large number households (measure one). that are ex-ante identical except regarding skill level (denoted by λ), which is given exogenously and determines the persistent level of household income.

2.1 Shocks

Income Shocks

All households face the prospect of idiosyncratic labor endowment shocks (l) that create income fluctuations. The shocks l are assumed to be discrete and evolve according to a first-order Markov process within a transition probability matrix π_l A household's effective labor supply is λl and labor income $w\lambda l$, where w is the wage rate.

Medical Expenditure Shocks

All households also face the prospect of idiosyncratic medical expenditure shocks (x) that also evolve independently according to a first-order Markov process within a transition probability matrix π_x. The medical expenditures here represent out-of-pocket expenditures that are assumed to be expended only for recovery without generating utility.

Preference Shocks

Following Krusell and Smith (1998), this model assumes that a household's time preference may change. The utility discount factor β, which assumes one of three values $\{\beta_h, \beta_m, \beta_l\}$, is also stochastic. Within this framework, households with higher β tend to save more, which contributes to the generation of the right tail of the wealth distribution. β is also assumed to follow a Markov process.

The three stochastic processes are assumed to be distributed identically and independently across households and over time.

2.2 Asset Market

As the asset market is incomplete, households are constrained by a limited level of liquidity. Because households can only borrow a limited amount, b, they cannot fully ensure that they can reach their minimum level of consumption by engaging in asset trading. Therefore, households will save in a precautionary manner to guard against uncertainty.

2.3 Firm

Assume that a representative firm hires labor and rents capital from households, and only effective labor ($\lambda_i l_{i,t}$ for each household i) is productive. Let Y_t denote the total output at period t, and K_t the aggregate capital, and N_t the aggregate effective labor. The production technology is assumed to be a standard Cobb-Douglas type:

$$Y_t = A_t K_t^{\theta} N_t^{1-\theta}. \tag{1}$$

2.4 Social Insurance and Government

Assume the existence of an asset-based, means-tested social insurance system that guarantees a minimum level of consumption $\underline{C}$ by supplementing income when a household's disposable wealth (H) falls below $\underline{C}$, in accordance with Hubbard et al. (1995).

The government taxes household labor income to finance the social insurance system. Because the labor supply is inelastic, this taxation policy does not affect labor supply and will only slightly distort household saving decisions.[5] The government is required to have a balanced budget at each period.

2.5 Household's Problem

In the economy, household i chooses a level of consumption l ($c_{i,t}$) and asset holdings ($a_{i,t+1}$) for each period t that will maximize its expected discounted lifetime utility,

$$E_0 \left[\sum_{t=0}^{\infty} \left(\prod_{j=0}^{t} \beta_{i,j} \right) \ln(c_{i,t}) \right] \tag{2}$$

subject to:

$$c_{i,t} + a_{i,t+1} = (1-\tau_t) w_t \lambda_i l_{i,t} + (1+r_t) a_{i,t} - x_{i,t} + TR_{i,t}; \tag{3}$$

$$TR_{i,t} = \max\{0, \ \underline{C} - H_{i,t}\}; \tag{4}$$

$$a_{i,t} \geq -b; \ \ c_{i,t} > 0, \tag{5}$$

where $H_{i,t} = (1-\tau_t) w_{i,t} l_{i,t} + (1+r) a_{i,t} - x_{i,t}$.

[5] If the government taxes capital income, it will directly distort asset prices and affect asset-holding and consumption decisions. By assuming that the government taxes household labor, this study can more easily focus on the impact of a social insurance system on savings behavior and wealth distribution.

In the above household's problem, E_t is the expectation operator. Given a wage rate w_t and a rate of return of assets r_t, the household receives after-tax (tax rate τ_t) labor income $(1-\tau_t)w_t\lambda_i l_{i,t}$ and previous assets plus interest $(1+r_t)a_{i,t}$ at period t. The household may also receive a transfer $TR_{i,t}$ if qualified for the social insurance program (i.e. $\underline{C}-H_{i,t}>0$).

3 Parameterization and Model Computation

The model period is set at one year. In the production function, the capital share (θ) is set at 0.36 and the depreciation rate of capital (δ) at 0.06 (from Stokey and Rebelo, 1995). The liquidity constraint b is set at zero.

Preference Shocks

In accordance with Krusell and Smith (1998), the discount factor process is calibrated by assuming a symmetric distribution of β, with 80% of the population falling within the middle value and 10% falling at each extreme point within any time period. As the extreme discount values are expected to persist for 120 years, they are more persistent than Krusell and Smith (1998) had assumed. The three values of β with a slight deviation (less than 1%) from its mean, $\{.968\ .955\ .952\}$, are selected so that the wealth distribution can match some features of the data.[6] Table 2 in the following section displays the features of the wealth distribution.

Skill Levels and Income Shocks

This model assumed the existence of four skill levels (λ) that had led to the emergence of four permanent income groups. The target of the calibration is to match the average income of the top 25% of households to the average income of households in the bottom 25%. Four values of labor efficiency λ, {2.2, 1.0, 0.55, 0.25}, are used such that the model can match the average household income data from 1990 to 1995 (U.S. Census Bureau). The mean of λ is normalized to unity.

Within each permanent income group, individuals face income fluctuations, which are captured by the labor endowment shocks in the model. A first order autoregressive (AR(1)) process is used to approximate the pattern of the logarithm of labor endowment

[6]The calibration result slightly differs from that of Krusell and Smith (1998). Whereas they had relied solely on the discount factor process to match the wealth distribution, this study assumes that the social insurance system also plays a role in wealth distribution.

shocks, l_t.[7] The process is set as:

$$\log(l_{t+1}) = \rho_l \log(l_t) + \varepsilon_{lt}, \tag{6}$$

where ε_{lt} is white noise. Based on Hubbard et al. (1995)'s estimation of the middle-education group, the ρ_l is set at 0.955 and the variance of ε_{lt} at 0.025. The AR(1) process is approximated using a three-state Markov chain.[8]

Medical expenditure shocks

To characterize medical expenditure risk, a four-state Markov chain is employed. Out-of-pocket medical expenditures are calculated by assuming that out-of-pocket costs represent 20% of total medical costs for each medical state (from Medical Expenditure Panel Survey (MEPS)), a percentage roughly equal to that of the U.S. population under 65 in 1996 and 1997. Table 1 describes the definitions of the four states. The transition probabilities are calculated using data obtained from Monheit (2003), who studied the persistence of medical expenditures. The transition probability matrix is the following:

$$P_X = \begin{bmatrix} 0.821 & 0.158 & 0.018 & 0.003 \\ 0.418 & 0.495 & 0.069 & 0.018 \\ 0.229 & 0.470 & 0.237 & 0.064 \\ 0.138 & 0.370 & 0.330 & 0.162 \end{bmatrix}.$$

The Social Insurance System

Consistent with Hubbard et al.'s (1995) estimation, the means-tested consumption floor $\underline{C}$ is set at 20% of average labor income such that the benchmark model can represent the size of the U.S. social insurance system.

Computation Methodology

The methodology used to approximate the steady state equilibrium is similar to that used by Aiyagari(1994), including value function iteration with linear interpolation of the asset states and the bisection method with adjusting upper/lower bounds for equilibrium price convergency.

[7] Aiyagari (1994) and Hubbard et al. (1995) employed a similar framework.

[8] See the procedure described in Tauchen (1986).

4 Quantitative Analysis

The model economy with $\underline{C}$ is set at 20% of average labor income as a benchmark. By doing so, the simulation results obtained using the benchmark model reflect a wealth distribution much closer to that of the U.S. distribution, as compared with basic Bewley models (Table 2).

4.1 Policy Experiments

Elimination of the Social Insurance System

If the social insurance system is entirely eliminated, all households and particularly lower-income households, can no longer rely on the distribution of social insurance benefits to secure their consumption, and must thus engage in precautionary savings behaviors to guard against uncertainty. Eliminating the social insurance system within a society that offers no other form of public or private assistance would lead households at the bottom of the income distribution to increase their asset holdings, and would thus decrease the Gini coefficient to .56. Table 3 presents the experimental results.

Social Insurance Reform

In contrast to the significant impact of eliminating the social security system, engaging in minor reform of the social insurance system would not have a significant impact on wealth distribution. When a 20% expansion (i.e., increasing $\underline{C}$ to 24% of average labor income) such that the social insurance system covers more households as well as a 20% contraction (i.e., decreasing $\underline{C}$ to 16% of average labor income) such that it covers fewer households were investigated, both reforms were found to have a negligible impact on wealth distribution. See the comparison in Table 4.

4.2 Robustness Tests

The discount factor process is constructed following several assumptions made in Krusell and Smith (1998). To test the robustness of the results, the same experiments were performed by fixing β at 0.96 for all agents, and thus eliminating the heterogeneity over β. Table 5 presents the results. Although the nature of the wealth distribution presented in the table, particular within the right tail, does not match the data, it reflects a very similar impact of the social insurance system on wealth distribution. Specifically, it indicates that entirely eliminating the social insurance system significantly decreases the

Gini coefficient whereas reforming the system, whether by expanding or contracting it, has no significant impact.

5 Concluding Remarks

This paper investigated the impact of the existence of an asset-based, means-tested social insurance system on wealth distribution. Previous studies have found that the existence of such a system in the United States is largely responsible for the low rate of savings and the lack of asset holdings among many Americans. This paper extended these studies by examining the extent to which the existence of a social insurance system can explain the nature of wealth distribution in the United States and determining whether reform of the system would affect wealth distribution. To conduct this investigation, a dynamic equilibrium (Bewley-type) model with heterogeneous agents was developed to characterize the current nature of wealth distribution in the United States. The results obtained by examining skill levels, uninsurable risks, time preferences, and the social insurance system (safety net), the primary factors in the wealth distribution (inequality) reflected in the model, and by performing counterfactual and policy experiments suggest that entirely eliminating the social insurance system would prompt households characterized by low levels of income and assets to increase their precautionary savings and would decrease the Gini coefficient from nearly .80 to less than .60. In contrast, the results indicate that merely reforming the social insurance system, whether by expanding or contracting it by 20%, would have no significant impact on wealth distribution.

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Table 1: States of Medical Expenditure

State	Low	Fair	High	Very High
Expenditure Range	Bottom 70%	70 – 95%	95 – 99%	top 1%
Out-of-Pocket Expenditure as of Average Income	0.20%	2.53%	13.18%	59.66%

Source: MEPS, 1996.

Table 2: Social Insurance and Wealth Inequality

		Percentage of Wealth Held by			
	Gini Index	Top 1%	Top 5%	Top 20%	Bottom 40%
U.S Data[1]	.78	29.6	53.6	79.5	1.4
Baseline Aiyagari[1]	.38	3.2	13.1	41.0	14.9
Benchmark Model	.80	22.4	52.0	83.6	0.1

Note: From Quadrini and Rios-Rull (1997).

Table 3: Impact of Social Insurance on Wealth Distribution

		Percentage of Wealth Held by			
	Gini Index	Top 1%	Top 5%	Top 20%	Bottom 40%
Benchmark Model ($\underline{C} = 20\%\bar{w}$)	.80	22.4	52.0	83.6	0.1
No Social Insurance					
Some Private Assistance ($\underline{C} = 5\%\bar{w}$)	.75	20.5	47.7	77.5	2.3
Little Private Assistance ($\underline{C} = 1\%\bar{w}$)	.70	19.0	44.5	73.4	4.2
No Private Assistance	.56	14.2	33.8	59.2	9.1

Notes: $\bar{w}$ represents the mean wage; the values of $\underline{C}$ in economies without a social insurance system represent levels of private or charity assistance.

Table 4: Impact of Social Insurance Reform

		Percentage of Wealth Held by			
	Gini Index	Top 1%	Top 5%	Top 20%	Bottom 40%
Benchmark Model	.80	22.4	52.0	83.6	0.1
20% Expansion	.81	22.5	52.3	83.8	0.09
20% Contraction	.79	22.0	51.2	82.5	0.7

Notes: a 20% expansion represents a 20% increase in the consumption floor; $\underline{C} = 0.24\bar{w}$; a 20% contraction represents $\underline{C} = 0.16\bar{w}$.

Table 5: Robustness Tests: Economies without β Heterogeneity

	Gini Index	Percentage of Wealth Held by Top 1%	Top 5%	Top 20%	Bottom 40%
With Social Insurance[1]	.616	6.9	26.0	62.7	3.8
With a 20% Expansion	.623	7.0	26.3	63.4	3.6
With a 20% Reduction	.607	6.8	25.7	61.8	4.0
With no Social Insurance	.383	4.6	17.1	42.8	14.7

Note: $\underline{C} = 0.20\bar{w}$, as in the benchmark model.