Household Labor Search, Spousal Insurance, and Health Care Reform

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Background

- Employer-sponsored insurance (ESHI) is primary source of health insurance coverage for the working age in the U.S.
- Employers typically offer insurance not only to their employees, but also to the spouses (and dependents) of their employees
- Spousal health insurance benefits are heavily used by married couples, and these features create important links between health, health insurance, and the labour market
- Re-evaluate these relationships in the context of the 2010 Affordable Care Act (ACA), whose provisions include individual and firm mandates, health insurance exchanges, and subsidies

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- Re-evaluate these relationships in the context of the 2010 Affordable Care Act (ACA), whose provisions include individual and firm mandates, health insurance exchanges, and subsidies
- **Provisions in the ACA significantly affect employers' incentives to offer spousal health insurance benefits.**

This paper

- Develop frictional labour market model that integrates multi-person household search model (e.g. Dey and Flinn, 2008, and Guler, Guvenen, and Violante, 2014) into equilibrium Burdett and Mortensen (1998) framework
- Characterise jobs by endogneously determined wage and menu of health insurance offerings, that households select from
- The ACA reduces the probability of firms offering health insurance, with an "employee-only" contract emerging amongst low-productivity firms
- Further, provisions in the ACA reduces the value of spousal insurance, and the extent to which insurance coverage matters for job mobility decisions.

Literature

- Interactions between health, insurance, and the labour market:
  Surveys: Currie and Madrian (1999), Gruber (2002), Gruber (2004)
  Structural empirical: Rust and Phelan (1997), Dey and Flinn (2005), De Nardi, French and Jones (2016), Aizawa and Fang (2018), Aizawa (2019).
- Household job search:
  Dey and Flinn (2008), Gemici (2011), Guler, Guvenen and Violante (2012), Flabbi, Flinn and Salazar (2019), Pilossoph and Wee (2019a,b).
- Empirical search papers with posting:
  van den Berg and Ridder (1998), Bontemps, Robin and van den Berg (1999, 2000), Meghir, Narita and Robin (2015), Shephard (2017).
- Impact of ACA on insurance coverage and the labour market:
  Pashchenko and Porapakkarm (2013), Heim, Lurie and Simon (2015), Courtemanche, Marton and Yelowitz (2016), Nakajima and Tüzemen (2017), Duggan, Goda and Jackson (2019).

I. A model of household search, health, and insurance

Empirical environment (1)

For now, we consider the *pre-ACA* environment:

- The economy consists of a continuum of *stable* household units (singles and couples) with a population size N
- Time is continuous and households are infinitely lived
- Persistent type heterogeneity: Households differ in terms of demographics $\mathbf{x}$ (marital status, children, etc.) and in unobservables $\alpha \sim \mathcal{B}(\cdot; \mathbf{x})$: adults indexed $j \in \{1, 2\}$
- Dynamic state variables: Households also differ in labour market state and the endogenous health status $\mathbf{h}$ of its members (more later).

Focus on decision problem of couples: single agent model is a special case of the general household model.

Empirical environment (2)

Jobs are characterised by a wage w, and a *menu* of insurance offerings I (with associated coverage type and premiums):

- *Frictional* labour market: adult j sequentially samples job offers from $F(w, I)$ at Poisson rate $\lambda_u^j(\mathbf{x})$ when non-employed and at rate $\lambda_e^j(\mathbf{x})$ when employed
- Employed face a constant risk of entering non-employment, with *exogenous* job destruction occurring at rate $\delta_j(\mathbf{x})$
- *Endogenous* transitions to non-employment possible through changes in health status, or in the state of their spouse.

Insurance options

Upon accepting an offer, households select an insurance coverage option $i \in I$, with each having a distinct premium $r(i; w, I)$:

1. No health insurance ($I = 0$); may still be insured if they are covered by their spouse's insurance [$i = 0$ (no insurance)]
2. Employee only insurance ($I = 1$). Insurance is offered, but no coverage for spouses [$i = 0$, $i = 1$ (employee only)]
3. Employee and spouse insurance ($I = 2$). Insurance is offered, and made available to both the employee and their spouse [$i = 0$, $i = 1$, $i = 2$ (employee and spouse)].

An equilibrium condition will determine the value of the insurance premiums $r(i; w, I)$.

Qualifying insurance events

Employees are not able to change insurance coverage options freely during a job spell $\implies$ both $\mathbf{i}$ and $\mathbf{I}$ are state variables:

- It may be changed in response to a *qualifying event* (given no family dynamics, these are only linked to employment events)
- Coverage may also be changed when an *open enrolment* event occurs. For tractability this is modelled as a stochastic event [at rate η households may reoptimise from the available set $\mathbf{I}$].

Preferences

For couples, we consider a *unitary* model of the household, with preferences constant absolute risk aversion (CARA):

$$U(c, P_1, P_2; \boldsymbol{\alpha}, \mathbf{x}) = \alpha_1(1 - P_1) + \alpha_2(1 - P_2) - \exp(-\psi(\mathbf{x}) \cdot c),$$

and where:

- $\psi(\mathbf{x}) > 0$ is the coefficient of absolute risk aversion and c is household consumption
- P_j is the adult j employment indicator; $\boldsymbol{\alpha}$ is value of leisure [recall that $\boldsymbol{\alpha}$ is heterogeneous in population].

Budget constraint

- Household consumption comprises net income, less any out-of-pocket medical expenditure costs:

$$c = y[P_1(w_1 - r(i_1; w_1, l_1)) + P_2(w_2 - r(i_2; w_2, l_2)), \\ (2 - P_1 - P_2)b_{UI}; \mathbf{x}] - \underbrace{o(m_1|q_1(\mathbf{i})) - o(m_2|q_2(\mathbf{i}))}_{\text{out-of-pocket medical expenditure}},$$

- $y(z, b; \mathbf{x}) \equiv z + b - T(z, b; \mathbf{x})$ is the net-income function (note that insurance premiums are *pre-tax* deductions)
- $q_j(\mathbf{i})$ is adult j insurance coverage given vector of insurance choices $\mathbf{i}$ and $o(m_j|q_j)$ is out-of-pocket medical expenditure.

Health and medical expenditure

Current health status is measured by the scalar h.

- Total H ordered health statuses, $h^1 < h^2, \ldots, < h^H$
- Law-of-motion for h: Poisson rate at which individual j with insurance status q experiences a change in health status from current h to h' is given by $\nu_j(h'|h, q, \mathbf{x})$.

Individuals are subject to a new medical expenditure shock whenever they change their health status or insurance coverage:

- Mixture distribution: probability mass at zero expenditure; conditional distribution specified as Gamma-Gompertz ▷
- *Simplifying assumption*: current expenditure realisation $\mathbf{m}$ is *not* observed to household (use *expected* flow utilities)
- Obtain expressions for expected flow utilities and medical expenditure in terms of Gauss ${}_2F_1$ hypergeometric function △.

Value functions

- Value in any joint state depends on i) couple's current wages $\mathbf{w}$; ii) insurance choices $\mathbf{i}$; iii) insurance offerings $\mathbf{I}$; iv) health status $\mathbf{h}$; and v) persistent type $(\alpha, \mathbf{x})$.
- Example: consider single earner state *eu* where male (adult 1) is employed and female (adult 2) is non-employed, and suppress conditioning on persistent household type $(\alpha, \mathbf{x})$.

Value functions (eu) state

$$\mathcal{D}_{eu}(\mathbf{i},\mathbf{h})\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h}) = \overline{u}_{eu}(w_1,i_1,l_1,\mathbf{h})$$

where $\overline{\mathcal{V}}_{s,s'} = \max_{\mathbf{i}\in\mathbf{I}} \mathcal{V}_{s,s'}$ is the max value over available options,
and $\mathcal{D}_{eu}(\mathbf{i},\mathbf{h}) \equiv \rho + \overline{\nu}_1(h_1,q_1) + \overline{\nu}_2(h_2,q_2) + \lambda_e^1 + \lambda_u^2 + \delta_1 + \eta$.

Value functions (eu) state: health transition

$$\mathcal{D}_{eu}(\mathbf{i},\mathbf{h})\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h}) = \overline{u}_{eu}(w_1,i_1,l_1,\mathbf{h})$$
$$+ \sum_{h_1'} \nu_1(h_1'|h_1,q_1)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1',h_2),\mathcal{V}_{uu}(h_1',h_2)\}$$
$$+ \sum_{h_2'} \nu_2(h_2'|h_2,q_2)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1,h_2'),\mathcal{V}_{uu}(h_1,h_2')\}$$

where $\overline{\mathcal{V}}_{s,s'} = \max_{\mathbf{i}\in\mathbf{I}} \mathcal{V}_{s,s'}$ is the max value over available options,
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Value functions (eu) state: male job offer

$$\begin{aligned}\mathcal{D}_{eu}(\mathbf{i},\mathbf{h})\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h}) &= \overline{u}_{eu}(w_1,i_1,l_1,\mathbf{h}) \\ &+ \sum_{h_1'} \nu_1(h_1'|h_1,q_1)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1',h_2),\mathcal{V}_{uu}(h_1',h_2)\} \\ &+ \sum_{h_2'} \nu_2(h_2'|h_2,q_2)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1,h_2'),\mathcal{V}_{uu}(h_1,h_2')\} \\ &+ \lambda_e^1 \int \max\{\overline{\mathcal{V}}_{eu}(w_1',l_1',\mathbf{h}),\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h})\}\,\mathrm{d}F(w_1',l_1')\end{aligned}$$

where $\overline{\mathcal{V}}_{s,s'} = \max_{\mathbf{i}\in\mathbf{I}} \mathcal{V}_{s,s'}$ is the max value over available options, and $\mathcal{D}_{eu}(\mathbf{i},\mathbf{h}) \equiv \rho + \overline{\nu}_1(h_1,q_1) + \overline{\nu}_2(h_2,q_2) + \lambda_e^1 + \lambda_u^2 + \delta_1 + \eta$.

Value functions (eu) state: female job offer

$$\begin{aligned}
\mathcal{D}_{eu}(\mathbf{i},\mathbf{h})\mathcal{V}_{eu}(w_1, i_1, l_1, \mathbf{h}) &= \overline{u}_{eu}(w_1, i_1, l_1, \mathbf{h}) \\
&+ \sum_{h_1'} \nu_1(h_1'|h_1, q_1) \max\{\mathcal{V}_{eu}(w_1, i_1, l_1, h_1', h_2), \mathcal{V}_{uu}(h_1', h_2)\} \\
&+ \sum_{h_2'} \nu_2(h_2'|h_2, q_2) \max\{\mathcal{V}_{eu}(w_1, i_1, l_1, h_1, h_2'), \mathcal{V}_{uu}(h_1, h_2')\} \\
&+ \lambda_e^1 \int \max\{\overline{\mathcal{V}}_{eu}(w_1', l_1', \mathbf{h}), \mathcal{V}_{eu}(w_1, i_1, l_1, \mathbf{h})\} \, \mathrm{d}F(w_1', l_1') \\
&+ \lambda_u^2 \int \max\{\overline{\mathcal{V}}_{ee}(\mathbf{w}, \mathbf{l}, \mathbf{h}), \overline{\mathcal{V}}_{ue}(w_2, l_2, \mathbf{h}), \mathcal{V}_{eu}(w_1, i_1, l_1, \mathbf{h})\} \\
&\qquad \mathrm{d}F(w_2, l_2)
\end{aligned}$$

where $\overline{\mathcal{V}}_{s,s'} = \max_{\mathbf{i}\in\mathbf{I}} \mathcal{V}_{s,s'}$ is the max value over available options, and $\mathcal{D}_{eu}(\mathbf{i},\mathbf{h}) \equiv \rho + \overline{\nu}_1(h_1, q_1) + \overline{\nu}_2(h_2, q_2) + \lambda_e^1 + \lambda_u^2 + \delta_1 + \eta$.

Value functions (eu) state: male job destruction

$$
\begin{aligned}
\mathcal{D}_{eu}(\mathbf{i},\mathbf{h})\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h}) &= \overline{u}_{eu}(w_1,i_1,l_1,\mathbf{h}) \\
&+ \sum_{h_1'} \nu_1(h_1'|h_1,q_1)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1',h_2),\mathcal{V}_{uu}(h_1',h_2)\} \\
&+ \sum_{h_2'} \nu_2(h_2'|h_2,q_2)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1,h_2'),\mathcal{V}_{uu}(h_1,h_2')\} \\
&+ \lambda_e^1 \int \max\{\overline{\mathcal{V}}_{eu}(w_1',l_1',\mathbf{h}),\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h})\}\,\mathrm{d}F(w_1',l_1') \\
&+ \lambda_u^2 \int \max\{\overline{\mathcal{V}}_{ee}(\mathbf{w},\mathbf{l},\mathbf{h}),\overline{\mathcal{V}}_{ue}(w_2,l_2,\mathbf{h}),\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h})\} \\
&\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \mathrm{d}F(w_2,l_2) \\
&+ \delta_1\mathcal{V}_{uu}(\mathbf{h})
\end{aligned}
$$

where $\overline{\mathcal{V}}_{s,s'} = \max_{\mathbf{i}\in\mathbf{I}} \mathcal{V}_{s,s'}$ is the max value over available options, and $\mathcal{D}_{eu}(\mathbf{i},\mathbf{h}) \equiv \rho + \overline{\nu}_1(h_1,q_1) + \overline{\nu}_2(h_2,q_2) + \lambda_e^1 + \lambda_u^2 + \delta_1 + \eta$.

Value functions (eu) state: open enrolment

$$
\begin{aligned}
\mathcal{D}_{eu}(\mathbf{i},\mathbf{h})\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h}) &= \overline{u}_{eu}(w_1,i_1,l_1,\mathbf{h}) \\
&+ \sum_{h_1'} \nu_1(h_1'|h_1,q_1)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1',h_2),\mathcal{V}_{uu}(h_1',h_2)\} \\
&+ \sum_{h_2'} \nu_2(h_2'|h_2,q_2)\max\{\mathcal{V}_{eu}(w_1,i_1,l_1,h_1,h_2'),\mathcal{V}_{uu}(h_1,h_2')\} \\
&+ \lambda_e^1 \int \max\{\overline{\mathcal{V}}_{eu}(w_1',l_1',\mathbf{h}),\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h})\}\,\mathrm{d}F(w_1',l_1') \\
&+ \lambda_u^2 \int \max\{\overline{\mathcal{V}}_{ee}(\mathbf{w},\mathbf{l},\mathbf{h}),\overline{\mathcal{V}}_{ue}(w_2,l_2,\mathbf{h}),\mathcal{V}_{eu}(w_1,i_1,l_1,\mathbf{h})\} \\
&\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\mathrm{d}F(w_2,l_2) \\
&+ \delta_1\mathcal{V}_{uu}(\mathbf{h}) + \eta\overline{\mathcal{V}}_{eu}(w_1,l_1,\mathbf{h}),
\end{aligned}
$$

where $\overline{\mathcal{V}}_{s,s'} = \max_{\mathbf{i}\in\mathbf{I}} \mathcal{V}_{s,s'}$ is the max value over available options, and $\mathcal{D}_{eu}(\mathbf{i},\mathbf{h}) \equiv \rho + \overline{\nu}_1(h_1,q_1) + \overline{\nu}_2(h_2,q_2) + \lambda_e^1 + \lambda_u^2 + \delta_1 + \eta$.

Steady state flows

Given compensation distribution $F(w, l)$ and premiums $r(i; w, l)$ solve for steady state of labour market using flow equations:

- Characterise $g_{uu}(\mathbf{h}; \alpha, \mathbf{x})$, $g_{eu}(w_1, i_1, l_1, \mathbf{h}; \alpha, \mathbf{x})$, $g_{ue}(w_2, i_2, l_2, \mathbf{h}; \alpha, \mathbf{x})$, and $g_{ee}(\mathbf{w}, \mathbf{i}, \mathbf{l}, \mathbf{h}; \alpha, \mathbf{x})$
- To solve for these, need to consider all possible source joint states that enter a particular joint destination state
- Example: suppose $\mathcal{V}_{eu}(w_1, i_1, l_1, \mathbf{h}) \geq \mathcal{V}_{uu}(\mathbf{h})$ and consider eu state measure $g_{eu}(w_1, i_1, l_1, \mathbf{h}; \alpha, \mathbf{x})$.

[Skip flows ⊳⊳]

Flow equations (eu) state: outflows

Outflows may be characterised (again, suppressing persistent type $(\boldsymbol{\alpha}, \mathbf{x})$ conditioning):

$$g_{eu}(w_1, i_1, l_1, \mathbf{h}) \times \Bigg[\delta_1 + \overbrace{\overline{\nu}_1(h_1|q_1(i_1))}^{\substack{\text{adult 1}\\ \text{health shock}}} + \overbrace{\overline{\nu}_2(h_2|q_2(i_1))}^{\substack{\text{adult 2}\\ \text{health shock}}} + \underbrace{\lambda_e^1 \int_{\boldsymbol{\Omega}_{eu}^{1-}(w_1, i_1, l_1, \mathbf{h})} \mathrm{d}F(w_1', l_1')}_{\substack{\text{adult 1}\\ \text{job acceptance}}} + \underbrace{\lambda_u^2 \int_{\boldsymbol{\Omega}_{eu}^{2-}(w_1, i_1, l_1, \mathbf{h})} \mathrm{d}F(w_2', l_2')}_{\substack{\text{adult 2}\\ \text{job acceptance}}} + \eta\Bigg],$$

with $\overline{\nu}_j(h|q) = \sum_{h'} \nu(h'|h, q)$, and $\boldsymbol{\Omega}_{eu}^{1-}$ and $\boldsymbol{\Omega}_{eu}^{2-}$ denoting set of dominating job offers.

Flow equations (eu) state: job acceptance inflows

We then have inflows from a job acceptance event:

$$
\begin{aligned}
& f(w_1, l_1) \times v^*_{eu}(w_1, i_1, l_1, \mathbf{h}) \\
& \quad \times \Bigg[\underbrace{\lambda_u^1 g_{uu}(\mathbf{h})}_{\text{adult 1 accepts job from } uu} + \underbrace{\lambda_e^1 \sum_{l_1'} \sum_{i_1' \in l_1'} \int_{\boldsymbol{\Omega}^{1+}_{eu}(w_1, i_1', l_1, l_1', \mathbf{h})} g_{eu}(w_1', i_1', l_1', \mathbf{h})\, \mathrm{d}w_1'}_{\text{adult 1 accepts higher value job}} \\
& \underbrace{+ \lambda_u^1 \sum_{l_2'} \sum_{i_2' \in l_2'} \int_{\boldsymbol{\Omega}^{2+}_{ue}(w_1, i_2', l_1, l_2', \mathbf{h})} g_{ue}(w_2', i_2', l_2', \mathbf{h})\, \mathrm{d}w_2'}_{\text{adult 1 accepts job, adult 2 quits from } ue} + \underbrace{\lambda_e^1 \sum_{\mathbf{i}'} \sum_{\mathbf{i}' \in \mathbf{i}'} \int_{\boldsymbol{\Omega}^{3+}_{ue}(w_1, \mathbf{i}', l_1, \mathbf{i}', \mathbf{h})} g_{ee}(\mathbf{w}', \mathbf{i}', \mathbf{i}', \mathbf{h})\, \mathrm{d}\mathbf{w}'}_{\text{adult 1 accepts job, adult 2 quits from } ee} \Bigg]
\end{aligned}
$$

where $v^*_{eu}(w_1, i_1, l_1, \mathbf{h})$ is an indicator for $i_1 \in l_1$ being optimal, and $\boldsymbol{\Omega}^{1+}_{eu}$, $\boldsymbol{\Omega}^{2+}_{eu}$, and $\boldsymbol{\Omega}^{3+}_{eu}$ are acceptance sets.

Flow equations (eu) state: job destruction inflows

We also have job destruction induced inflows from the joint state ee when female exogenously loses her job at rate δ_2:

$$\delta_2 \times v^*_{eu}(w_1, i_1, I_1, \mathbf{h}) \times \sum_{I'_2} \sum_{i'_2 \in I'_2} \sum_{i'_1 \in I_1} \int g_{ee}(w_1, w'_2, \mathbf{i}', I_1, I'_2, \mathbf{h}) \, \mathrm{d}w'_2$$

Flow equations (*eu*) state: health transition inflows, *eu*

Inflows due to health transitions from either adult. These could be from an initial single earner state:

$$\underbrace{\sum_{h_1'} \nu_1(h_1|h_1', q_1(i_1)) g_{eu}(w_1, i_1, I_1, h_1', h_2)}_{\text{adult 1 health transition from } eu} + \underbrace{\sum_{h_2'} \nu_2(h_2|h_2', q_2(i_1)) g_{eu}(w_1, i_1, I_1, h_1, h_2')}_{\text{adult 2 health transition from } eu},$$

Flow equations (eu) state: health transition inflows, ee

Or from a dual earner state that results in an endogenous quit:

$$\Big[\underbrace{\sum_{h_1'}\sum_{I_2'}\sum_{i_2'\in I_2'}\sum_{i_1'\in I_1}\int_{\Omega_{eu}^{5+}(w_1,\mathbf{i}',I_1,I_2',\mathbf{h})}\nu_1(h_1|h_1',q_1(\mathbf{i}'))g_{ee}(w_1,w_2',\mathbf{i}',I_1,I_2',h_1',h_2)\,\mathrm{d}w_2'}_{\text{adult 1 health transition from } ee\text{, adult 2 quits}}$$

$$+\underbrace{\sum_{h_2'}\sum_{I_2'}\sum_{i_2'\in I_2'}\sum_{i_1'\in I_1}\int_{\Omega_{eu}^{5+}(w_1,\mathbf{i}',I_1,I_2',\mathbf{h})}\nu_2(h_2|h_2',q_2(\mathbf{i}'))g_{ee}(w_1,w_2',\mathbf{i}',I_1,I_2',h_1,h_2')\,\mathrm{d}w_2'}_{\text{adult 2 health transition from } ee\text{, adult 2 quits}}\Big]$$

$$\times\ v_{eu}^*(w_1,i_1,I_1,\mathbf{h}).$$

Flow equations (eu) state: open enrolment inflows

Finally, we also have positive inflows when an open enrolment event occurs and $i_1 \in I_1$ is optimal given $\langle w_1, I_1, \mathbf{h} \rangle$:

$$v^*_{eu}(w_1, i_1, I_1, \mathbf{h}) \times \eta \times \sum_{i'_1 \in I_1} g_{eu}(w_1, i'_1, I_1, \mathbf{h}).$$

Firm behaviour

Firms are heterogeneous with respect to their productivity $p \sim \Gamma$ and their costs of ϵ of providing different insurance contracts

- As in Burdett and Mortensen (1998) there is *compensation posting*: firms post $\langle w, I \rangle$ which households accept or reject
- Choice of $\langle w, I \rangle$ maximizes profits taking as given the optimal strategies of households and the aggregate distribution $F(w, I)$
- Insurance premiums $r(w; i, I)$ are *not* a firm choice, but determined by an equilibrium self-insurance condition.

Firm profits

- Health is a *productivity factor*: worker flow marginal product given by $p \times a(h)$, with $a(h^H) = 1$, and endogenous $\widetilde{A}(w, I)$ the average health productivity at firm with contract (w, I)
- Conditional on I, firm profits (exclusive of any fixed costs) are

$$\pi(w, I; p) = \left[p \cdot \widetilde{A}(w, I) - w\right] \times \ell(w, I),$$

where $\ell(w, I)$ is the total firm size $\triangle$

- Let $\pi_I(p) = \max_w \pi(w, I; p)$, with the insurance offering

$$I(p; \epsilon) = \arg\max_{I \in \mathcal{I}} \{\pi_I(p) - \bar{\epsilon}_I + \varepsilon_I\}.$$

- Assume generalized extreme value distribution for ε_I to allow for correlation in value of providing different insurance types.

[Market equilibrium ▹]

II. Estimation, identification, and model fit

Estimation and identification

Equilibrium of the model is complicated. Implement a multistep estimator that doesn't require the equilibrium to be computed:

1. Assume $F_I(w)$ known up to finite parameter vector. Estimate this, sector sizes Δ_I, and worker-side parameters
2. Given estimates from (1), solve for the steady state worker flows and the implied firm size objects. *Assuming* $a(h)$ *is known* obtain $\widetilde{A}(w, I)$, and using the firms' FOC

$$p \equiv w_I^{-1}(w) = \frac{w\ell'(w, I) + \ell(w, I)}{\widetilde{A}(w, I)\ell'(w, I) + \ell(w, I)\widetilde{A}'(w, I)},$$

where all partial derivatives are w.r.t. the wage w.

Estimation and identification (2)

3. The firm productivity distribution is identified by noting that the conditional wage offer distributions must satisfy

$$F_I(w_I(p)) = \frac{1}{\Delta_I} \int_{\underline{p}}^{p} \Delta(I;p)\, \mathrm{d}\Gamma(p).$$

From which we obtain identification of the productivity

$$\gamma(p) = \sum_I \Delta_I \times f_I(w_I(p)) \times w_I'(p).$$

4. Non-parametric estimates of the sector probabilities given by

$$\widehat{\Delta}(I;p) = \frac{\Delta_I \times f_I(w_I(p)) \times w_I'(p)}{\gamma(p)}.$$

5. Identification of sector cost distribution follows from implied $\pi_I(p)$ and distributional assumptions on ϵ_I.

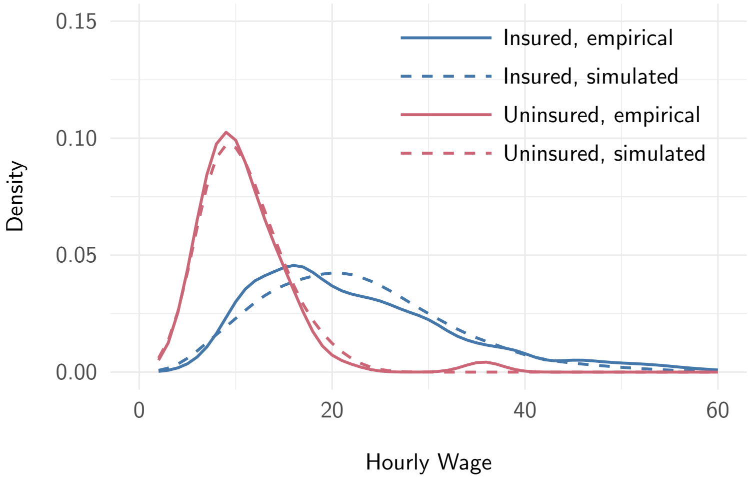
Empirical specification

- Method of simulated moments using SIPP data for worker labour moments, MEPS data for medical expenditure, Kaiser Family Foundation Survey for firm size/offering
- Assume leisure flows α normally distributed and statistically independent in household, and first step conditional wage offer distributions $F_I(w)$ follow beta distribution on $[\underline{w}_I, \overline{w}_I]$
- Accurate tax schedules calculated with TAXSIM; replaced with differentiable function ▹ (see MaCurdy et al., 1990)
- Demographic types: couples with children / couples no children / single men / single women with children / single women no children; $H = 2$ health types (healthy/unhealthy).

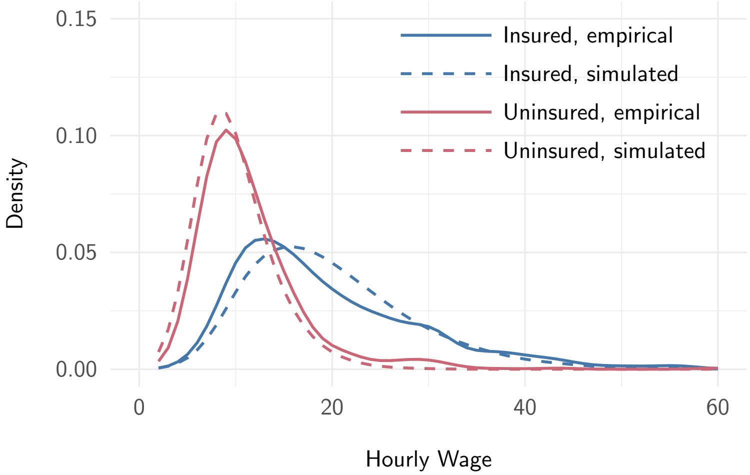
In baseline, very few firms offer employee only insurance; *estimate as two sector model and show this is true in equilibrium*.

Wage distribution: married men with children

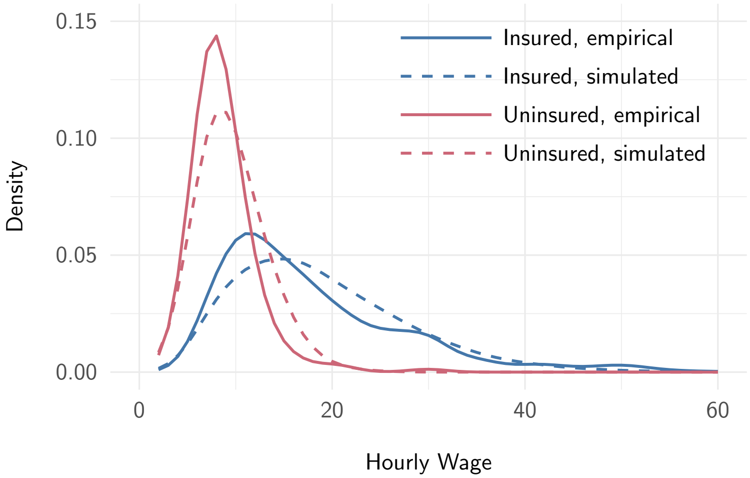
Wage distribution: married men no children



Wage distribution: single men no children

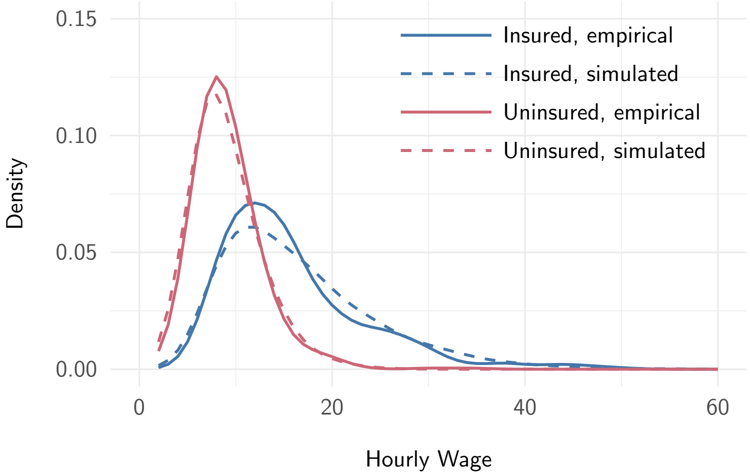


Wage distribution: married women with children

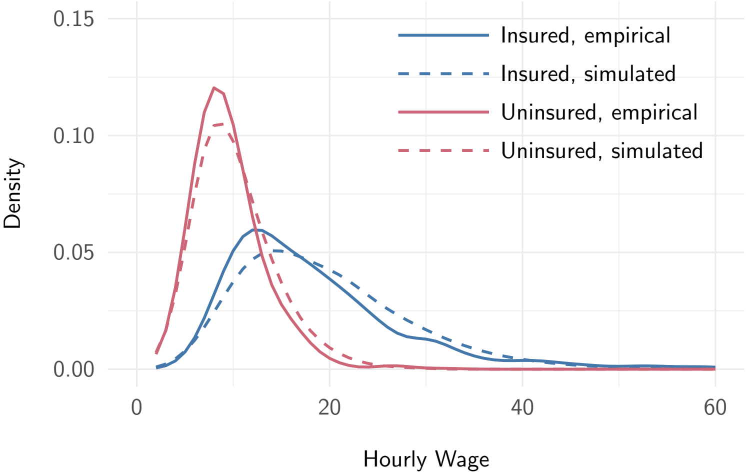


Wage distribution: married women no children

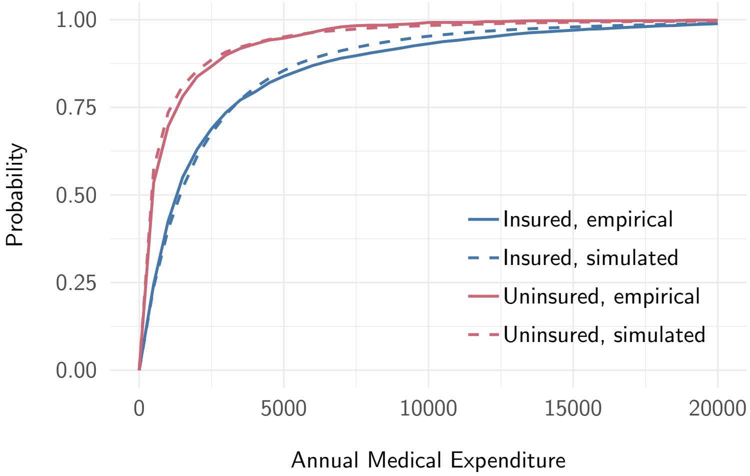
Wage distribution: single women with children



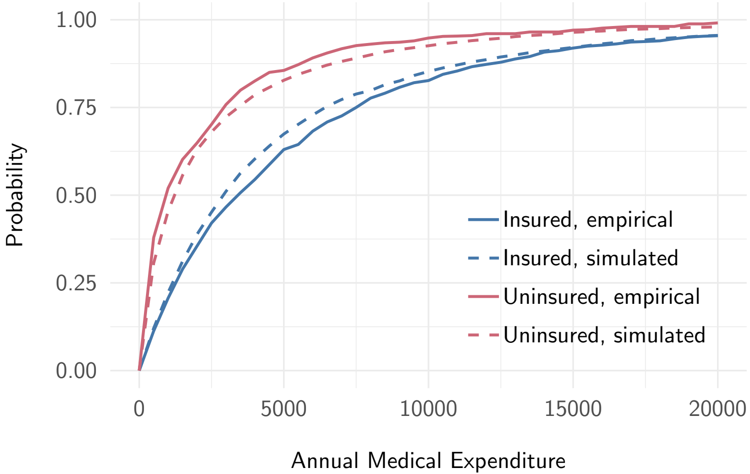
Wage distribution: single women no children



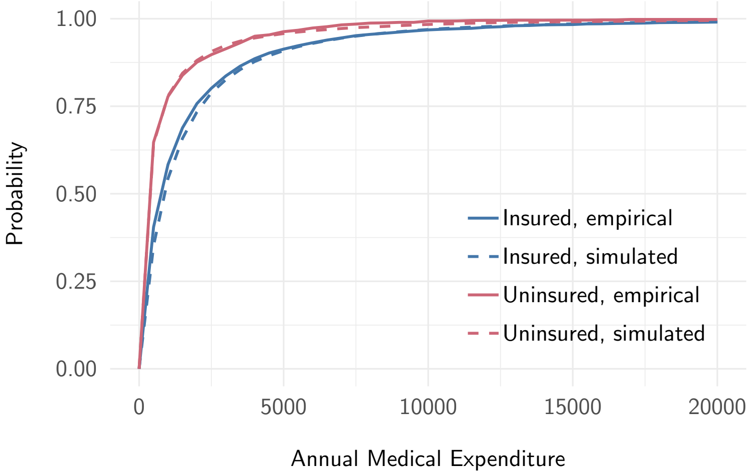
Medical expenditure distribution: healthy women



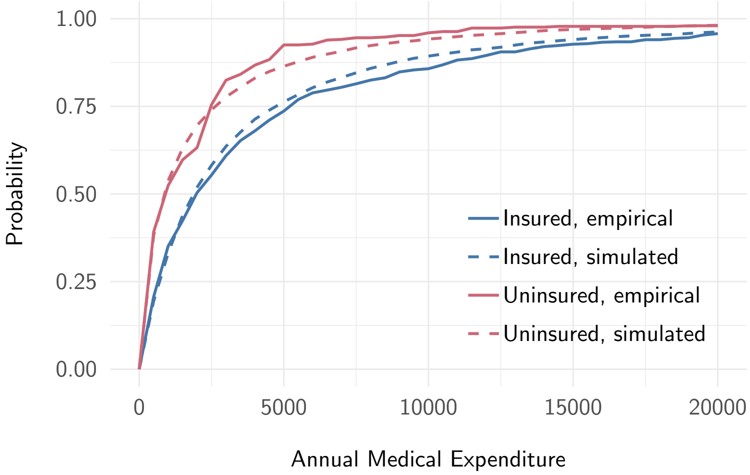
Medical expenditure distribution: unhealthy women



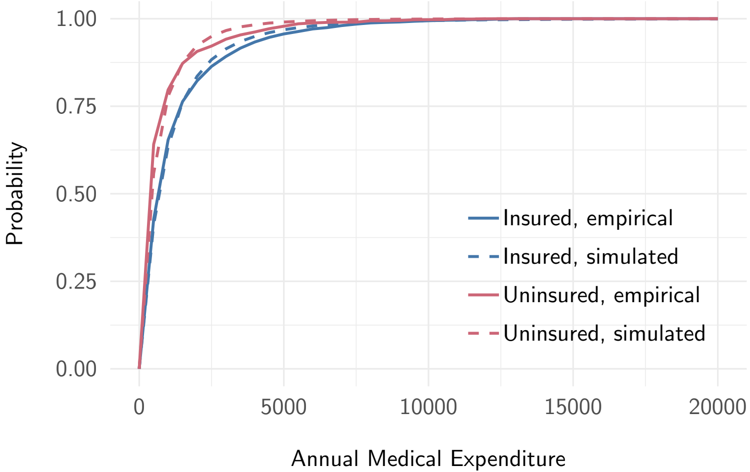
Medical expenditure distribution: healthy men



Medical expenditure distribution: unhealthy men



Medical expenditure distribution: children



Annual employment transitions: married

	Children		No Children	
	Data	Model	Data	Model
Transitions from employment				
... to non-emp.	0.08	0.12	0.03	0.06
... to emp. (ins.)	0.08	0.17	0.11	0.13
... to emp. (unins.)	0.02	0.03	0.01	0.01
Transitions from non-employment				
... to emp. (ins.)	0.11	0.16	0.19	0.17
... to emp. (unins.)	0.06	0.06	0.04	0.04

Annual employment transitions: single

	Single Men		Single Women			
	No Children		Children		No Children	
	Data	Model	Data	Model	Data	Model
Transitions from employment						
. . . to non-emp.	0.05	0.06	0.10	0.08	0.04	0.07
. . . to emp. (ins.)	0.08	0.05	0.07	0.03	0.07	0.06
. . . to emp. (unins.)	0.06	0.03	0.07	0.02	0.05	0.02
Transitions from non-employment						
. . . to emp. (ins.)	0.12	0.11	0.05	0.09	0.07	0.11
. . . to emp. (unins.)	0.15	0.05	0.19	0.06	0.09	0.04

Annual health transitions: married

	Married Men				Married Women			
	Insured		Uninsured		Insured		Uninsured	
	Data	Model	Data	Model	Data	Model	Data	Model
Transitions from healthy								
. . . to healthy	0.98	0.97	0.92	0.88	0.97	0.98	0.92	0.87
. . . to unhealthy	0.02	0.03	0.08	0.12	0.03	0.02	0.08	0.13
Transitions from unhealthy								
. . . to healthy	0.65	0.60	0.41	0.32	0.56	0.65	0.45	0.33
. . . to unhealthy	0.35	0.40	0.59	0.68	0.44	0.35	0.55	0.67

Annual health transitions: single

	Single Men				Single Women			
	Insured		Uninsured		Insured		Uninsured	
	Data	Model	Data	Model	Data	Model	Data	Model
Transitions from healthy								
. . . to healthy	0.98	0.97	0.92	0.88	0.97	0.98	0.92	0.87
. . . to unhealthy	0.02	0.03	0.08	0.12	0.03	0.02	0.08	0.13
Transitions from unhealthy								
. . . to healthy	0.65	0.60	0.41	0.32	0.56	0.65	0.45	0.33
. . . to unhealthy	0.35	0.40	0.59	0.68	0.44	0.35	0.55	0.67

Joint employment status and insurance coverage

		Female							
		$e=1,\ q=1$		$e=1,\ q=0$		$e=0,\ q=1$		$e=0,\ q=0$	
		Data	Model	Data	Model	Data	Model	Data	Model
Male	$(e_1, q_1) = (1,1)$	0.68	0.60	0.01	0.01	0.12	0.17	0.02	0.01
	$(e_1, q_1) = (1,0)$	0.01	0.01	0.04	0.02			0.02	0.03
	$(e_1, q_1) = (0,1)$	0.05	0.10						
	$(e_1, q_1) = (0,0)$	0.01	0.01	0.02	0.02			0.03	0.02

Firm size

	Firm Size		Offer ESHI	
	Data	Model	Data	Model
0–10	0.65	0.59	0.49	0.35
10–25	0.21	0.21	0.78	0.73
25–50	0.08	0.11	0.87	0.95
50–100	0.03	0.07	0.90	1.00
100+	0.04	0.02	0.98	1.00

III. Implementing the Affordable Care Act

The Affordable Care Act

1. **Health Insurance Exchanges**. Exchanges allow individuals without ESHI to purchase community rated insurance
2. **Premium Subsidies**. Individuals who do not have access to ESHI, either through their own of their spouses' employer, are eligible to receive income-contingent subsidies toward the purchase of health insurance from the exchanges.
3. **Individual Mandate**. All individuals must have health insurance or face an income-contingent tax penalty
4. **Employer Mandate**. Employers with 50 or more employees must provide health insurance to full-time workers and their dependents (*note:* does not include spouses) or pay a fine

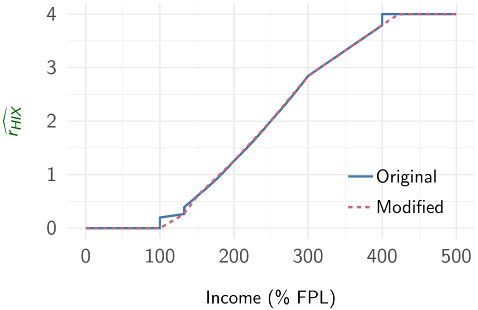
[HIX] [Subsidies] [Individual mandate] [Employer mandate] ▶▶|

The Affordable Care Act: health insurance exchanges

- Marketplace insurance has the same impact on health as does ESHI, but provides less coverage, as given by the factor $\nu \leq 1$
- Incorporate non-employer insurance by extending choice set for all employed and non-employed workers ($i = -1$): optimise over set at open-enrolment or qualifying event
- The equilibrium insurance premium r_{HIX} is equal to insurer expected medical payments, multiplied by $(1 + \zeta)$, where ζ is determined by a medical loss requirement in the ACA.

The Affordable Care Act: premium subsidies

- Adult j eligible for subsidy if i) they purchase from exchange ii) don't have access to ESHI through own or spouse's employer
- Subsidy amount depends on r_{HIX} and household income and structure, generating post-subsidy price $\widehat{r_{HIX}}$



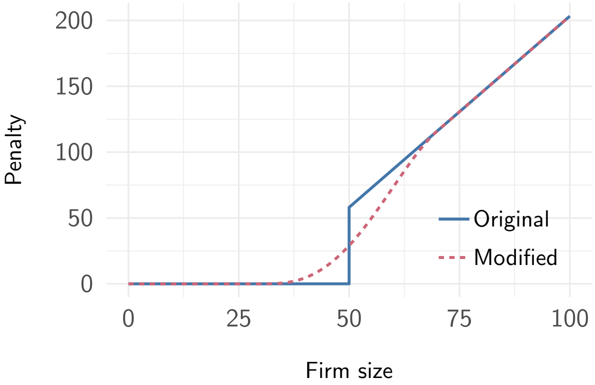
The Affordable Care Act: individual mandate

- Household members who are not insured from any source face a tax penalty
- This is the maximum of a per-person penalty ($695) and an income-based (2.5%) penalty that depends upon household modified gross income (less the applicable tax filing threshold)
- Again, the penalty function is smoothed in the neighbourhood of the effective marginal tax rate changes.

The Affordable Care Act: employer mandate

- The ACA requires firms with 50+ full-time employees to provide ESHI to workers and dependents or pay a fine. (The definition of dependents does not include employee's spouse.)
- Employer penalty not a pre-tax deduction: scale by $(1 - \tau_b)^{-1}$, where τ_b is combined federal and state business income tax
- The per-employee penalty for large non-complying firms ($2904 in 2016), applies to all workers less the first 30
- Firm penalty function $\mho(\ell, I)$ is replaced with *sufficiently smooth differentiable* function of firm size $\ell(w, I)$ for $I = 0$.

The Affordable Care Act: employer mandate

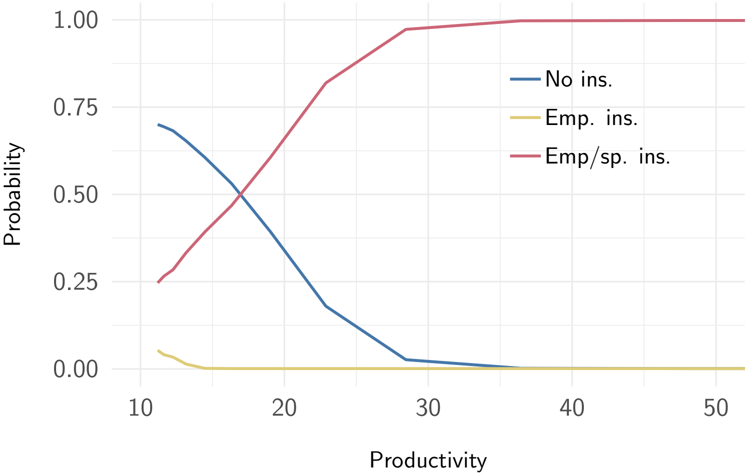


Impact of the ACA

Key results:

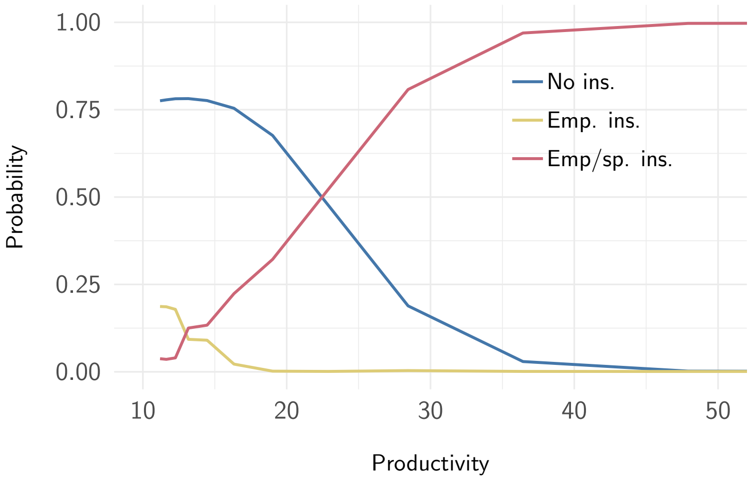
- Significant changes in firms' insurance offering decisions: overall offering rate decreases, "employee-only" contract emerges among low productivity firms
- Changes households' sources of insurance coverage, reduces uninsurance rate and improves health outcomes
- Reduces households' valuation of spousal insurance, and the link between insurance coverage and job-mobility.

Insurance offering decision: pre-ACA



$\Delta_1 = 0.43$ (No ins.), $\Delta_2 = 0.01$ (Emp. ins.), $\Delta_3 = 0.56$ (Emp/sp. ins.)

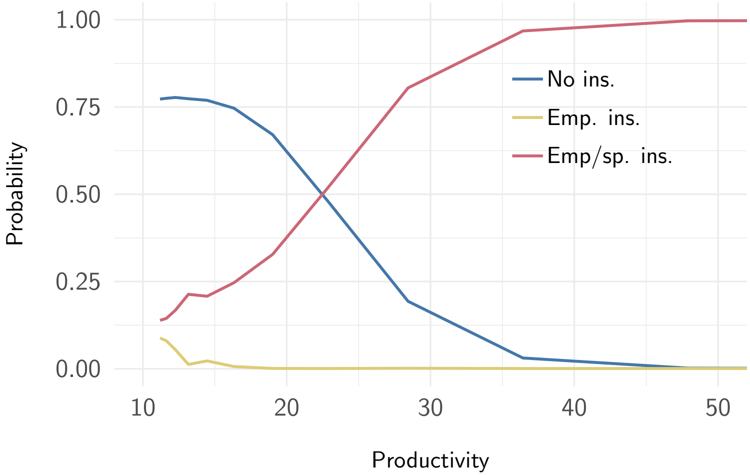
Insurance offering decision: post-ACA



$\Delta_1 = 0.60$ (No ins.), $\Delta_2 = 0.06$ (Emp. ins.), $\Delta_3 = 0.34$ (Emp/sp. ins.)

Insurance offering decision: modified-ACA

Access to spousal health insurance does not restrict subsidy eligibility



$\Delta_1 = 0.60$ (No ins.), $\Delta_2 = 0.02$ (Emp. ins.), $\Delta_3 = 0.38$ (Emp/sp. ins.)

Insurance coverage: *ee* state

		Female			
		Own ESHI	Spousal ESHI	HIX	Uncovered
Male	Own ESHI	0.17 / 0.10	0.39 / 0.34	0.00 / 0.08	0.07 / 0.06
	Spousal ESHI	0.23 / 0.17	0.00 / 0.00	0.00 / 0.00	0.00 / 0.00
	HIX	0.00 / 0.05	0.00 / 0.00	0.00 / 0.07	0.00 / 0.02
	Uncovered	0.05 / 0.03	0.00 / 0.00	0.00 / 0.02	0.09 / 0.05

Notes: Pre-ACA / Post-ACA

Insurance coverage: *eu* state

		Female			
		Own ESHI	Spousal ESHI	HIX	Uncovered
Male	Own ESHI	0.00 / 0.00	0.72 / 0.69	0.00 / 0.06	0.06 / 0.04
	Spousal ESHI	0.00 / 0.00	0.00 / 0.00	0.00 / 0.00	0.00 / 0.00
	HIX	0.00 / 0.00	0.00 / 0.00	0.00 / 0.19	0.00 / 0.00
	Uncovered	0.00 / 0.00	0.00 / 0.00	0.00 / 0.01	0.21 / 0.01

Notes: Pre-ACA / Post-ACA

Household outcomes

	Base	ACA
Married Couples		
Male employed, female employed	0.75	0.73
Male employed, female non-employed	0.16	0.18
Male non-employed, female employed	0.08	0.08
Insurance rate	0.82	0.90
Spousal insurance rate	0.64	0.54
Male good health	0.93	0.95
Female good health	0.93	0.95
Single Individuals		
Employed	0.70	0.65
Insurance rate	0.55	0.95
Good health	0.88	0.98

The value of spousal insurance (I)

- Quantify how much households' value the availability of spousal ESHI, and how these valuations change post-ACA
- Define welfare $\mathcal{W}(\boldsymbol{\alpha}, \mathbf{x})$ of a type-$(\boldsymbol{\alpha}, \mathbf{x})$ household to be the value functions weighted by respective steady-state measures
- Then, remove the availability of spousal health insurance, but otherwise leave compensation structure unchanged
- Following this, the *direct valuation* of spousal insurance is the change in consumption such that initial welfare is attained.

The value of spousal insurance (II)

Pre-ACA:

- Average (mean) direct valuation is \$1160 (for households with low incidence of joint-employment this is \$2290)
- The *equilibrium valuation* allows firm responses: mean valuation of \$900 (\$1900 if low incidence of joint-employment)
- In the new equilibrium, the total insurance offering probability is $(\Delta_1 + \Delta_2)$ is around 5 ppt higher.

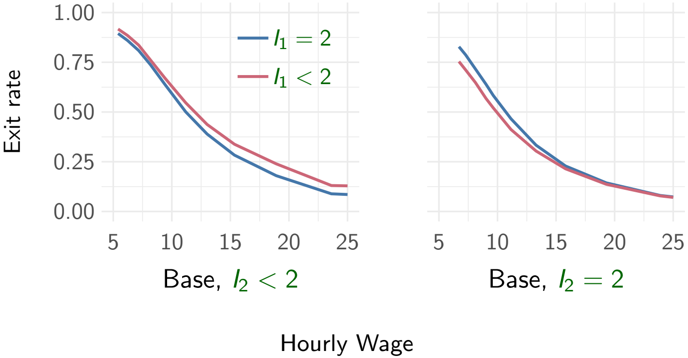
Post-ACA:

- ACA changes these values considerably: average direct value falls to \$260 (equilibrium values slightly lower)
- If no premium subsidies were offered, the direct valuation increase to \$410.

Job mobility

- How does spousal health insurance affect job mobility, and how does this change under ACA?
- Consider the exit rate from a job as a function of the wage, conditional on own and spouses insurance coverage
- Differences (under given equilibrium) are only generated by differences in job-acceptance behaviour.

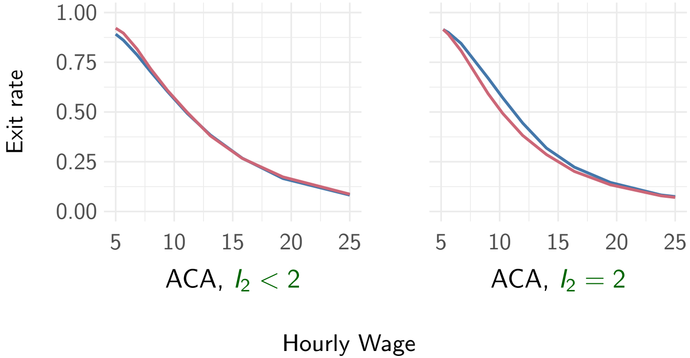
Married womens' exit rate to another job: pre-ACA



Left: wife without emp/sp. $\Rightarrow$ exit rate higher when husband without emp/sp.

Right: wife with emp/sp. $\Rightarrow$ exit rate higher when husband with emp/sp.

Married womens' exit rate to another job: post-ACA



Conclusion

- ACA may change the incentives for firms to offer spousal health insurance for several reasons
- We propose an equilibrium model of joint household labour supply in a frictional labour market with endogenous compensation package offerings by the firm
- Results suggest long-run impact of ACA is to reduce firms' insurance offering probability, with "employee-only" insurance emerging amongst low-productivity firms
- ACA provisions greatly reduces the value of spousal insurance, and reduces the extent to which insurance coverage matters for job mobility decisions.

Tax schedule implementation

Tax schedules (a function of *family* earnings and demographic characteristics $\mathbf{x}$) are first calculated using TAXSIM:

- Smooth the underlying tax schedules using the method proposed by MaCurdy et al. (1990)
- With K tax brackets, the marginal tax rate approximation at earnings z and total UI receipt b is given by:

$$\widehat{MTR}(z; b, \mathbf{x}) = \sum_{k=1}^{K} \left[\Phi^{k}_{\mathbf{x},b}(z) - \Phi^{k+1}_{\mathbf{x},b}(z) \right] \tau^{k}_{\mathbf{x},b},$$

  where $\tau^{k}_{\mathbf{x},b}$ is tax rate at the k^{th} bracket and $\Phi_{\mathbf{x},b^k}$ is normal CDF with mean equal to k^{th} bracket threshold and s.d. $\sigma^{k}_{\mathbf{x}}$
- Set $\sigma^{k}_{\mathbf{x}} = 400$ (annual dollars) and apply same smoothing to premium subsidy and tax penalty functions in counterfactuals.

[◁ Back]

Health and medical expenditure

Current health status is measured by the scalar h.

- Total H ordered health statuses, $h^1 < h^2, \ldots, < h^H$

Integral representation of ${}_2F_1$ hypergeometric function

$$
{}_2F_1(p, q; r, z) = \frac{\Gamma(r)}{\Gamma(q)\Gamma(r-q)} \times \int_0^\infty y^{-q+r-1}(y+1)^{p-r}(y-z+1)^{-p}\,\mathrm{d}y.
$$

See Abramowitz and Stegun (1964).

not observed to household (use *expected* flow utilities)

- Obtain expressions for expected flow utilities and medical expenditure in terms of Gauss ${}_2F_1$ hypergeometric function △

Gamma-Gompertz distribution (1)

We parameterize the conditional expenditure distribution M_j^+ as Gamma-Gompertz (Bemmaor and Glady, 2012):

- Three parameter distribution: b (scale), and s, β (shape) > 0; untruncated CDF: $M^+(m) = 1 - \beta^s / [\beta - 1 + \exp(b \cdot m)]^s$
- Mean conditional expenditure for $m \in [0, x]$ given by:

$$\begin{aligned}
\mathbb{E}[m|m \in [0,x]] &= \frac{1}{M^+(x)} \int_0^x \frac{mbse^{bm}\beta^s}{(\beta - 1 + e^{bm})^{s+1}} \, \mathrm{d}m \\
&= \frac{1}{M^+(x)} \left[\mathbb{E}[m] - \frac{\beta^s x}{(\beta - 1 + e^{bx})^s} \right. \\
&\quad \left. - \frac{\beta^s}{bs(\beta - 1 + e^{bx})^s} \, {}_2F_1 \left(s, 1; s+1, \frac{\beta - 1}{\beta - 1 + e^{bx}} \right) \right]
\end{aligned}$$

where ${}_2F_1$ is the Gauss hypergeometric function △.

[◃ Back]

Gamma-Gompertz distribution (2)

Suppose adult 1 is uninsured so that $o(m_1|q_1 = 0) = m_1$, while adult 2 is fully insured with $o(m_2|q_2 = 1) = 0$. Then,

$$\int U(y - o(m_1|q_1), P_1, P_2)\, \mathrm{d}M_1(m_1|h_1, q_1)$$
$$= \alpha_1(1 - P_1) + \alpha_2(1 - P_2) - \exp(-\psi y) R_1(\psi, h_1, 0, M_1(\cdot)),$$

where the *risk adjustment* factor R_1 is:

$$R_1(\psi, h_1, 0, M_1(\cdot)) = M_1^0 + (1 - M_1^0)$$
$$\times \frac{1}{M^+(x)} \Big[{}_2F_1(1, -\psi/b, 1 - s, \beta)$$
$$-(1 - M^+(x)) e^{\psi x}\ {}_2F_1\left(1, -\psi/b, 1 - s, \frac{e^{bx} - 1 + \beta}{e^{bx}}\right)\Big]$$

When $x \to \infty$, R_1 is finite when $\psi < bs$ [MGF exists].

[◃ Back]

Gamma-Gompertz distribution (1)

We parameterize the conditional expenditure distribution M_j^+ as Gamma-Gompertz (Bemmaor and Glady, 2012):

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Integral representation of ${}_2F_1$ hypergeometric function ×

$$
{}_2F_1(p, q; r, z) = \frac{\Gamma(r)}{\Gamma(q)\Gamma(r-q)} \times \int_0^\infty y^{-q+r-1}(y+1)^{p-r}(y-z+1)^{-p}\,\mathrm{d}y.
$$

See Abramowitz and Stegun (1964).

$\mathbb{E}$

where ${}_2F_1$ is the Gauss hypergeometric function △.

[◁ Back]

Firm profits

Firm size

- Measure of male workers with wage w, insurance choice i, insurance offerings I, and joint health status $\mathbf{h}$ is

$$\ell_1(w,i,I,\mathbf{h}) = \frac{1}{f(w,I)} \int \Big\langle g_{eu}(w,i,I,\mathbf{h};\boldsymbol{\alpha},\mathbf{x})$$

$$+ \sum_{I_2'} \sum_{i_2' \in I_2'} \int g_{ee}(w,w_2',i,i_2',I,I_2',\mathbf{h};\boldsymbol{\alpha},\mathbf{x})\,\mathrm{d}w_2' \Big\rangle\,\mathrm{d}\mathcal{B}(\boldsymbol{\alpha},\mathbf{x}).$$

- The analogous object for females, $\ell_2(w,i,I,\mathbf{h})$, is defined symmetrically. Total firm size is therefore

$$\ell(w,I) = \sum_{\mathbf{h}} \sum_{i \in I} [\ell_1(w,i,I,\mathbf{h}) + \ell_2(w,i,I,\mathbf{h})].$$

Market equilibrium (1)

A market equilibrium is defined by a set of wage offer distributions $F_I(w)$ in each sector $I \in \mathcal{I}$, and a sector choice probability function $\Delta(I;p)$ such that simultaneously:

1. The conditional distribution of wage offers in sector I is given by:
$$F_I(w_I(p)) = \frac{1}{\Delta_I} \int_{\underline{p}}^{p} \Delta(I;p) \, \mathrm{d}\Gamma(p)$$
where $\Delta_I = \int_p \Delta(I;p) \, \mathrm{d}\Gamma(p)$.
2. The strategy of a productivity p firm, conditional on sector choice I, is the wage policy function $w_I(p)$, which maximizes $\pi(w, I;p)$ given the labour supply function $\ell(w, I)$. Given a vector of choice specific costs $\boldsymbol{\epsilon}$, the insurance offering decision of a productivity p is given by $I(p;\boldsymbol{\epsilon})$.

[◃ Back]

Market equilibrium (2)

3. Conditional on the firm productivity level p, the proportion of firms with insurance offerings I is given by $\Delta(I; p)$.
4. Insurance premiums at a productivity p firm, with insurance offerings I, and wage policy $w_I(p)$, are equal to expected medical expenditure conditional upon worker choice $i \in I$, and are given by $r(i; w_I(p), I)$.
5. The expected flow marginal product at a productivity p firm with wage policy $w_I(p)$, insurance offering I, and insurance premiums $\{r(i; w_I(p), I)\}_{i \in I}$ is given by $A(w, I; p)$
6. The behaviour of households of type $(\alpha, \mathbf{x})$ is as described by the household value functions.

[◁ Back]