Market Ineffciency, Insurance Mandate and Welfare: The U.S. Health Care Reform 2010

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The U.S. health insurance system

- Mixed system:
  - Private health insurance for working population
  - Public health insurance for poor (Medicaid) and old (Medicare)
- Main issues in the current system:
  - Low coverage: 47 million uninsured in 2006 (15%)
  - High cost: 16% of GDP on Health in 2006 and close to 20% by 2015
  - Health outcomes: questionable?

Medicare Prescription Drug, Improvement, and Modernization Act (2003)

- Health Savings Accounts
- Medicare Part D (2006) for prescription drugs
- Stop imports of generic drugs
- Restrict Medicare's ability to negotiate drug prices

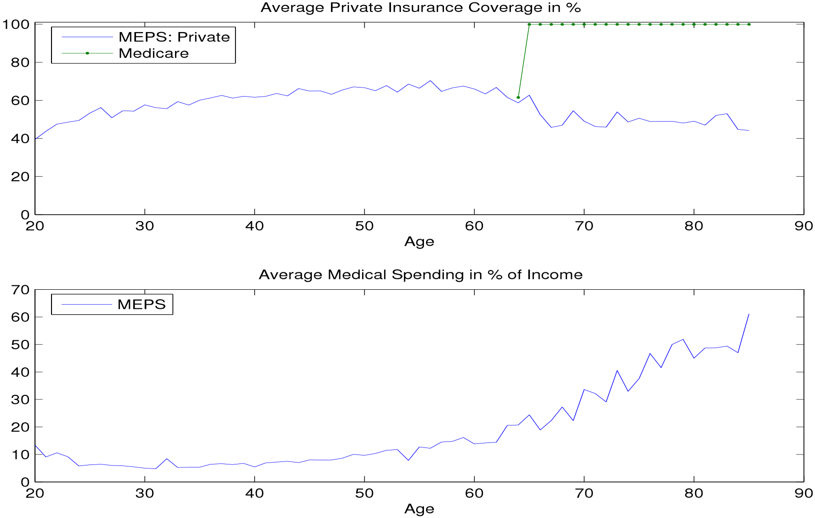
Affordable Care Act (2010)

- Private insurance:
  - Health insurance exchanges
  - Health insurance mandate with fines and subsidies
  - Restrictions on insurance companies
- Public insurance
  - Expansion of Medicaid
  - Cuts in Medicare
  - Financing
- Extension of government intervention with emphasis on the number of insured individuals

This paper

- A macro-economic analysis of the Obama health care reform:
  1. we quantify the effects on market aggregates incl.
  2. analyze the financing of the reform and
  3. calculate the effects on welfare of various socio-economic groups
- What type of model is suitable?

Health insurance and expenditure profiles (2004/05)



Main contributions

1. A stochastic dynamic general equilibrium **overlapping generations model** with
   1. endogenous health expenditures and
   2. insurance choice to

   that accounts for the life-cycle patterns of

   1. health expenditures and
   2. insurance take-up rates observed in the data

2. Demonstrate the usefulness of the model by
   - quantifying the short-run and long-run effects of the Patient Protection and Affordable Care Act (2010)
   - incl. transitions and welfare analysis

Results preview

- Adverse selection $\downarrow$: $\rightarrow$ almost universal coverage
- Moral hazard $\uparrow$: $\rightarrow$ health care spending $\uparrow$ by almost 6%
- To finance reform:
  1. 2.7% payroll tax on incomes $> \$200,000$
  2. $\uparrow$ consumption tax by about 1.1%
  3. $\downarrow$ government spending by about 1% of GDP
- Reform $\uparrow$ health capital, labor supply
- $\downarrow$ capital stock and output by up to 2%
- Welfare $\uparrow$ for most generations along the transition: $< 1\%$ of Comp.Cons.
- Insurance take-up rate mainly driven by tax penalty and not subsidies

Related literature

1. Health microeconomics/metrics
   - Grossman (1972a,1972b), Grossman (2000)
2. Quantitative macroeconomics/public finance
   - Ayagari (1994), Imrohoroglu et al (1995), Hugget (1996)
3. Macro-health economics:
   - Exogeneous health expenditure shocks: Attanasio, Kitao and Violante (2008), Jeske and Kitao (2009), Pashchenko and Porapakkarm (2010), Janicki (2011)
   - Endogenous health expenditures and insurance: Suen (2006), Feng (2009) and Jung and Tran (2008, 2010)

Outline

1. Model
2. Calibration
3. Policy experiments
4. Conclusion

MODEL

The Model: Key Features

1. Overlapping generations model with heterogeneous agents:
    - Sectors: household, firm, and government
    - Markets: consumption, labor and capital
    - Households live for multiple-periods as workers and retirees, and face period mortality shocks and labor productivity shocks
    - Incomplete financial markets
2. New features:
    - Health as a durable good: consumption and investment
    - Health shocks
    - Endogenous health spending and financing
    - **The health insurance system**

Preferences and technology

- Preferences:
$$u\left(c_j, l_j, s_j\right)$$
- Health capital:
  - service flow from health capital
$$s_j = s\left(h_j\right) \quad (1)$$
  - health production
$$h_j = h\left(m_j, h_{j-1}, \varepsilon_j\right) \quad (2)$$
  - health shocks
$$p_j\left(\varepsilon_j, \varepsilon_{j-1}\right) = \Pr\left(\varepsilon_j | \varepsilon_{j-1}, j\right)$$
- Human capital:
  - accumulation
$$e_j = e\left(h_{j-1}, \epsilon_j\right) \text{ for } j = \{1, ..., J_1\}$$
  - productivity shocks
$$\pi_j\left(\epsilon_j, \epsilon_{j-1}\right) = \Pr\left(\epsilon_j | \epsilon_{j-1}, j\right)$$

Health insurance

- A private health insurance market for workers
  - Private insurers with two plans: individual and group
  - Group insurance offers provided by employers with a probability

$$\omega_{GI}\left(i_{GI,j}, i_{GI,j-1}\right) = \Pr\left(i_{GI,j} | i_{GI,j-1}, income\right)$$

  - Health insurance choice: endogenous
    - $in_j = 0$: no insurance
    - $in_j = 1$: individual based insurance
    - $in_j = 2$: group based insurance (if offered via employer)

- A public insurance program for retirees (Medicare): no insurance choice

Household health expenditures

- The total health expenditure: $p_m m$
- Worker's out of pocket health expenditures:

$$o^W(m_j) = \begin{cases} p_{m,noIns}m & \text{if } in_j = 0, \\ \min\left[p_{m,Ins}m_j, \gamma + \rho\left(p_{m,Ins}m_j - \gamma\right)\right] & \text{if } in_j = 1, 2 \end{cases}$$

- Retiree's out of pocket health expenditures:

$$o^R(m_j) = \min\left[p_{m,Med}m_j, \gamma^{Med} + \rho^{Med}\left(p_{m,Med}m_j - \gamma^{Med}\right)\right]$$

Household problem: Timing of events

t

+ a: asset
+ h: health capital
+ in: insurance

t+1

+ a': asset
+ h': health capital
+ in': insurance

Shocks:

+ ε: health
+ ϵ: productivity
+ i_{GI}: group insurance

Choices:

+ c: consumption
+ l: leisure
+ m: medical services
+ a': savings
+ in': insurance

Shocks:

+ ε': health
+ ϵ': productivity
+ i_{GI}': group insurance

$\boxed{x(t) = \{j, a, h, in, \varepsilon, \epsilon, i_{GI}\}} \rightarrow \boxed{choice = \{c, l, m, a', in'\}} \dashrightarrow \boxed{x(t+1) = \{j+1, a', h', in', \varepsilon', \epsilon', i_{GI}'\}}$

Worker's dynamic optimization problem

$$V\left(x_j\right) = \max_{\{c_j, l_j, m_j, a_{j+1}, in_{j+1}\}} \left\{ u\left(c_j, s_j, l_j\right) + \beta\pi_j E_{\varepsilon_{j+1}, \epsilon_{j+1}, i_{GI} | \varepsilon_j, \epsilon_j, i_{GI}} \left[V\left(x_{j+1}\right) \right] \right\}$$

s.t.

$$\begin{aligned} & \left(1+\tau^C\right) c_j + (1+g)\, a_{j+1} + o^W\left(m_j\right) + 1_{\{in_{j+1}=1\}} p\,(j,h) + 1_{\{in_{j+1}=2\}} p \\ = \;& w\left(1-l_j\right) e\left(h_{j-1}, \epsilon_j\right) + R\left(a_j + T^{Beq}\right) + Insprofit_1 + Insprofit_2 - Tax_j + T_j^{SI} \end{aligned}$$

$$0 \leq a_{j+1}$$

$$s_j = s\left(h_j\right)$$

$$h_j = h\left(m_j, h_{j-1}, \varepsilon_j\right)$$

Worker's dynamic optimization problem 2

where

$$
\begin{aligned}
Tax_j &= \tilde{\tau}\left(\tilde{y}_j^W\right) + \left(\tau^{Soc} + \tau^{Med}\right)\left(w\left(1-l_j\right)e\left(h_{j-1},\epsilon_j\right) - 1_{\{in_{j+1}=2\}}p\right) \\
\tilde{y}_j^W &= \left\{ \begin{array}{c} w\left(1-l_j\right)e\left(h_{j-1},\epsilon_j\right) + ra_j + rT^{Beq} + Insprofit_1 + Insprofit_2 \\ -0.5\left(\tau^{Soc} + \tau^{Med}\right)\left(w\left(1-l_j\right)e\left(h_{j-1},\epsilon_j\right) - 1_{\{in_{j+1}=2\}}p\right) - 1_{\{in_{j+1}=2\}}p \end{array} \right. \\
T_j^{SI} &= \max\left[0, \underline{c} + Tax_j - w\left(1-l_j\right)e\left(h_{j-1},\epsilon_j\right) - R\left(a_j + T^{Beq}\right) - InsP_1 - InsP_2\right]
\end{aligned}
$$

Retiree's dynamic optimization problem

$$V\left(x_j\right) = \max_{\{c_j, m_j, a_{j+1}\}} \left\{ u\left(c_j, s_j\right) + \beta \pi_j E_{\varepsilon_{j+1}, \epsilon_{j+1} | \varepsilon_j, \epsilon_j} \left[V\left(x_{j+1}\right)\right]\right\}$$

s.t.

$$\begin{aligned} \left(1+\tau^C\right) c_j + (1+g)\, a_{j+1} + o^R\left(m_j\right) + p^{Med} &= R\left(a_j + T_j^{Beq}\right) - Tax_j + T_j^{Soc} + T_j^{SI} \\ 0 &\leq a_{j+1} \end{aligned}$$

where

$$\begin{aligned} Tax_j &= \tilde{\tau}\left(\tilde{y}_j^R\right) \\ \tilde{y}_j^R &= ra_j + rT_j^{Beq} \\ T_j^{SI} &= \max\left[0, \underline{c} + o^R\left(m_j\right) + Tax_j - R\left(a_j + T_j^{Beq}\right) - T_j^{Soc}\right] \end{aligned}$$

Firms and insurance companies

- Firms:

$$\max_{\{K,L\}} \{F(K,L) - qK - wL\}, \text{ given } (q,w)$$

- Insurance companies:

$$(1+\omega_{ins}) \sum_{j=2}^{J_1} \mu_j \int \left[1_{\{in_j(x_j)=1\}} (1-\rho) \max(0, p_{m,Ins} m_j(x_j) - \gamma) \right] d\Lambda(x_j)$$

$$= (1+r) \sum_{j=1}^{J_1} \mu_j \int \left(1_{\{in_j(x_j)=1\}} p(j,h) \right) d\Lambda(x_j)$$

$$(1+\omega_{ins}) \sum_{j=2}^{J_1} \mu_j \int \left[1_{\{in_j(x_j)=2\}} (1-\rho) \max(0, p_{m,Ins} m_j(x_j) - \gamma) \right] d\Lambda(x_j)$$

$$= (1+r) \sum_{j=1}^{J_1} \mu_j \int \left(1_{\{in_j(x_j)=2\}} p \right) d\Lambda(x_j)$$

Government I

- Bequests:

$$\sum_{j=1}^{J} \mu_j \int T_j^{Beq}(x)\, d\Lambda_j(x) = \sum_{j=1}^{J} \tilde{\mu}_j \int a_j(x)\, d\Lambda_j(x)$$

- Social Security:

$$\begin{aligned} & \sum_{j=J_1+1}^{J} \mu_j \int T_j^{Soc}(x)\, d\Lambda_j(x) \\ = \; & \sum_{j=1}^{J_1} \mu_j \int \tau^{Soc} \left(we\left(j, h_j, \epsilon\right) - 1_{\{in_{j+1}=2\}} p \right) d\Lambda_j(x) \end{aligned}$$

Government II

- Medicare:

$$\sum_{j=J_1+1}^{J} \mu_j \int \left(1-\rho^{Med}\right) \max\left(0, m_j(x) - \gamma^{Med}\right) d\Lambda_j(x)$$

$$= \sum_{j=1}^{J_1} \mu_j \int \tau^{Med} \left(we(j, h_j, \epsilon) - 1_{\{in_{j+1}=2\}} p\right) d\Lambda_j(x)$$

$$+ \sum_{j=J_1+1}^{J} \mu_j \int p_j^{Med} d\Lambda_j(x)$$

- General government budget:

$$G + \sum_{j=1}^{J} \mu_j \int T_j^{SI}(x_j) \, d\Lambda(x_j)$$

$$= \sum_{j=1}^{J} \mu_j \int Tax_j(x_j) \, d\Lambda(x_j) + \sum_{j=1}^{J} \mu_j \int \tau^C c(x_j) \, d\Lambda(x_j)$$

A competitive equilibrium

Given the transition probability matrices and the exogeneous government policies, a competitive equilibrium is a collection of sequences of distributions of household decisions, aggregate capital stocks of physical and human capital, and market prices such that

- Agents solve the consumer problem
- The F.O.Cs of firms hold
- The budget constraints of insurances companies hold
- All markets clear
- All the government programs and the general budget clear
- The distribution is stationary

CALIBRATION

Parameterization

- Preferences:

$$u(c,l,s) = \frac{\left(\left(c^{\eta} l^{1-\eta}\right)^{\kappa} s^{1-\kappa}\right)^{1-\sigma}}{1-\sigma}$$

- Health services:

$$s_j = h_j$$

- Health capital accumulation:

$$h_j = i\left(m_j, h_{j-1}, \varepsilon_j\right) = \overbrace{\phi_j m_j^{\xi}}^{\text{Smooth}} + \overbrace{\left(1-\delta_j\right) h_{j-1}}^{\text{Trend}} + \overbrace{\varepsilon_j}^{\text{Disturbance}}$$

- Human capital:

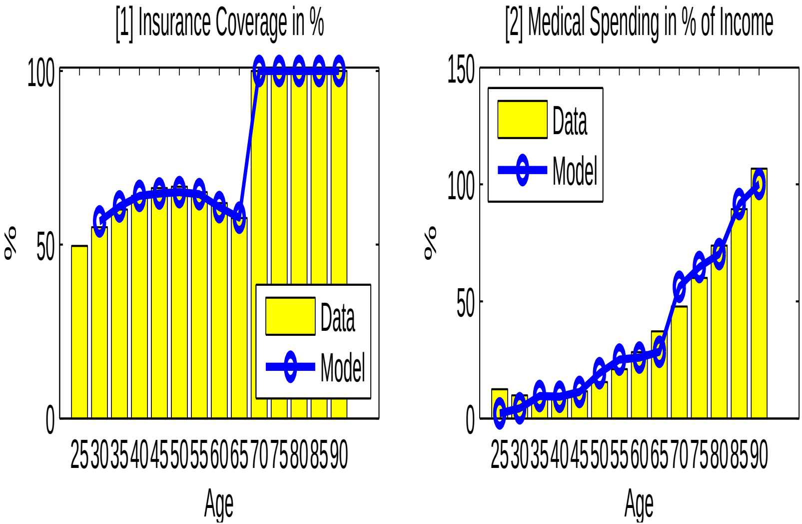
$$e_j = e\left(\epsilon_j\right)^{\chi}\left(h_{j-1}^{\theta}\right)^{1-\chi} \text{ for } j = \{1, ..., J_1\}$$

Calibration

Baseline Parameters		
Demographics: $J_1 = 9$ $J_2 = 5$ $n = 1.2\%$	Health Production: $\phi(j) \in \{0.47, 1.30\}$ $\xi = 0.22$	Insurance: $\gamma = 1.7\%$ of median income $\rho = 29\%$ $\gamma^{Med} = 6\%$ of elderly's aver health spending $\rho^{Med} = 34\%$
Preferences: $\sigma = 2.5$ $\kappa = 0.79$ $\eta = 0.35$ $\beta = 1.0125$	Health Productivity: $\theta = 0$, $\chi = 0.9$	Premium: exogenously dependent of ages and health
Technology: $\alpha = 0.33$ $\delta = 9\%$ $g = 2\%$		

- Depreciation rates of health capital δ_j from MEPS data
- Markov switching probabilities of health shocks, productivity shocks, and group insurance offers from MEPS data
- Magnitudes of health shocks and productivity shocks from MEPS as well

The model vs. the data



POLICY EXPERIMENTS

Patient Protection and Affordable Care Act (2010)

WITHIN A YEAR

- Provide a $250 rebate this year to Medicare prescription drug beneficiaries whose initial benefits run out.

90 days after enactment:

- Would provide immediate access to high-risk pools for people with no insurance because of pre-existing conditions

Six months after enactment:

- Bar insurers from denying people coverage when they get sick
- Bar insurers from denying coverage to children with pre-existing conditions
- Bar insurers from imposing lifetime caps on coverage
- Require insurers to allow people to stay on their parents' policies until they turn 26

Patient Protection and Affordable Care Act (2010)

2011

- Require individual and small group market plans to spend 80 percent of premium dollars on medical services. Large group plans would have to spend at least 85 percent

2013

- Increase the Medicare payroll tax and expand it to dividend, interest and other unearned income for singles earning more than $\$200,000$ and joint filers making more than $\$250,000$

2014

- Provide subsidies for families earning up to 400 percent of poverty level, currently about $\$88,000$ a year, to purchase health insurance
- Require most employers to provide coverage or face penalties
- Require most people to obtain coverage or face penalties

2018

- Impose a 40 percent excise tax on high-end insurance policies.

2019

- Expand health insurance coverage to 32 million people

Our experiments

Starting from benchmark we implement:

1. **Mandate:** Agents who do not buy health insurance face a tax penalty of 2.5% of their income
2. **Insurance Exchange:** Agents with income between 133% and 400% of the FPL get a subsidy to help them buy insurance
3. **Expansion of Medicaid:** Agents with income $<$ 133% of federal poverty level get free insurance
4. **No screening** Insurance companies can't price discriminate
5. **Financing:**
    1. payroll tax on the rich (income $>$ 200k)
    2. consumption tax, or
    3. fixed tax (let exogenous gov't consumption adjust)

Aggregate effects

	Benchmark	τ_V
Capital: K	100.000	99.256
Weekly hours worked:	39.673	39.799
Health capital: H	100.000	101.103
Human capital: Hk	100.000	100.145
Output: Y	100.000	99.850
Medical spending: $p_m * M$	100.000	106.423
Workers insured in %	61.777	92.864
Consumption: C	100.000	97.929
Consumption tax: τ^C	5.724	6.877
Payroll tax: τ^V	0.000	2.562
Wages: w	100.000	99.706
Welfare	-100.000	-99.813

Table: Steady state result with health as consumption good only $\theta = 0$.

The key channels of effects

1. Savings effect: self-insurance vs. market insurance
2. Moral hazard effect: lower effective price of health services
3. Tax effect: higher tax rates
4. General equilibrium effect: wage and interest rates

$$
\begin{aligned}
& \left(1+\tau^{C}\right) c_j + (1+g)\, a_{j+1} + o^{W}(m_j) \\
& + 1_{\left\{in_{\mathbf{j+1}}=1\right\}} (1 - subsidy)\, p + 1_{\left\{in_{\mathbf{j+1}}=2\right\}} p + 1_{\left\{in_{\mathbf{j+1}}=0\right\}} Penalty \\
= \quad & \left(1-\tau^{V}\right) w \left(1 - l_j\right) e\left(h_{j-1}, \epsilon_j\right) + R\left(a_j + T^{Beq}\right) \\
& + Insprofit_1 + Insprofit_2 - Tax_j + T_j^{SI} - \tau^{LS},
\end{aligned}
$$

Aggregate efficiency effects: 4 key channels

	Benchmark	τ_V
1. Savings effect:		
Capital: K	100.000	99.256
2. Moral hazard effect:		
Medical spending: $p_m * M$	100.000	106.423
3. Tax/Redistribution effect:		
Consumption tax: τ^C	5.724	6.877
Payroll tax: τ^V	0.000	2.562
Subsidy in % of GDP:	0.000	0.261
4. General equilibrium effect:		
Wages: w	100.000	99.706

Table: Steady state result with health as consumption good only $\theta = 0$.

Welfare effects

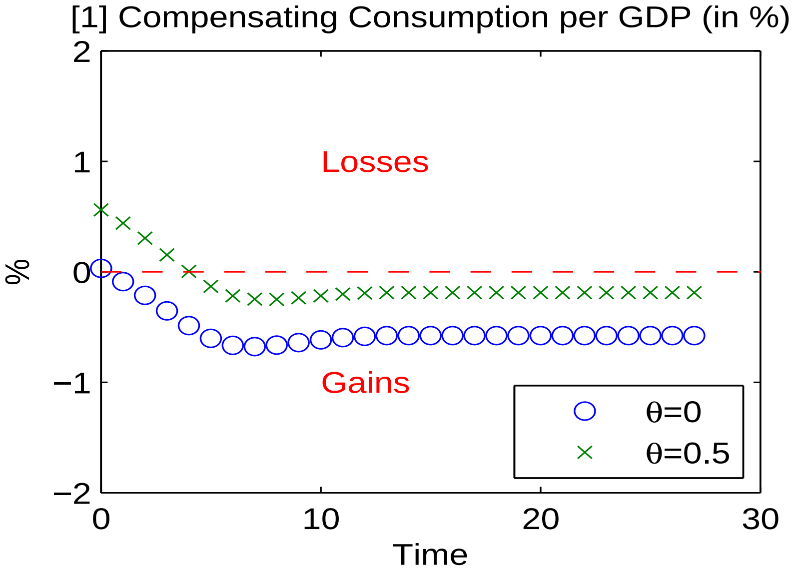
- Negative efficiency effects
  - Capital drops
  - Output drops
  - Household income drops (w decrease)
  - Consumption of C drops
- Positive insurance effects
  - More insured, improved risk sharing
  - Increases in medical spending
  - Increases in health capital H
  - If H is productive, it has a positive effect on output

Welfare effects

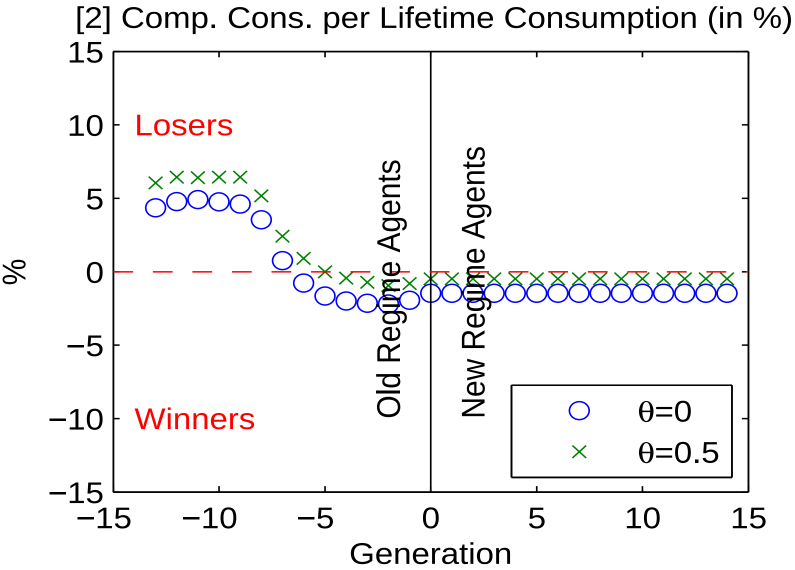
	Benchmark	τ_V
	Negative welfare effects:	
1. Capital: K	100.000	99.256
2. Weekly hours worked:	39.673	39.799
3. Output/Income: Y	100.000	99.850
4. Consumption: C	100.000	97.929
	Positive welfare effects:	
1. Workers insured in %	61.777	92.864
2. Medical spending: $p_m M$	100.000	106.423
3. Health capital: H	100.000	101.103
4. Human capital: Hk	100.000	100.145
	Overall welfare effect:	
Welfare	-100.000	-99.813

Table: Steady state result with health as consumption good only $\theta = 0$.

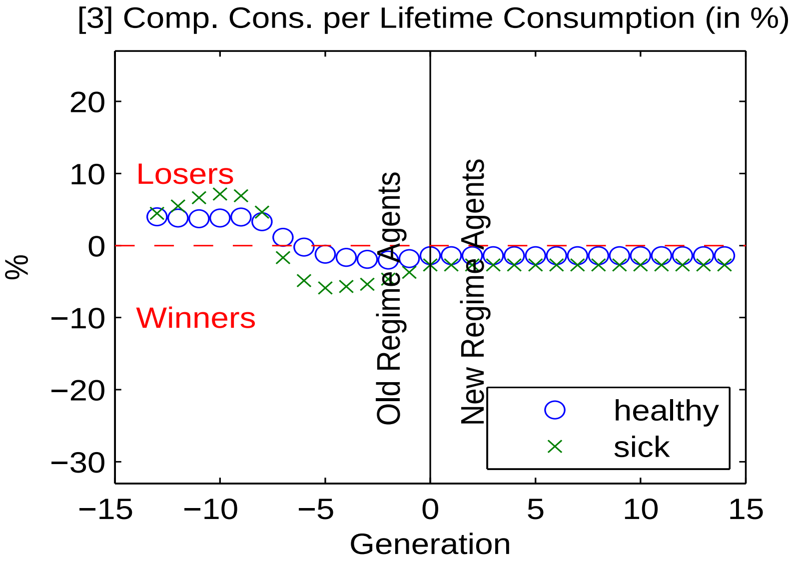
Welfare effects over transitions: payroll tax



Welfare effects over transitions: payroll tax



Welfare effects over transitions: payroll tax



Financing the reform 1

We distinguish between three possible taxes to finance the subsidies:

1. τ_V: payroll tax on the rich (income $>$ 200k)
2. Δ_{Cg}: adjustment in residual government consumption (net of tax effect)
3. τ_C: consumption tax

Aggregate effects

	Benchmark	[1] τ_V	[2] Δ_{Cg}	[3] τ_C
Capital: K	100.000	99.256	99.661	99.646
Weekly hours worked:	39.673	39.799	39.816	39.816
Health capital: H	100.000	101.103	101.192	101.189
Human capital: Hk	100.000	100.145	100.283	100.282
Output: Y	100.000	99.850	100.077	100.072
Consumption: C	100.000	97.929	99.650	98.300
Medical spending: $p_m M$	100.000	106.423	106.776	106.708
Workers insured in %	61.777	92.864	95.988	95.988
Payroll tax: τ^V	0.000	2.562	0.000	0.000
Consumption tax: τ^C	5.724	6.877	5.724	7.198
Govt consumption in % of GDP:	16.500	16.500	15.911	16.500
Subsidy in % of GDP:	0.000	0.261	0.260	0.261
Penalty in % of GDP:	0.000	0.078	0.041	0.041
Wages: w	100.000	99.706	99.795	99.790
Welfare	-100.000	-99.813	-99.302	-99.698

Table: Steady state result with health as consumption good only $\theta = 0$.

Aggregate efficiency effects: four key channels

	Benchmark	[1] τ_V	[2] Δ_{C_g}	[3] τ_C
1. Savings effect:				
Capital: K	100.000	99.256	99.661	99.646
2. Moral hazard effect:				
Medical spending: $p_m * M$	100.000	106.423	106.776	106.708
3. Tax/Redistribution effect:				
Consumption tax: τ^C	5.724	6.877	5.724	7.198
Payroll tax: τ^V	0.000	2.562	0.000	0.000
4. General equilibrium effect:				
Wages: w	100.000	99.706	99.795	99.790

Table: Steady state result with health as consumption good only $\theta = 0$.

Welfare effects

	Benchmark	[1] τ_V	[2] Δ_{C_g}	[3] τ_C
	Negative welfare effects:			
1. Capital: K	100.000	99.256	99.661	99.646
2. Weekly hours worked:	39.673	39.799	39.816	39.816
3. Output: Y	100.000	99.850	100.077	100.072
4. Consumption: C	100.000	97.929	99.650	98.300
	Positive welfare effects:			
1. Workers insured in %	61.777	92.864	95.988	95.988
2. Medical spending: $p_m M$	100.000	106.423	106.776	106.708
3. Health capital: H	100.000	101.103	101.192	101.189
4. Human capital: Hk	100.000	100.145	100.283	100.282
	Overall welfare effect:			
Welfare	-100.000	-99.813	-99.302	-99.698

Table: Steady state result with health as consumption good only $\theta = 0$.

No penalty

	Benchmark	[1] τ_V	[2] Δ_{Cg}	[3] τ_C
Capital: K	100.000	100.200	100.266	100.243
Weekly hours worked:	39.673	39.276	39.374	39.374
Health capital: H	100.000	100.264	100.445	100.444
Human capital: Hk	100.000	99.214	99.522	99.522
Output: Y	100.000	99.538	99.767	99.759
Medical spending: $p_m M$	100.000	103.326	105.205	105.197
Workers insured in %	61.777	60.124	65.678	65.677
Consumption: C	100.000	100.042	100.591	99.693
Consumption tax: τ^C	5.724	6.178	5.724	6.678
Payroll tax: τ^V	0.000	3.199	0.000	0.000
Govt consumption in % of GDP:	16.500	16.500	16.123	16.500
Interest rate: R in %	4.077	3.907	3.935	3.936
Wages: w	100.000	100.327	100.246	100.238
Welfare	-100.000	-99.470	-99.272	-99.531

Table: Steady state result with health as consumption good only $\theta = 0$.

No subsidy

	Benchmark	[1] τ_V	[2] Δ_{Cg}	[3] τ_C
Capital: K	100.000	98.443	98.452	98.427
Weekly hours worked:	39.673	39.433	39.446	39.445
Health capital: H	100.000	101.097	101.171	101.167
Human capital: Hk	100.000	99.531	99.660	99.657
Output: Y	100.000	99.171	99.259	99.249
Medical spending: $p_m M$	100.000	105.959	106.482	106.447
Workers insured in %	61.777	93.516	95.703	95.703
Consumption: C	100.000	97.172	98.775	97.410
Consumption tax: τ^C	5.724	6.950	5.724	7.215
Payroll tax: τ^V	0.000	2.150	0.000	0.000
Govt consumption in % of GDP:	16.500	16.500	15.925	16.500
Interest rate: R in %	4.077	4.040	4.045	4.046
Wages: w	100.000	99.638	99.598	99.591
Welfare	-100.000	-99.941	-99.458	-99.862

Table: Steady state result with health as consumption good only $\theta = 0$.

Health as investment good

	Benchmark	[1] τ_V	[2] Δ_{C_g}	[3] τ_C
Capital: K	100.000	98.901	98.973	98.945
Weekly hours worked:	39.684	39.776	39.802	39.798
Health capital: H	100.000	101.053	101.129	101.127
Human capital: Hk	100.000	99.931	100.268	100.262
Output: Y	100.000	99.590	99.839	99.825
Medical spending: $p_m M$	100.000	105.895	106.173	106.136
Workers insured in %	63.355	95.428	98.431	98.431
Consumption: C	100.000	97.811	99.701	98.124
Consumption tax: τ^C	5.507	6.690	5.414	7.111
Payroll tax: τ^V	0.000	3.752	0.000	0.000
Govt consumption in % of GDP:	16.500	16.500	15.833	16.500
Wages: w	100.000	99.659	99.572	99.565
Welfare	-100.000	-99.844	-99.335	-99.797

Table: Steady state result with health as investment good $\theta = 0.5$

Conclusion

1. Construct a heterogeneous agents macro-model with health as a durable good
2. Account for life-cycle patterns of health expenditures and private insurance take up rates
3. Assess the macroeconomic effects of the Obama health care reform 2010

Future work on macro-health economics

1. Immediate:
    - Re-calibrate
    - Sensitivity analysis
2. Model:
    - A structural estimation of the health production function
    - Health capital and endogenous survival probabilities
3. Future work:
    - Incomplete markets and optimal public health insurance with endogenous health capital
    - Life cycle consumption puzzle: the role of health