Health Insurance Reform: The impact of a Medicare Buy-In

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Motivation

Table: Insurance coverage in the US (2008)

	Percentage uninsured		
Age	19–34	35–54	55–64
%	28	18	13
	Unhealthy among the uninsured		
%	7	17	26

Source: The Henry J. Kaiser Family Foundation.

Motivation

- Health care reform: how do we reduce the number of uninsured? Will the reform improve welfare?
- A universal health insurance law has been passed – however, still controversial.
- Possibilities:
  - Public option – More affordable for some than individual private insurance since allows for pooling.
  - Single payer – "Medicare for all"
  - Individual mandate.
  - All are controversial in the US.

What we do

- We consider a modest version of a public option: a Medicare buy-in optional for people 55-64.
  - Potentially a political compromise given opposition to universal health insurance.
  - Idea has been proposed by President Clinton in the early 1990's.
- Compare with current system of individual health plans (IHI) and group insurance provided through employer (EHI).
- Compare with individual mandate

Questions & Methodology

- Issues:
  - Does Medicare buy-in actually reduce the number of uninsured? Or, does adverse selection lead to no one purchasing this insurance?
  - What subsidy is required to get all 55-64 year olds to be insured? How much would this cost?
  - Does this insurance affect labor participation since individuals can rely less on EHI?
  - How does welfare compare across different arrangements?
- Method of Analysis:
  - Construct a general equilibrium life-cycle model with endogenous health insurance choice
  - Perform quantitative policy experiments

Related Literature

- Auerbach and Kotlikoff (1987) and growing literature - calibrated general equilibrium life cycle model to study dynamic fiscal policy and social insurance programs.
- Attansio, Kitao and Violante (2008) - closest to us, evaluate alternative funding schemes for Medicare given projected aging of population.
- Jeske and Kitao (2009) - study adverse selection and welfare improving role of tax deductible premiums for group insurance programs.

Model Economy

- A general equilibrium life-cycle model with
  1. Endogenous demand for private health insurance
  2. Endogenous labor supply (indivisible)
  3. Market incompleteness due to a borrowing constraint and lack of annuity markets.
  4. Uncertainty due to
     - income shocks
     - health status
     - medical expenditure shocks – depends on health status and age
     - length of life – survival probability depends on health status and age

Model Economy: Demographics

- A continuum of finitely-lived households
- Overlapping generations of individuals of age $j = 1, 2, ..., J$, where $j = 1$ corresponds to age 21 and $J = 80$ corresponds to age 100.
- Lifespan is uncertain
  1. $\rho_{j,h}$ – probability of an individual of age j with health status h surviving to age $j + 1$.
  2. $h \in \{h_g, h_b\}$ denotes good or bad health status
  3. $\rho_{J,h} = 0$

Endowment and Income

- Individuals start life with zero assets ($j = 1$).
- Individuals endowed with one unit of time each period.
  - Indivisible labor: work $\bar{n}$ or zero
  - If work, earn $wz\bar{n}$,

    where w: market wage (determined in equilibrium)

    z: idiosyncratic labor productivity (random shock)
- Idiosyncratic labor productivity shock $z \in Z$,
  where $Z = \{z_1, z_2, ..., z_L\}$
  - evolves following an age-dependent first-order Markov process

Preferences

$$E\left[\sum_{j=1}^{J}\beta^{j-1}\left(\prod_{t=1}^{j-1}\rho_{t,h}\right)u\left(c_j,n_j\right)\right],$$

where

$$u\left(c,1-n\right)=\frac{\left[c^{\phi}\left(1-n\right)^{1-\phi}\right]^{1-\mu}}{1-\mu}$$

Health Status and Medical Expenditure Uncertainty

- Health status $h \in \{h_g, h_b\}$
  - Two state Markov chain with a transition matrix $\pi_j^h(h', h)$
- Medical expenditure shock $x \in X_{j,h}$
  - $X_{j,h} = \{x_{j,h}^1, x_{j,h}^2, ..., x_{j,h}^m\}$
  - probability of expenditure x, $\pi_j^x(x|h')$, depends on age and health status revealed mid period.

Employment-based and Individual Health Insurance

1. Employment-based Health Insurance (EHI)
   - offered by employers to employees, $e = 1$ if EHI offered; $e = 0$ if not.
   - premium does not depend on age or health status
   - premium q^e is tax free income to employees.
2. Individual Health Insurance(IHI)
   - Everyone has access to IHI
   - Price is a function of individual specific characteristics
   - The premium $q^i(j, h)$ paid before this period's medical expenditure x is realized.

Government: Tax Revenues

1. Consumption tax: τ_c
2. Income taxes:
   - 2.1 Labor income tax, τ_l
   - 2.2 Capital income tax, τ_k

Government Funded Social Programs

- Medicare
  - public health insurance for the elderly
  - eligibility age $J^r = 45$ (corresponds to age 65)
  - covers a fraction ω_m of medical expenditures
  - financed by government revenue (88%) and a Medicare premium q^m (12%)
- Social Security
  - provides the elderly with a benefit s at the eligibility age of $J^r = 45$ (corresponds to age 65)
- Welfare
  - guarantees a minimum level of consumption $\underline{c}$ for all households
  - Transfer T is made such that a minimum level of consumption $\underline{c}$ is affordable

Government Budget Constraint

- Government budget constraint

$$\int \{\tau_l[(w\eta_j zn - q^e \cdot e) + s] + \tau_k r\,(a+b) + \tau_c c + q^m\} d\Phi$$
$$= \int [T + s + \omega_m \cdot x] d\Phi + G,$$

  where Φ is the distribution of population over state variables.

- G is residual

Supply Side

- Production Technology

$$\begin{aligned} Y &= F(K, L) \\ &= AK^{\theta}L^{1-\theta}, \end{aligned}$$

where Y denotes aggregate output, K aggregate capital stock, L aggregate effective labour, and θ the capital income share.

Agent's Problem

- Time line for decisions within a period
  - Stage 1: Employment and health insurance are chosen given (e, z, a, h, j).
  - Stage 2: Consumption and savings are chosen after health status and medical expenditure, $(h',\ x)$, are realized.

Agent's Problem

State vector $s = (a, h, z, e, j)$

$$V(s) = \max_{n \in \{0, \bar{n}\},\ \iota_{IHI}} \sum_{(h', x)} \pi_j^x(x|h') \pi_j^h(h', h) \left\{ \max_{c,\ a'} \ u(c, n) + \right.$$
$$\left. \beta \rho_{j,h'} \sum_{(z', e')} P^j_{(z', e')|(z,e)} V(s') \right\}$$

subject to

$$(1 + \tau_c)c + a' + q^i(j, h) i_{IHI} = W + T$$
$$W \equiv (1 - \tau_l)(wzn - q^e * \iota_{EHI}) + (1 + (1 - \tau_k) r)(a + b) - (1 - \hat{\omega}) x$$
$$T = \max\{0,\ (1 + \tau_c)\underline{c} - W\}$$

Agent's Problem

$$\hat{\omega} = \begin{cases} \omega & \text{if } \iota_{EHI} = 1 \text{ or } \iota_{IHI} = 1 \\ 0 & \text{otherwise} \end{cases}$$

$$\iota_{EHI} = \begin{cases} 1 & \text{if } e = 1 \text{ and } n = \bar{n} \\ 0 & \text{otherwise} \end{cases}$$

$$a' \geq 0; \quad c \geq 0.$$

Old Agent's Problem

$$V(j,a,h) = \max_{c,\ a'} \{u(c,0) + \beta \rho_{j,h'} V(j+1, a', h') \,|h', x\}$$

subject to

$$(1+\tau_c)c + a' = W + T$$

$$W \equiv s + (1 + (1-\tau_k)\, r)\,(a+b) - (1-\omega_m)x - q^m$$

$$T = \max\{0,\ (1+\tau_c)\underline{c} - W\}$$

$$a' \geq 0; \quad c \geq 0.$$

Equilibrium Conditions

$$L = \int n(s) z \eta_j d\Phi$$

$$K = \int (a + b) d\Phi$$

where

$$b = \int \frac{(1 - \rho_{j-1,h})a}{1 + g} d\Phi$$

Equilibrium Conditions

$$q^i\,(j,h) = \psi \sum_{(h',x)} \pi_j^x(x|h')\pi_j^h(h',h)\omega\ x$$

$$q^e = \int \sum_{(h',x)} \pi_j^x(x|h')\pi_j^h(h',h)\omega\ x\ \iota_{EHI}\ d\Phi$$

$$q^m = (1-\sigma_m)\int \sum_{(h',x)} \pi_j^x(x|h')\pi_j^h(h',h)\omega_m\ x\ (\iota_{j\geq J^r})d\Phi$$

where ψ is the markup for IHI and Φ is the equilibrium distribution of population over state variables.

Medicare Buy-in

$$V(s) = \max_{n\in\{0,\bar{n}\},\ \iota_{IHI},\ \iota_{MB}} \sum_{(h',x)} \pi_j^x(x|h')\pi_j^h(h',h)\left\{ \max_{c,\ a'} \ u(c,n)+ \right.$$

$$\left. \beta\rho_{j,h'} \sum_{(z',e')} P^j_{(z',e')|(z,e)} V(s') \right\}$$

subject to

$$(1+\tau_c)c + a' + q^i(j,h)\ \dot{}\iota_{IHI} + q^{mb}(j)\ \dot{}\iota_{MB} = W + T$$

$$W \equiv (1-\tau_l)(w\eta_j z n - q^e i_{EHI}) + (1+(1-\tau_k)r)(a+b) - (1-\hat{\omega})x$$

$$T = \max\{0,\ (1+\tau_c)\underline{c} - W\}$$

Medicare Buy-in

$$\hat{\omega} = \begin{cases} \omega & \text{if } \iota_{EHI} = 1, \text{ or } \iota_{IHI} = 1 \\ \omega_b & \text{if } \iota_{MB} = 1 \\ 0 & \text{otherwise} \end{cases}$$

$$\iota_{EHI} = \begin{cases} 1 & \text{if } e = 1 \text{ and } n = \bar{n} \\ 0 & \text{otherwise} \end{cases}$$

$$a' \geq 0; \quad c \geq 0;$$

Medicare Buy-in–Insurance premium

$$q^b(j) = (1-\sigma_b)\int \sum_{(h',x)} \pi_j^x(x|h')\pi_j^h(h',h)\omega_b \; x \; \iota_{MB} \; \iota_j d\Phi$$

where σ_b is the government subsidy rate.

If the Medicare buy-in is not priced by age:

$$q^b = (1-\sigma_b)\int \sum_{(h',x)} \pi_j^x(x|h')\pi_j^h(h',h)\omega_b x \iota_{MB} d\Phi$$

Calibration

- Medical Expenditure Panel Survey (MEPS) is used for our calibration of income fluctuations, health status transition, and medical expenditures.
  - We use eight two-year panels from 1999/2000 to 2006/2007.
  - All values are transformed to 2007 dollars.

Labor Productivity Shocks z and EHI offer e

- Specify 5 earning groups from whole sample with equal size

$$Z = \{0.05,\ 0.43,\ 0.79,\ 1.23,\ 2.50\}$$

  expressed as fraction of average earnings in 2007 dollars ($\$30,678$).
- e, an indicator of EHI offer, is either 0 or 1.
- Calibrate transition probabilities of z and e jointly – a 10 by 10 matrix for each 5-year age group.

EHI offer and Labor Productivity Shocks z_t

Table: Joint transition matrices of earnings and EHI offer by age group 20-24

Age 20-24	$e'=1$ $z'=z_1$	$e'=1$ $z'=z_2$	$e'=1$ $z'=z_3$	$e'=1$ $z'=z_4$	$e'=1$ $z'=z_5$	$e'=0$ $z'=z_1$	$e'=0$ $z'=z_2$
$e=1$ $z=z_1$	0.08	0.24	0.25	0.09	0.07	0.10	0.11
$e=1$ $z=z_2$	0.04	0.38	0.24	0.09	0.02	0.07	0.11
$e=1$ $z=z_3$	0.01	0.11	0.48	0.24	0.03	0.02	0.04
$e=1$ $z=z_4$	0.01	0.04	0.16	0.58	0.13	0.01	0.01
$e=1$ $z=z_5$	0.01	0.02	0.03	0.19	0.63	0.00	0.00
$e=0$ $z=z_1$	0.01	0.04	0.02	0.02	0.00	0.59	0.24
$e=0$ $z=z_2$	0.01	0.06	0.05	0.02	0.01	0.22	0.47
$e=0$ $z=z_3$	0.01	0.04	0.07	0.05	0.01	0.09	0.26
$e=0$ $z=z_4$	0.01	0.02	0.04	0.15	0.06	0.08	0.14
$e=0$ $z=z_5$	0.00	0.00	0.04	0.17	0.00	0.04	0.12

Health Status and Medical Expenditure Shocks x_t

- Self-reported health status in MEPS, from 1 to 5 representing excellent, very good, good, fair and poor health.
- Mapping to health status in model: Scores from 1 to 3, $h = g$; scores from 4 to 5, $h = b$.
- To capture the long-tail in the distribution of health expenditures, we use three expenditure states with uneven measures (top 5%, 35% and 60%) for each age and health status.

Health Status and Medical Expenditure Shocks x_t

Table: Health expenditures from MEPS (2007 dollars)

		Medical expenditure		
Age	Health	60%	35%	5%
20-29	Good	62	1,353	10,870
	Bad	158	3,132	20,560
30-39	Good	110	1,670	12,259
	Bad	252	4,108	33,161
40-49	Good	214	2,285	14,394
	Bad	548	6,082	40,926
50-64	Good	521	3,863	24,336
	Bad	1,225	9,645	53,103
65-	Good	1,258	8,118	47,871
	Bad	2,597	15,540	63,096

Summary of Parameter Values

Parameters	*Notations*	*Values*	*Target/Note*
Discount Factor	β	0.974	K/Y ratio $= 2.5$
Risk Aversion	μ	3	
Depreciation Rate	δ	0.08	
Labor Parameter	ϕ	0.7	Agg. labor $= 0.34$
Capital Income Share	θ	0.36	
IHI premium Markup	ψ	0.08	PHI take up $= 0.64$
Social assistance	$\underline{c}$	24% of avg earnings	Jeske and Kitao (2009)
Social security benefit	s	45% of avg earnings	

Summary of Parameter Values (cont'd)

Parameters	*Notations*	*Values*	*Target/Note*
PHI coverage rate	ω	0.70	AKV (2008)
Medicare coverage rate	ω_m	0.50	AKV (2008)
Medicare Buy-in coverage rate	ω_{mb}	0.70	
Consumption tax rate	τ_c	0.05	
Capital tax rate	τ_k	0.40	
Labor tax rate	τ_l	0.35	

Quantitative Analysis

- Benchmark economy
- Policy experiments
  1. Mandate
  2. Medicare buy-in
- Policy implications
  1. Insurance coverage
  2. Tax burden
  3. Labor market
  4. Welfare

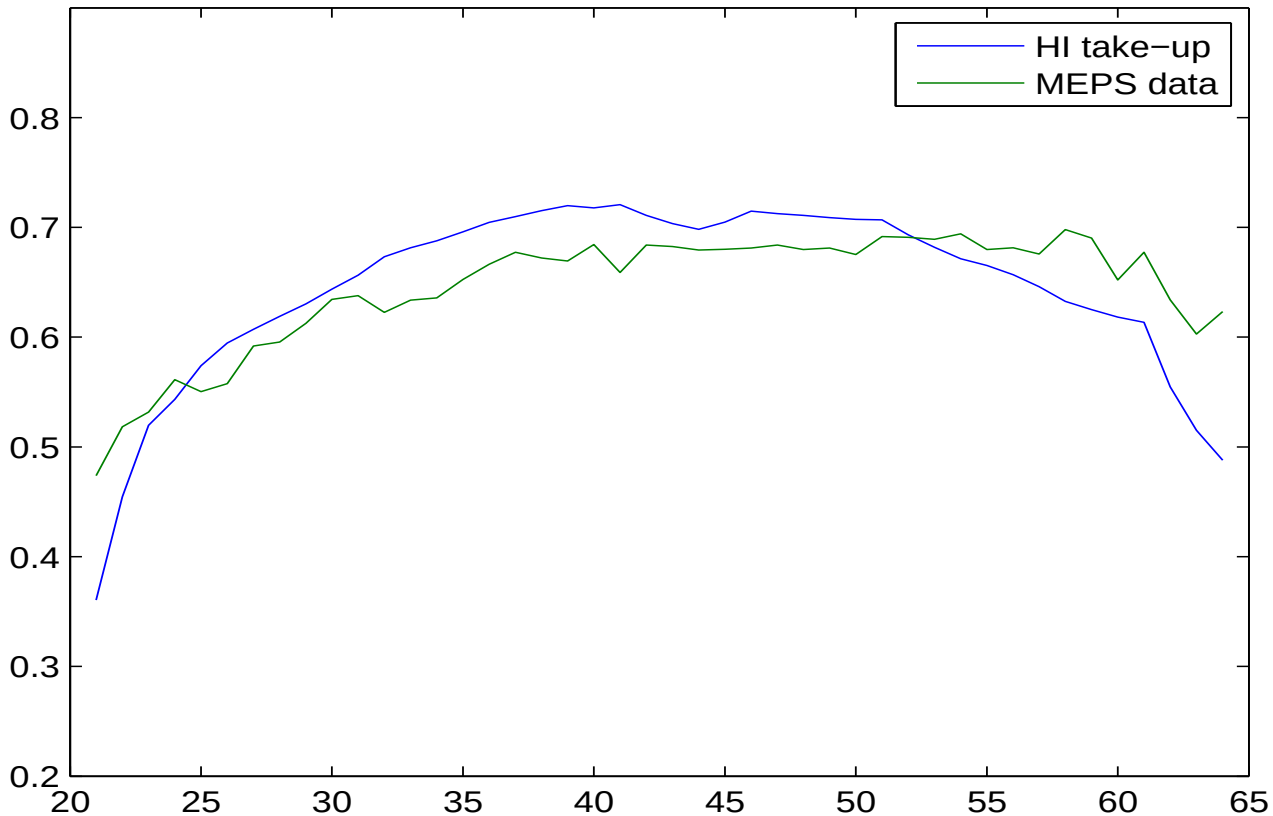
Benchmark economy

Table: Benchmark properties

	Working-age population				
	Total PHI coverage	EHI take-up	IHI take-up	Labor hours	Capital-output ratio
Model Bench	0.64	0.54	0.10	0.34	2.5
MEPS data	0.64	0.51	0.13	–	–

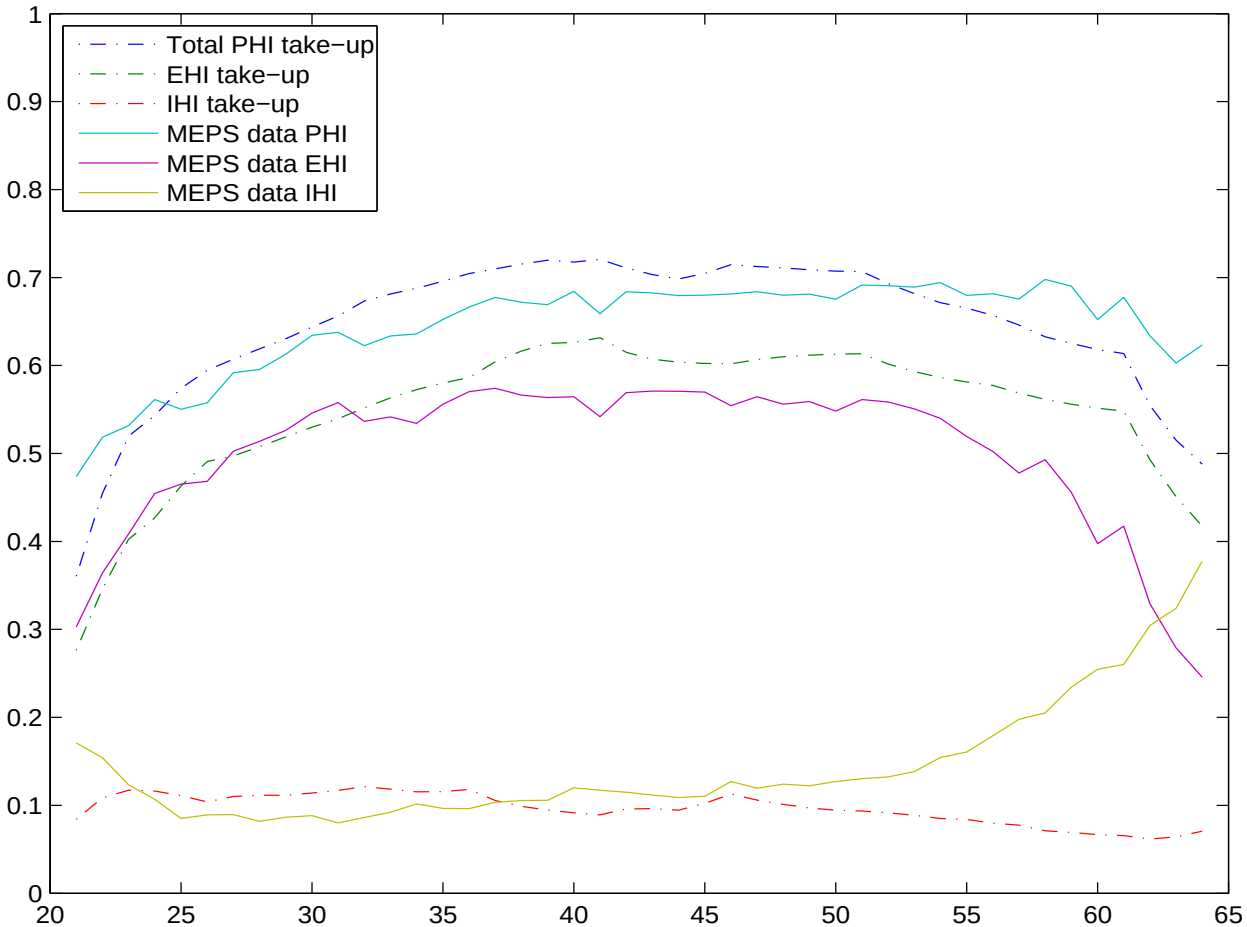
Benchmark economy (cont'd)

Figure 1: Age profile of HI take-up ratio (Benchmark)



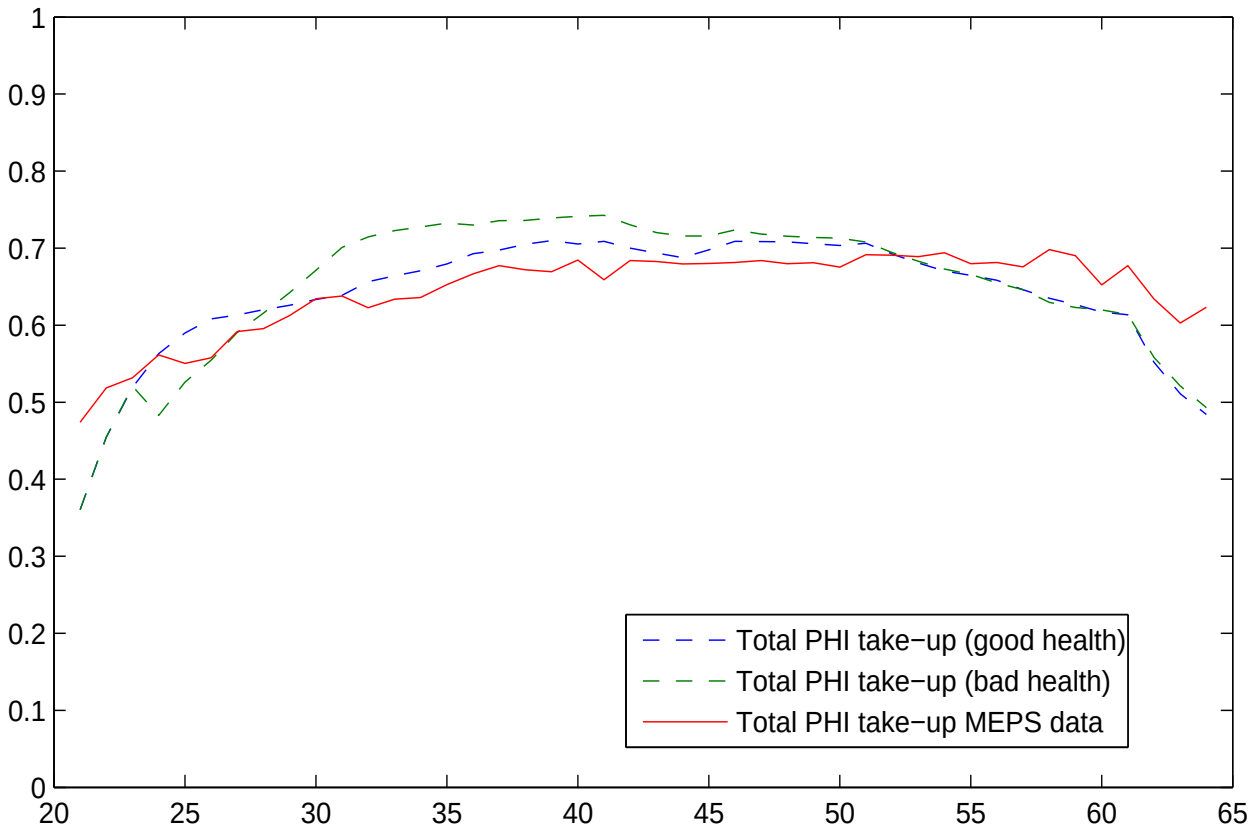
Benchmark economy (cont'd)

Figure: PHI, EHI and IHI take-up ratios (Benchmark)



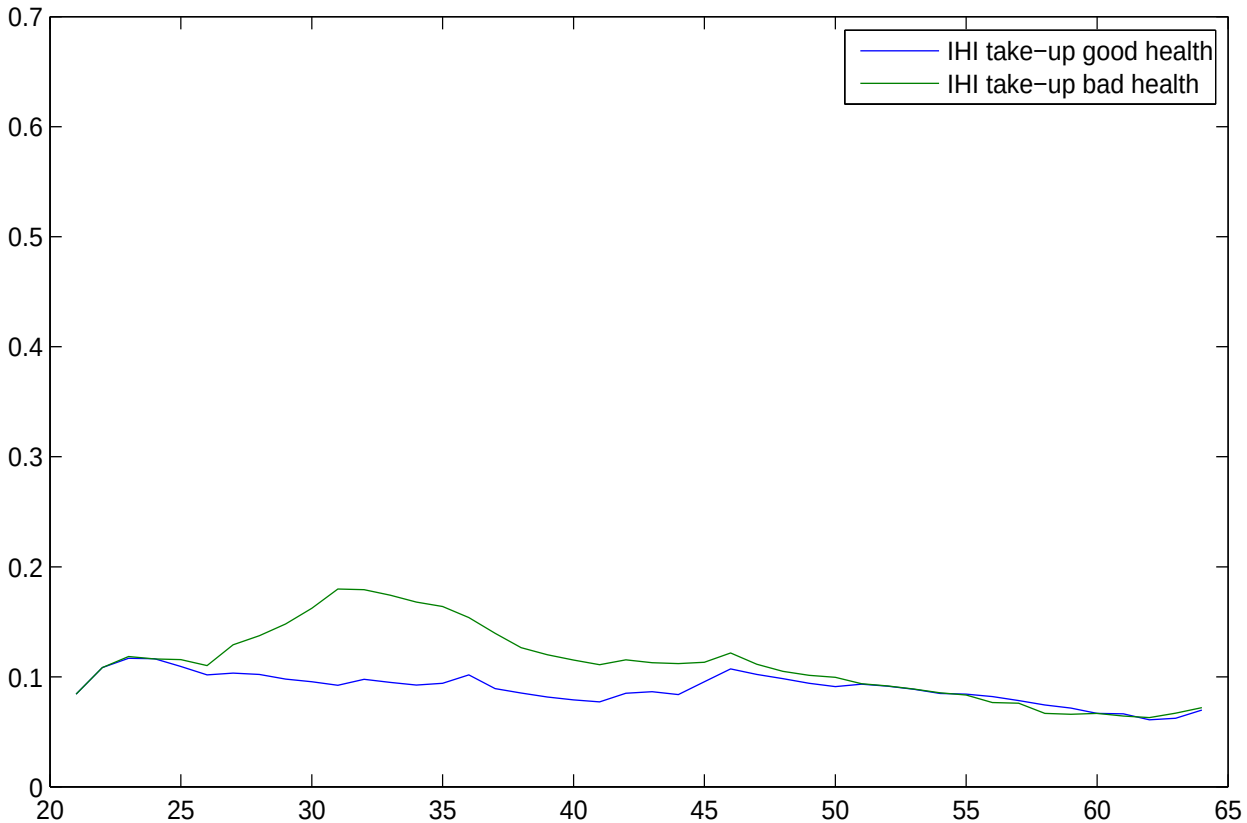
Benchmark economy (cont'd)

Figure : Total PHI take-up ratio by health status (Benchmark)



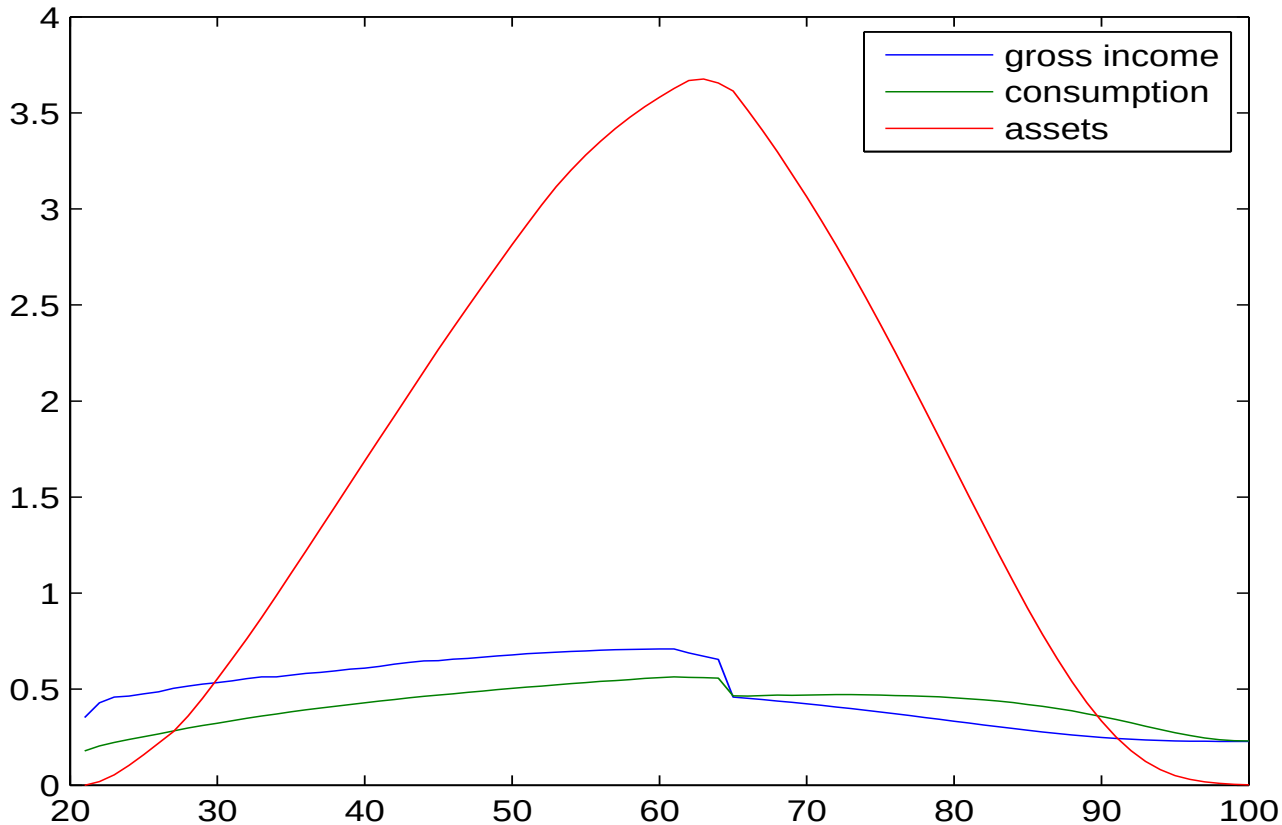
Benchmark economy (cont'd)

Figure: IHI purchase by health status (Benchmark)



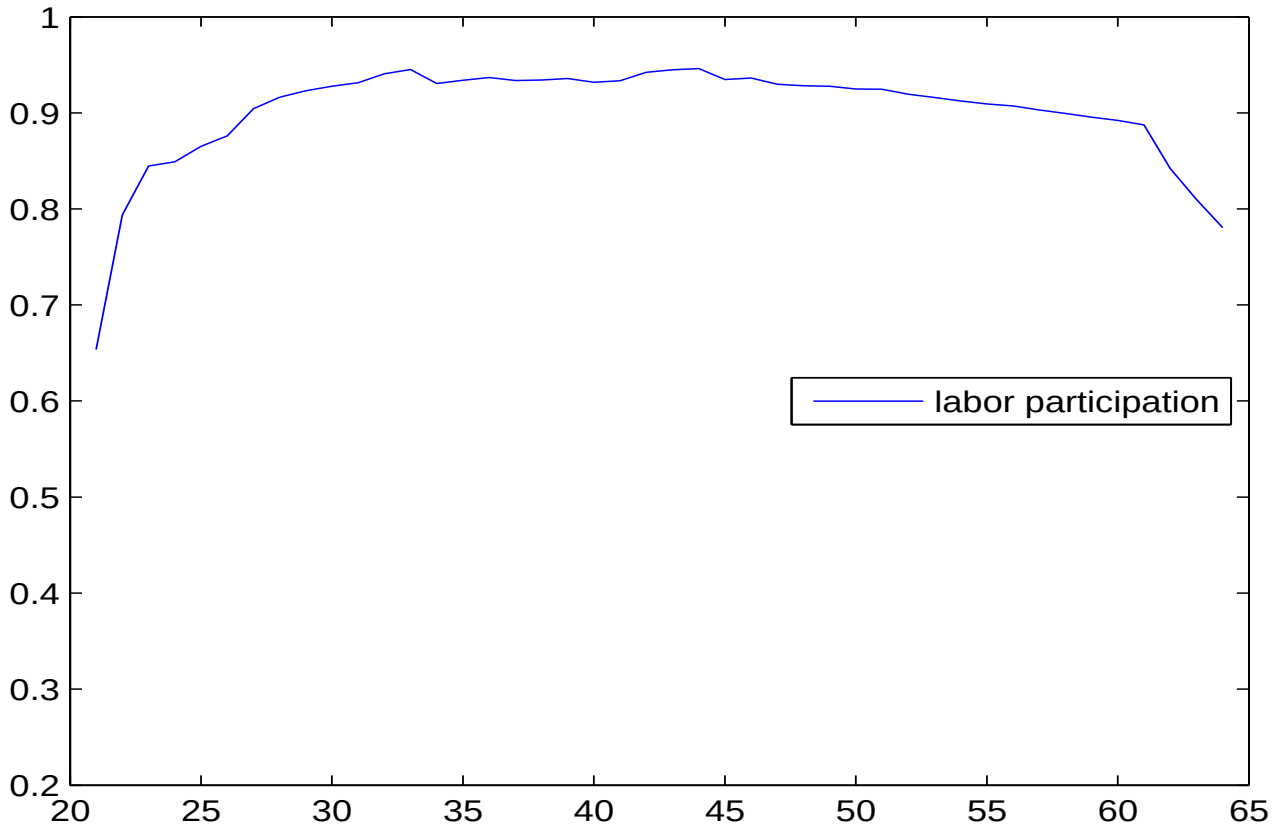
Benchmark economy (cont'd)

Figure 2: Income, Consumption and Asset Holding (Benchmark)



Benchmark economy (cont'd)

Figure 3: Labor Participation (Benchmark)



Policy Experiments

- Mandate – No government financing
  - 1. A mandate without new health insurance options
  - 2. A mandate with voluntary Medicare Buy-in for age 55-64
    - adverse selection problem
    - results same as the first policy
  - 3. With mandatory Medicare Buy-in for age 55-64
- Voluntary Medicare Buy-in – subsidy required
  - 1. No price discrimination with various subsidy rates
  - 2. Priced by age with various subsidy rates

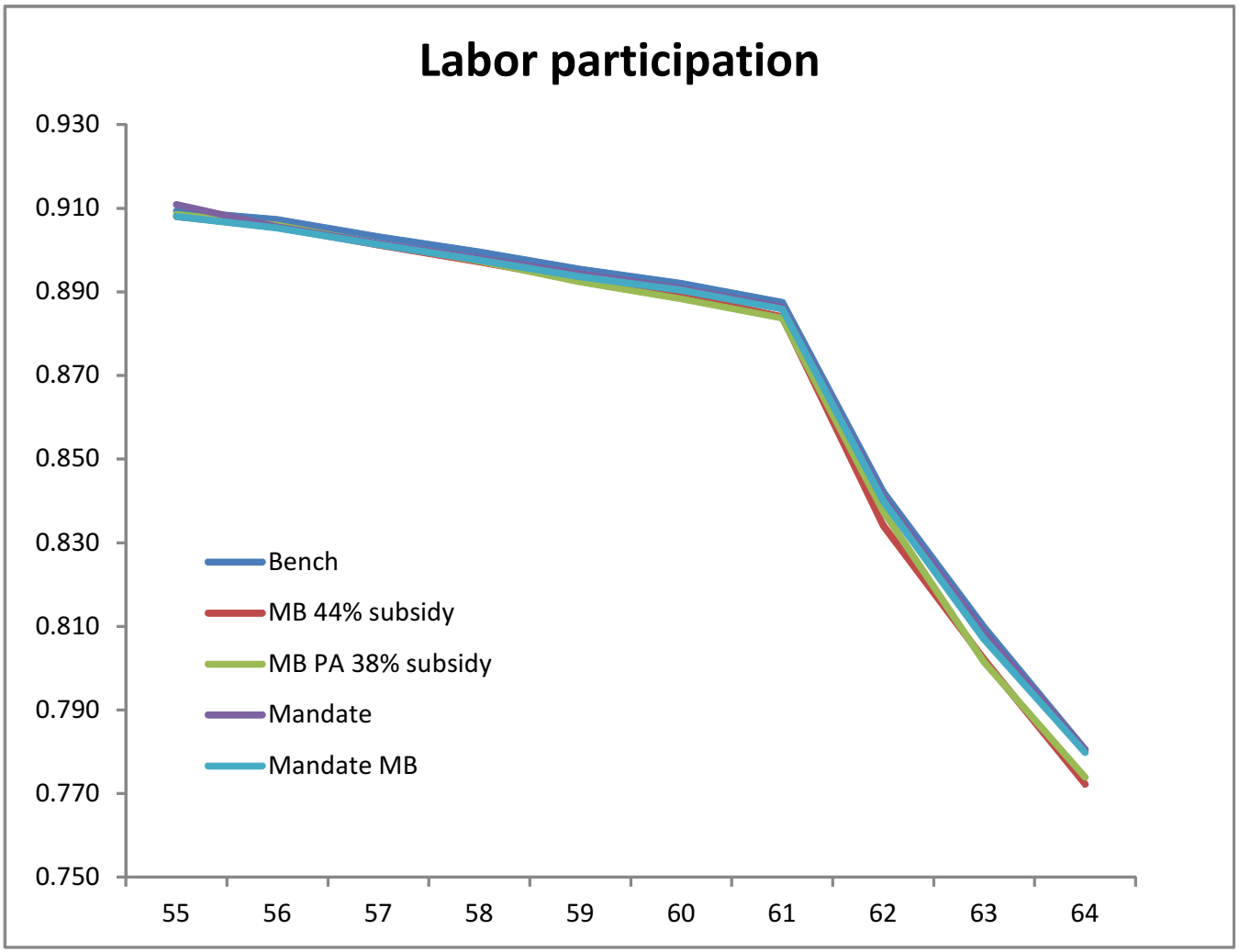
Policy implication: insurance coverage and tax burden

Table: Insurance coverage and tax burden

Reform policy	MB take-up ratio without EHI offer	MB subsidy to GDP ratio	Labor tax rate
Mandate	–	–	35%
Mandate MB	100%	0%	35%
MB (10% S)	28.5%	0.009%	35.015%
MB (20% S)	44.6%	0.028%	35.048%
MB (44% S)	100%	0.100%	35.160%
MB PA (10% S)	44.0%	0.014%	35.025%
MB PA (20% S)	44.8%	0.028%	35.047%
MB PA (38% S)	100%	0.088%	35.140%

Policy implication: Impact on labor market

Figure 6: Labor participation



Policy implication: Welfare

Table: Welfare comparison (CEV from Bench)

			Without EHI offer			
	New-born	All	Young good H	Young bad H	Mid age good H	Mid age bad H
Mandate						
Mandate	-0.141%	-0.112%	-0.139%	-0.092%	-0.301%	-0.119%
Mandate MB	-0.136%	-0.082%	-0.122%	-0.065%	-0.359%	0.251%
Voluntary MB with subsidy						
MB (44% S)	-0.012%	0.010%	-0.051%	-0.014%	0.349%	0.919%
MB PA (38% S)	-0.122%	0.013%	-0.041%	-0.006%	0.277%	0.850%

Note: Young – age<55; Mid age – 55-64.

Conclusion

- Without subsidy or mandate, adverse selection eliminates market for Medicare Buy-in.
- Even with mandate, adverse selection eliminates market for Medicare Buy-in if individuals can purchase IHI.
- To get 100 percent of 55-64 to purchase insurance requires 44% subsidy of Medicare Buy-in premium if all participants pay the same.
  - The subsidy is reduced to 38% if price differently by age.

Conclusion

- A subsidized Medicare Buy-in does not cause significant reduction in employment.
- All policies considered reduce lifetime expected welfare of an individual at the beginning of life.
- Mandate to purchase Medicare Buy-in for those without EHI improves welfare for those 55-64 and in bad health.
- Subsidized Medicare Buy-in improves average welfare.