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

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GRIPS
Motivation

- Universal health insurance is currently not available – Private health insurance provides primary coverage
- Individual plans are expensive to those with poor health

Table: Insurance coverage (2008)

<table>
<thead>
<tr>
<th>Age</th>
<th>19–34</th>
<th>35–54</th>
<th>55–64</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>28</td>
<td>18</td>
<td>13</td>
</tr>
</tbody>
</table>

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?
- The universal health insurance law has been passed.
- Possibilities:
  - Public option – More affordable alternative 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 one 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?
  - How much subsidy is required to get all 55-64 year olds to be insured?
  - 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.
Road Map

1. Introduction

2. Life-cycle Model

3. Calibration

4. Quantitative analysis

5. Conclusion
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
  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. \( \rho_{j,h} \) – survival probability of an individual of age \( j \) and with health status \( h \).
  2. \( h \in \{h_g, h_b\} \) denotes good or bad health status
  3. \( \rho_{J,h} = 0 \)
Endowment, Income and Preferences

- 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 $w\eta_j z\bar{n}$,
    where $w$: market wage (determined in equilibrium)
    $\eta_j$: age-specific productivity (given parameter)
    $z$: idiosyncratic labor productivity (random shock)
- Idiosyncratic labor productivity shock $z \in Z$,
  where $Z = \{z_1, z_2, ..., z_L\}$
  - evolves following first-order Markov process
- Preferences

$$u(c, 1-n) = \frac{\left[ c^\phi (1-n)^{1-\phi} \right]^{1-\mu}}{1-\mu}$$
Health Status and Medical Expenditure Uncertainty

- Health status $h \in \{h_g, h_b\}$
  1. evolves according to the first order Markov chain
  2. with a transition matrix $\pi^h_{j} (h', h)$

- Medical expenditure shock $x \in X_{j,h}$
  1. $X_{j,h} = \{x_{j,h}^1, x_{j,h}^2, \ldots, x_{j,h}^m\}$
  2. probability of expenditure $x$, $\pi^x_{j,h}$, depends on age and health status
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 and health status (group health insurance)
   - premium $q_e$ is untaxed income to employees.

2. Individual Health Insurance (IHI)
   - Everyone has access to IHI
   - Price is a function of individual specific characteristics
   - The premium $q_i(j, h, x)$ paid before this period’s medical expenditure $x'$ is realized.
Government: Tax Revenues

1. Consumption tax: $\tau_c$

2. Income taxes:
   2.1 Labor income tax, $\tau_l$
   2.2 Capital income tax, $\tau_k$
Government Funded Social Programs

- Medicare
  - public health insurance for the elderly
  - eligibility age $j^{med} = 45$ (corresponds to age 65)
  - covers a fraction $\omega_o (x)$ of medical expenditures
  - financed by government revenue (88%) and Medicare premium $q_{med}$ (12%)

- Social Security
  - provides the elderly with a benefit $ss$ at the eligibility age of $j^{ss} = 45$ (corresponds to age 65)

- Welfare
  - guarantees a minimum level of consumption $c$ for all households
  - Transfer $T$ is made such that a minimum level of consumption $c$ is affordable
Government Budget Constraint

- Government budget constraint

\[
\int \{ \tau_l [(w\eta_j zn - qe \cdot e) + ss] + \tau_k r (a + b) + \tau_c c \} \, d\Phi
\]

\[
= \int [T + ss + \omega_o \cdot x'] \, d\Phi + G
\]

- $G$ is residual
Supply Side

- Production Technology

\[ Y = F(K, L) = AK^\theta L^{1-\theta}, \]

where \( Y \) denotes aggregate output, \( K \) aggregate capital stock, \( L \) aggregate effective labour, and \( \theta \) the capital income share.
Agent’s Problem

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

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

\[
V(s) = \max_{n,IH} \left\{ \sum_{(h',x')} P(h',x') \left( \max_{c,a'} \left\{ u(c,n) + \beta \rho_j h \sum_{(z',e')} P(z',e') V(s') \right\} \right) \right\}
\]

subject to

\[
(1 + \tau_c)c + a' + \hat{q} = Wel + T
\]

\[
Wel \equiv (1 - \tau_l) \left( w \eta_j z n - q_e \cdot e \right) + \hat{s} s + (1 + (1 - \tau_k) r) (a + b) - (1 - \hat{\omega}) x
\]

\[
T = \max\{0, (1 + \tau_c)\underline{c} - Wel\}
\]
Agent’s Problem

\[ \hat{q} = \begin{cases} 
q_i(j, h, x) & \text{if } i_{IHI} = 1 \text{ and } i_{EHI} = 0 \text{ and } j < j^{med} \\
q_{med} & \text{if } j \geq j^{med} \\
0 & \text{otherwise}
\end{cases} \] (4)

\[ \hat{\omega} = \begin{cases} 
\omega_e(x') & \text{if } e = 1, i_{EHI} = 1, \text{ and } n = \bar{n} \\
\omega_i(x') & \text{if } i_{IHI} = 1, i_{EHI} = 0 \text{ and } j < j^{med} \\
\omega_o(x') & \text{if } j \geq j^{med} \\
0 & \text{otherwise}
\end{cases} \] (5)

\[ \hat{s}_s = \begin{cases} 
ss & \text{if } j \geq j^{ss} \text{ and } n = 0 \\
0 & \text{otherwise}
\end{cases} \] (6)

\[ n = \begin{cases} 
\{0, \bar{n}\} & \text{if } j < j^{r} \\
0 & \text{if } j \geq j^{r}
\end{cases} \] (7)

\[ i_{EHI} = \begin{cases} 
1 & \text{if } e = 1 \text{ and } n = \bar{n} \\
0 & \text{otherwise}
\end{cases} \] (8)
With a Medicare Buy-In

\[
V(s) = \max_{n,i_{IHI},i_{MB}} \left\{ \sum_{(h',x')} P(h',x') \max_{c,a'} \left\{ u(c,n) + \beta \rho j,h \sum_{(z',e')} P(z',e') \right\} \right\} \]

subject to (1), (2), (3), (6), (7), (8), (9), and

\[
\hat{q} = \begin{cases} 
q_i(j,h,x) & \text{if } i_{IHI} = 1 \text{ and } i_{EHI} = 0 \text{ and } j < j^{med} \\
q_{med} & \text{if } j \geq j^{med} \\
q_{mb}(j) & \text{if } i_{MB} = 1 \\
0 & \text{otherwise}
\end{cases}
\]

(10)
Agent’s Problem

\( \hat{\omega} = \begin{cases} 
\omega_e(x') & \text{if } e = 1, \ i_{EHI} = 1, \text{ and } n = \bar{n} \\
\omega_i(x') & \text{if } i_{IHI} = 1, \ i_{EHI} = 0 \text{ and } j < j^{med} \\
\omega_o(x') & \text{if } j \geq j^{med} \\
\omega_{mb}(x') & \text{if } i_{MB} = 1 \\
0 & \text{otherwise} 
\end{cases} \)  

(11)

\( i_{MB} = \begin{cases} 
\{0, 1\} & \text{if } j^{mb} \leq j < j^{med} \\
0 & \text{otherwise} 
\end{cases} \)  

(12)
Calibration

- Medical Expenditure Panel Survey (MEPS) is used for our calibration of income fluctuations, health status transition, and medical expenditures.


- All values are transformed to 2007 price level.
Labor Productivity Shocks $z$ and EHI offer $e$

- Specify 5 earning groups from whole sample with equal size
  \[ Z = \{0.05, 0.43, 0.79, 1.23, 2.50\} \]
  as of average earnings in in 2007 dollars($30,678$).
- $e$, an indicator of EHI offer, is either 0 or 1.
- Calibrate the transition probabilities of $z$ and $e$ jointly – a 10 by 10 matrix for each 5-year age group.
Health Status and Medical Expenditure Shocks $x_t$

- Self-reported health status in MEPS, from 1 to 5 representing health status excellent, very good, good, fair and poor.
- Two health statuses, good and bad, in the model: if an individual’s health score was above 3, the individual is clarified to bad health; otherwise, good health.
- 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)

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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Notations</th>
<th>Values</th>
<th>Target/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount Factor</td>
<td>$\beta$</td>
<td>0.974</td>
<td>$K/Y$ ratio $= 2.5$</td>
</tr>
<tr>
<td>Risk Aversion</td>
<td>$\mu$</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Depreciation Rate</td>
<td>$\delta$</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Labor Parameter</td>
<td>$\phi$</td>
<td>0.7</td>
<td>Agg. labor $= 0.34$</td>
</tr>
<tr>
<td>Capital Income Share</td>
<td>$\theta$</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>IHI premium Markup</td>
<td>$\psi$</td>
<td>0.08</td>
<td>PHI take up $= 0.64$</td>
</tr>
<tr>
<td>Social assistance</td>
<td>$c$</td>
<td>24% of avg earnings</td>
<td>Jeske and Kitao (2009)</td>
</tr>
<tr>
<td>Social security benefit</td>
<td>$ss$</td>
<td>45% of avg earnings</td>
<td></td>
</tr>
</tbody>
</table>
## Summary of Parameter Values (cont’d)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Notations</th>
<th>Values</th>
<th>Target/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI exp. coverage rate</td>
<td>$\omega_e, \omega_i$</td>
<td>0.70</td>
<td>AKV (2008)</td>
</tr>
<tr>
<td>Medicare exp. coverage rate</td>
<td>$\omega_o$</td>
<td>0.50</td>
<td>AKV (2008)</td>
</tr>
<tr>
<td>Cons. tax rate</td>
<td>$\tau_c$</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Capital tax rate</td>
<td>$\tau_k$</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>Labor tax rate</td>
<td>$\tau_l$</td>
<td>0.35</td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Working-age population</th>
<th>Model Bench</th>
<th>MEPS data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PHI coverage</td>
<td>0.64</td>
<td>0.64</td>
</tr>
<tr>
<td>EHI take-up</td>
<td>0.54</td>
<td>0.51</td>
</tr>
<tr>
<td>IHI take-up</td>
<td>0.10</td>
<td>0.13</td>
</tr>
<tr>
<td>Labor hours</td>
<td>0.34</td>
<td>–</td>
</tr>
<tr>
<td>Capital-output ratio</td>
<td>2.5</td>
<td>–</td>
</tr>
</tbody>
</table>
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 is needed
  - 1. A mandate without new health insurance options
  - 2. A mandate with voluntary Medicare Buy-in for age 55-64
    - adverse selection problem
    - the result 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>
<thead>
<tr>
<th>Reform policy</th>
<th>MB take-up ratio without EHI offer</th>
<th>MB subsidy as of Y</th>
<th>Labor tax rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandate</td>
<td>–</td>
<td>–</td>
<td>35%</td>
</tr>
<tr>
<td>Mandate MB</td>
<td>100%</td>
<td>0%</td>
<td>35%</td>
</tr>
<tr>
<td>MB (10% S)</td>
<td>28.5%</td>
<td>0.009%</td>
<td>35.015%</td>
</tr>
<tr>
<td>MB (20% S)</td>
<td>44.6%</td>
<td>0.028%</td>
<td>35.048%</td>
</tr>
<tr>
<td>MB (44% S)</td>
<td>100%</td>
<td>0.100%</td>
<td>35.160%</td>
</tr>
<tr>
<td>MB PA (10% S)</td>
<td>44.0%</td>
<td>0.014%</td>
<td>35.025%</td>
</tr>
<tr>
<td>MB PA (20% S)</td>
<td>44.8%</td>
<td>0.028%</td>
<td>35.047%</td>
</tr>
<tr>
<td>MB PA (38% S)</td>
<td>100%</td>
<td>0.088%</td>
<td>35.140%</td>
</tr>
</tbody>
</table>
Policy implication: Impact on labor market

Figure 6: Labor participation
Policy implication: Welfare

**Table: Welfare comparison (CEV from Bench)**

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

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.