Should There Be Vertical Choice in Health Insurance Markets?

Victoria Marone
Yale and NBER

Adrienne Sabety
Stanford

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Vertical choice
= Choice over financially vertically differentiated plans

My CZ

Health insurance | Reimbursements | Healthcare advice | Payments | Customer service

Consumer › Health insurance › Deductible

Health insurance deductible: how it works

Everybody aged 18 or over has a compulsory deductible for healthcare provided under their general insurance policy. In 2023, you pay the first €385 for the costs of healthcare yourself and we reimburse the costs above this amount.

Check how much you've already paid of your deductible on 'Mijn CZ'

What is the deductible?

Compulsory deductible

If you are aged 18 or older, you pay a deductible for the first part of healthcare you receive under the general insurance. This is the compulsory deductible.

The amount of the compulsory deductible is set each year by the Dutch government. In 2022, this was €385 and this will remain the same in 2023. The deductible applies to one calendar year (1 January to 31 December). You pay this amount in addition to your premium. Once you have paid the full amount of your compulsory deductible, we will reimburse any costs subsequently incurred.

Vertical choice
= Choice over financially vertically differentiated plans

Voluntary deductible

Besides the €385 compulsory deductible, you can opt to add a voluntary deductible. This could be a good option if you do not need healthcare very often, as you can save on the premium this way. Do bear in mind, however, that when you do require healthcare you will be required to pay more of the costs for this out of your own pocket. If you want to change your voluntary deductible, please let us know on 'Mijn CZ' before 1 January.

How much you can add to your deductible as a voluntary deductible depends on the kind of general insurance policy you have taken out.

- With the 'Zorg-op-maatpolis', 'Zorgkeuzepolis' or 'CZdirectpolis' policies, you can choose a voluntary deductible of €100, €200, €300, €400 or €500.
- If you have the 'Zorgbewustpolis', you can only choose a voluntary deductible of €500.

Vertical choice
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Discount on your premium

The higher your deductible, the greater your discount.

Amount of deductible	**Premium discount per year: CZ**	**Premium discount per year: CZdirect**
€ 385	€0	€0
€ 485	€36	€48
€ 585	€72	€96
€ 685	€108	€144
€ 785	€144	€192
€ 885	€210	€240

How did we get here?

(1) Health insurance markets are highly regulated the world around

- Asymmetric information about healthcare needs
- Dynamic risk (or if you want, fairness concerns) motivating regulation against price discrimination ("community rating")

→ Adverse selection
→ Competition does not deliver socially optimal outcomes (in K-H sense)
→ In particular, too little insurance transacted (Akerlof 1970; RS 1976; et al)

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- But how exactly to do this??

→ Lots of variation across countries

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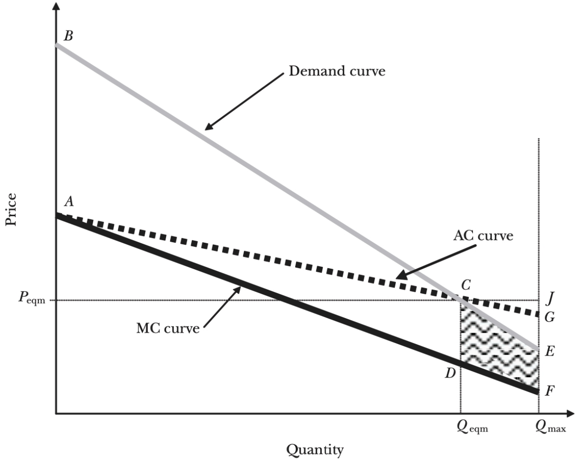
(3) One dimension of this 'design' choice is whether to offer consumers a **choice over coverage levels**

→ This is a **planning problem** >> planner is a price-setter
→ Two important differences from a monopolist : (i) social welfare objective, (ii) can garnish your wages!

Should the planner be doing this?... Where we started

Figure 1
Adverse Selection in the Textbook Setting



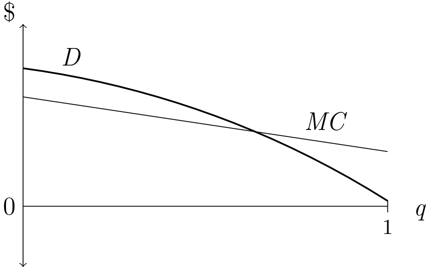
Source: Einav and Finkelstein 2011, JPE

Two-contract example

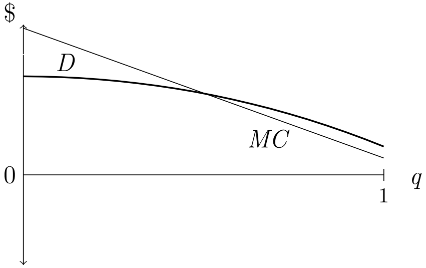
Market for high-coverage contract, outside option is low-coverage contract

- Consider demand (D) and marginal cost (MC) curves for two populations

(a) Population A



(b) Population B



$q \equiv$ Pct. of consumers

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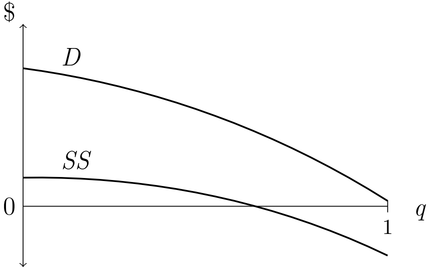

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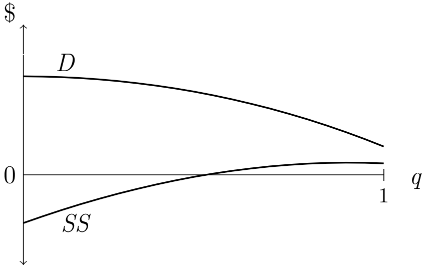

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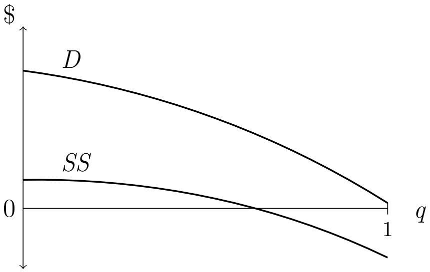

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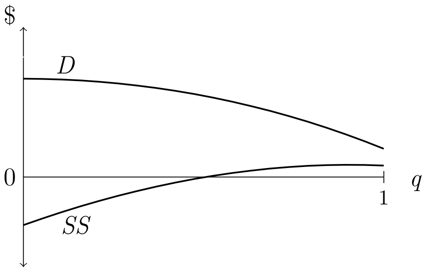

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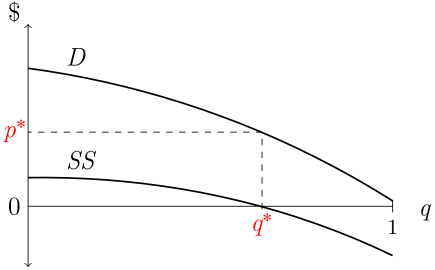

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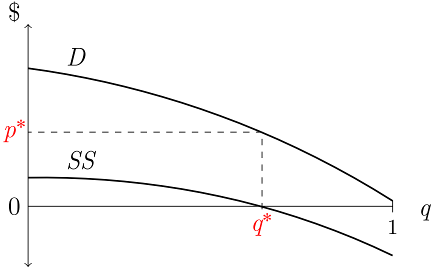

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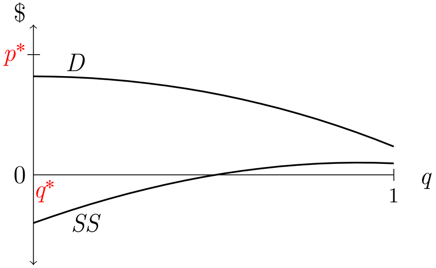

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Theoretical setting

- Regulated health insurance market where
  1. Plans vertically differentiated by coverage level
  2. Regulator knows distribution of consumer types
  3. Regulator can set premiums
     - ↳ Plans supplied by regulator

       or
     - ↳ Competitive private supply + Regulator can tax/subsidize plans
  4. Regulator cannot condition premium on consumer type
- Regulator sets premiums to maximize social surplus

Theoretical model

- Set of potential contracts by $X = \{x_0, x_1, ..., x_n\}$
  - Vertically differentiated (x_0 is null contract)
  - Each with premium p_x
- Population of consumers characterized by type $\theta : \{F, \psi, \omega\}$
  - F = Distribution over potential health states
  - ψ = Risk aversion parameter
  - ω = Moral hazard parameter
- Consumers face two-stage decision problem:
  - Stage 1: Given type θ, discrete choice of contract over X

    $\rightarrow$ Then health state is realized
  - Stage 2: Continuous choice of healthcare spending over $\mathbb{R}_+$

Demand for healthcare and health insurance

Stage 2

- Given contract (x) and realized health state (l)
- Choose healthcare spending (m), trading off
  - *Benefit* of healthcare spending: $b(m, l, \omega)$
  - Out-of-pocket *cost*: $c(m, x)$

$$m^*(l, x, \omega) = \mathsf{argmax}_m \left[\ b(m, l, \omega) - c(m, x)\ \right]$$

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Stage 1

- Choose contract to maximize expected utility

$$U(x, p_x, \theta) = \mathbb{E}\left[\ u_\psi(\ -p_x + b^*(l, x, \omega) - c^*(l, x, \omega))\ \middle|\ l \sim F\ \right]$$

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Constructing willingness to pay and social surplus

- Can express willingness to pay as:

$$WTP(x,\theta) = \underbrace{\mathbb{E}_l[\ c^*(l,x_0,\omega) - c^*(l,x,\omega)\ + b^*(l,x,\omega)]}_{\substack{\text{Value of mean} \\ \text{insured spending}}} + \underbrace{\Psi(x,\theta)}_{\substack{\text{Value of risk} \\ \text{protection}}}$$

- And social surplus as:

$$SS(x,\theta) = \underbrace{WTP(x,\theta)}_{\text{Willingness to pay}} - \underbrace{\mathbb{E}_l[\ k^*(l,x,\omega)\ ]}_{\text{Mean insurer cost}}$$

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Two-contract example, from fundamentals

Market for high-coverage contract, outside option is low-coverage contract

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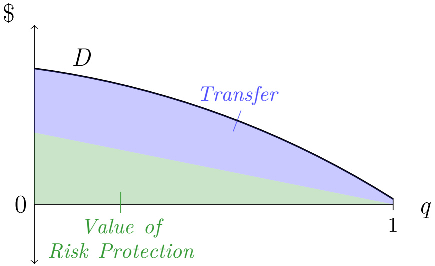

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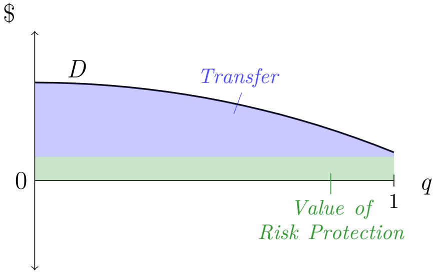

$D \equiv$ Willingness to pay $\quad q \equiv$ Pct. of consumers $\quad SS \equiv$ Social surplus

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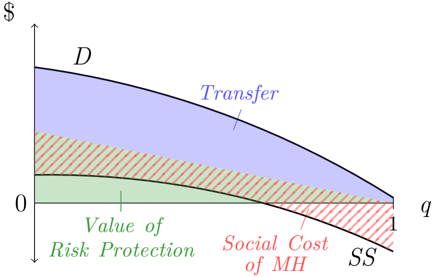

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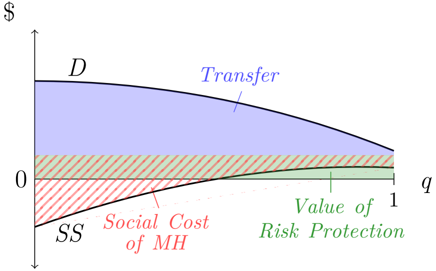

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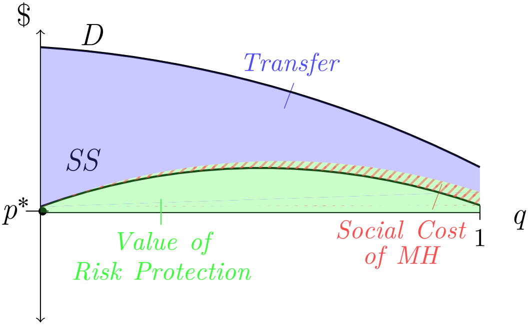
Where we're going

1. Parameterize theoretical model
2. Estimate distribution of $\theta : \{F, \psi, \omega\}$ empirically
3. Construct $WTP(x, \theta)$ and $SS(x, \theta)$ for particular set of plans X

$\rightarrow$ Do consumers with higher WTP have higher efficient coverage level?

$\Rightarrow$ Is offering choice welfare improving?

Empirical findings, basically



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Main empirical findings

- Substantial heterogeneity in efficient coverage level across households
- But efficient coverage level not increasing in willingness to pay

Key Conclusions

- Vertical choice should not be offered in this population
- Optimal single coverage level increases welfare by \$330 per household relative to a status quo with vertical choice
  - *And* leads to a more even distribution of $\underbrace{\text{health spending}}_{E(\text{Out-of-pocket}) + \text{Premium}}$

Empirical setting

- Data from the Oregon Educators Benefits Board
  - All public school employees in Oregon 2008–2013
  - ~45,000 households (~115,000 individuals)
  - 3 insurers offering 14 plan that vary in financial coverage level
- Individual-level panel dataset
  - Health insurance plan choices and choice set
  - Demographics: age, gender, risk score, zip code
- Health insurance claims data

$\Rightarrow$ Key points:
  - Existence of vertical choice
  - Plausibly exogenous variation in premiums and choice sets

Building the empirical model

Stage 2

- Given contract (x) and realized health state (l)
- Choose healthcare spending (m), trading off
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- Given plan (j) and realized health state (l) in time (t)
- Household (k) chooses healthcare spending (m), trading off
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  - Out-of-pocket *cost*: $c_{jt}(m) \rightarrow$ Data

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$$U_{kjt} = \mathbb{E}\left[\boxed{u_\psi(-p_x + b^*(l, x, \omega) - c^*(l, x, \omega))} \mid \underbrace{l \sim F_{kt}}_{\log(l+\kappa_{kt})\sim N(\mu_{kt}, \sigma^2_{kt})} \right]$$

$$j^*_{kt} = \text{argmax}_{j \in J_{kt}} U_{kjt}$$

Parametrizing utility u_ψ and payoffs

- Assume CARA preferences:

$$U_{kjt} = \mathbb{E}\left[-\exp\left(-\psi_k x_{kjt}(l)\right) \mid l \sim F_{kt}\right]$$

Household k
Plan j
Year t

  - ψ_k = Risk aversion
  - $x_{kjt}(l)$ = Money-metric payoff

- Where:

$$x_{kjt}(l) = -p_{kjt} + \underbrace{b^*_{jt}(l,\omega_k) - c^*_{jt}(l,\omega_k)}_{\substack{\text{Net benefit of} \\ \text{utilization}}} + \underbrace{\delta^{f(j)}_{kj}}_{\substack{\text{Insurer-X-} \\ \text{Region FE}}} + \underbrace{\gamma^{inertia}_{kjt}}_{\text{Inertia}} + \sigma_\epsilon \epsilon_{kjt}$$

where $\epsilon_{kjt} \sim$ T1EV

↳ Parameters to estimate

↳ Data

Heterogeneity

- Permit observed and unobserved heterogeneity in household types
  - Health state distribution $F_{kt} : \{\mu_{kt}, \kappa_{kt}, \sigma_{kt}\}$
  - Moral hazard ω_k
  - Risk aversion ψ_k
- Model $\{\mu_{kt}, \omega_k, \mathsf{log}(\psi_k)\}$ as jointly normal

$$\begin{bmatrix} \mu_{kt} \\ \omega_k \\ \mathsf{log}(\psi_k) \end{bmatrix} \sim N\left(\begin{bmatrix} \bar{\mu}_{kt} \\ \boldsymbol{\beta}^{\omega} \mathbf{X}_k^{\omega} \\ \boldsymbol{\beta}^{\psi} \mathbf{X}_k^{\psi} \end{bmatrix}, \begin{bmatrix} \sigma_{\mu}^2 & & \\ \sigma_{\omega,\mu}^2 & \sigma_{\omega}^2 & \\ \sigma_{\psi,\mu}^2 & \sigma_{\omega,\psi}^2 & \sigma_{\psi}^2 \end{bmatrix} \right)$$

Estimation

- Household (N = 44,562), plan (N = 14), year (N = 5) panel
- Estimate parameters by maximizing likelihood that
  - Households spend observed spending, given chosen plan
  - Households choose observed plan

→ Numerically integrate over
  - Distribution of unobserved heterogeneity (ψ_k, ω_k, μ_{kt})
  - Household health state distributions (F_{kt})

→ Analytically integrate over household preference shock (ϵ_{kjt})

Identification

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1. Why do households in more generous plans have higher spending if they are observationally equivalent?

- Moral hazard (ω)
- Adverse Selection (on unobservables) (σ_μ)

Identification

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- Moral hazard (ω)
  - Similar households facing different menus for exogenous reason
  - If assignment to higher coverage $\Rightarrow$ higher spending: Higher estimated ω
- Adverse Selection (on unobservables) (σ_μ)
  - Similar households facing similar menus
  - Why make different choices?
    - Private health information $\rightarrow$ if high spending choose high coverage
    - Idiosyncratic shock σ_ϵ $\rightarrow$ if not

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  - $\rightarrow$ Different households facing similar menus

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  → Different households facing similar menus

3. Is there additional heterogeneity in preferences (σ_ω and σ_ψ)?

- Households make repeated choices over time
  → Same household with different covariates facing different menus

Distribution of household types

		Mean	SD
Health state dist.	κ_k	0.72	0.46
	σ_k	1.09	0.17
	μ_k	1.30	1.04
Moral hazard	ω_k	1.42	0.32
Risk aversion	ψ_k	1.12	0.64

Relative to \$000s

- No insurance to full insurance increases spending by \$1,420
  - $\approx$ 25% of median total healthcare spending
- To avoid a normally distributed gamble with mean \$0 and SD \$900
  - Mean household is willing to pay \$454

Parameter estimates | Joint dist. | Fit: Choices | Fit: Spending

Mapping from theoretical model

$$WTP(x,\theta) = \underbrace{\mathbb{E}_l[c^*(l,x_0,0) - c^*(l,x,0) + v^*(l,x,\omega)]}_{\substack{\textit{Value of mean}\\ \textit{insured spending}}} + \underbrace{\Psi(x,\theta)}_{\substack{\textit{Value of risk}\\ \textit{protection}}}$$

$$SS(x,\theta) = \underbrace{\Psi(x,\theta)}_{\substack{\textit{Value of risk}\\ \textit{protection}}} - \underbrace{\mathbb{E}_l[k^*(l,x,\omega) - k^*(l,x,0) - v^*(l,x,\omega)]}_{\substack{\textit{Social cost}\\ \textit{of moral hazard}}}$$

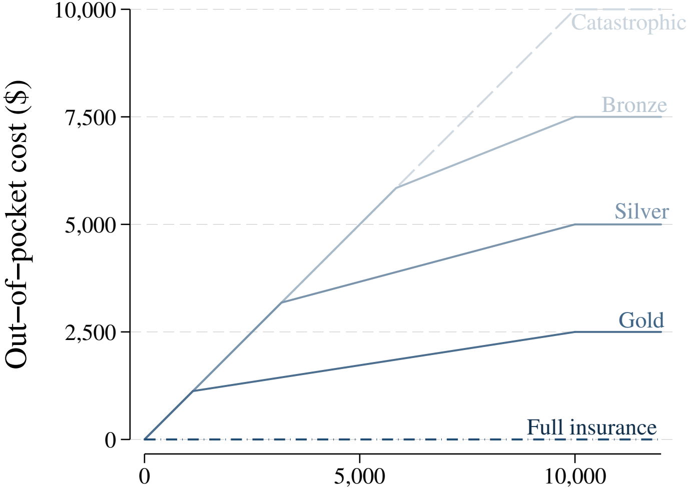
- Have estimates of consumer types $\rightarrow \theta_k = \{F_k, \psi_k, \omega_k\}$
- Have parameterizations of consumer utility $\rightarrow \{b, u\}$

$\rightarrow$ Need some plans (X) $\rightarrow x : \{c, k\}$

  - Plan $x \equiv$ {deductible, coinsurance rate, out-of-pocket maximum}

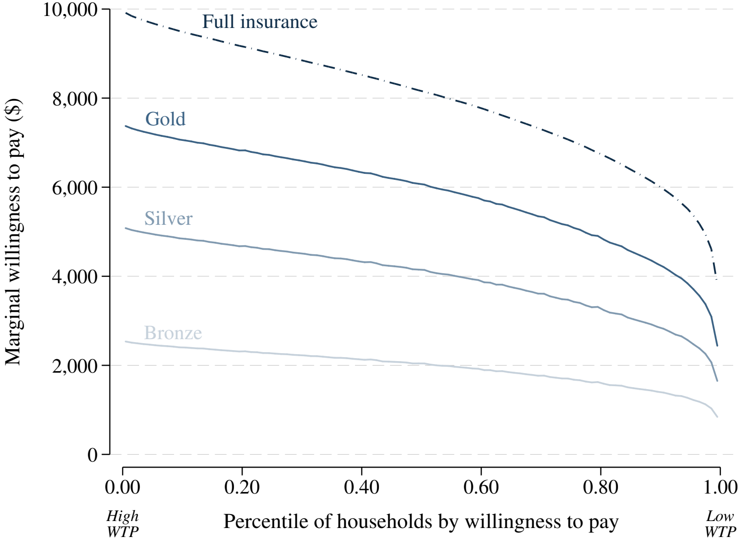
Plans to consider

Out-of-pocket cost functions



Willingness to pay

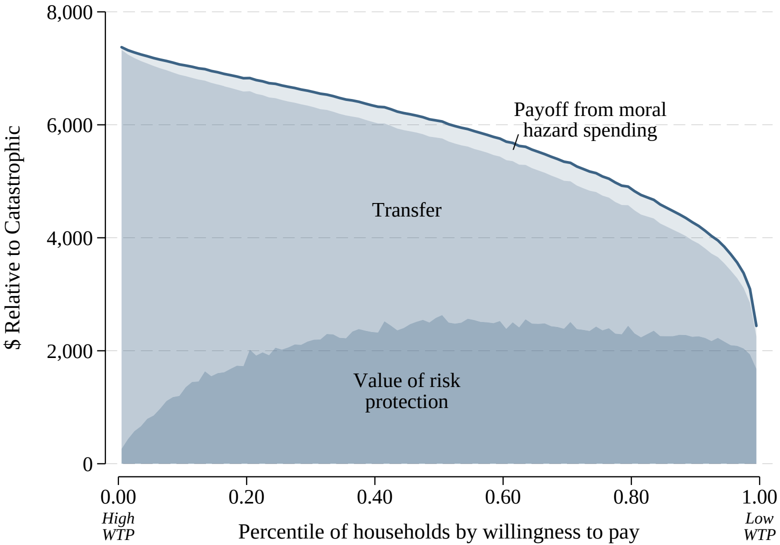
Relative to Catastrophic



Construction Spending by WTP

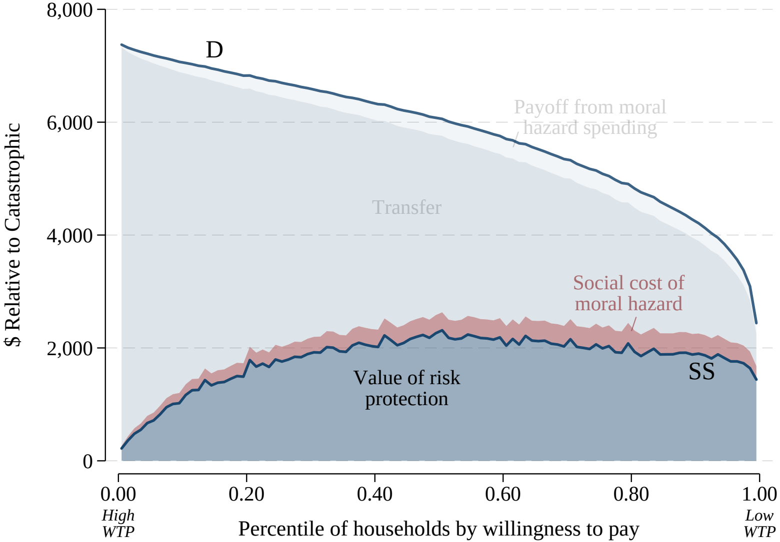
Breakdown of willingness to pay

For Gold plan

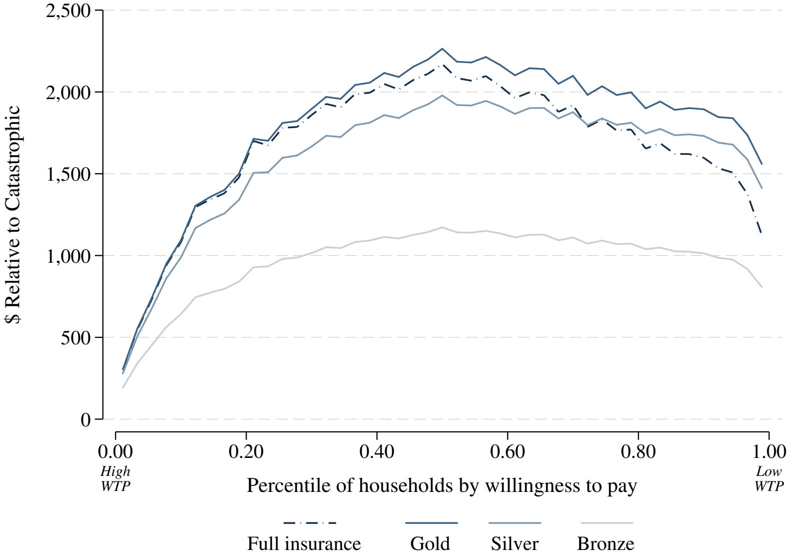


Breakdown of willingness to pay

For Gold plan

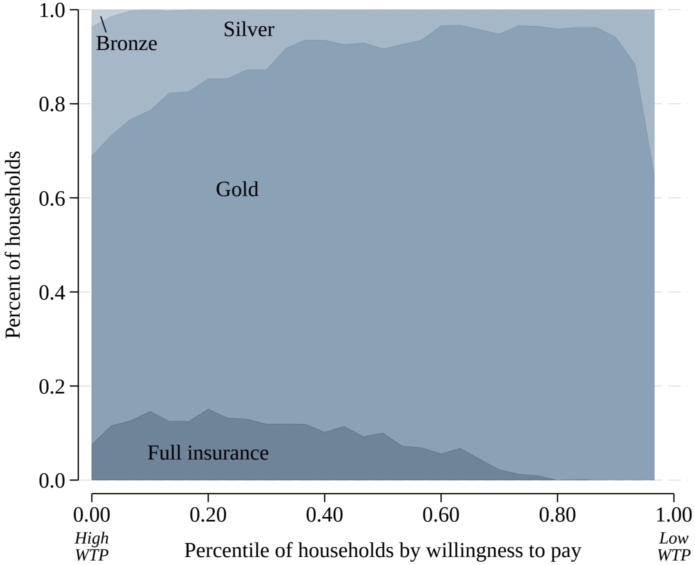


Social surplus from incremental insurance



RP and MH First-best

Heterogeneity in efficient level of insurance



Welfare under alternative policies

	Policy	Surplus per HH†	% Enrollment				
			Full	Gold	Silver	Bronze	Ctstr.
(1)	Regulated pricing with community rating	\$1,739	–	1.00	–	–	–

†Relative to allocating everyone in Catastrophic

Welfare under alternative policies

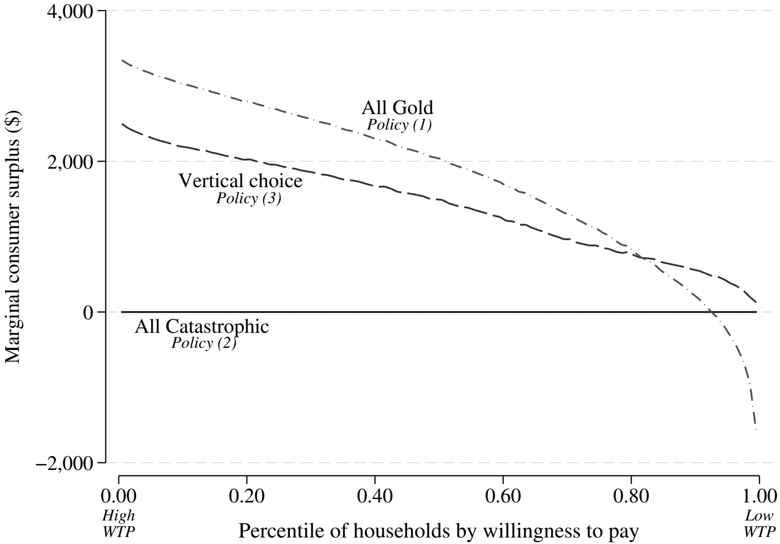
	Policy	Surplus per HH†	% Enrollment				
			Full	Gold	Silver	Bronze	Ctstr.
(1)	Regulated pricing with community rating	$1,739	–	1.00	–	–	–
(2)	Competitive pricing with community rating	$0	–	–	–	–	1.00
(3)	Subsidies to support vertical choice	$1,409	0.01	0.07	0.63	0.28	0.01

†Relative to allocating everyone in Catastrophic

⇒ Putting everyone in Gold (1) generates additional $330 in welfare per household relative to status quo vertical choice (3)

Distribution of marginal consumer surplus

Marginal consumer surplus = marginal WTP - marginal premium



Concluding thoughts

- Efficiency of vertical choice is theoretically ambiguous
  - Consumer heterogeneity is not a sufficient condition
  - Depends whether high-WTP consumers should have higher coverage
- To implement pooling, only need to enforce a minimum coverage level
  - If some should get more coverage, competitive market could supply it
- Private and social incentives may not align
  - Not clear helping consumers privately optimize increases welfare

Household summary statistics

	Median	Mean	Std. Dev.
Employee premium ($)	0	880	1,869
Insurer premium ($)	11,801	11,500	3,547
Total spending ($)	4,620	10,754	19,749
Out-of-pocket spending ($)	1,093	1,694	1,822
Employee age	49	47	10
Household mean age	38	40	14
Household size	2.0	2.6	1.4

Percent of household-years

Made unforced insurer switch	0.03	Individual	0.28
Made unforced plan switch	0.17	Family	0.72

Number of individuals	115,354
Number of households	44,562
Number of household-years	142,071

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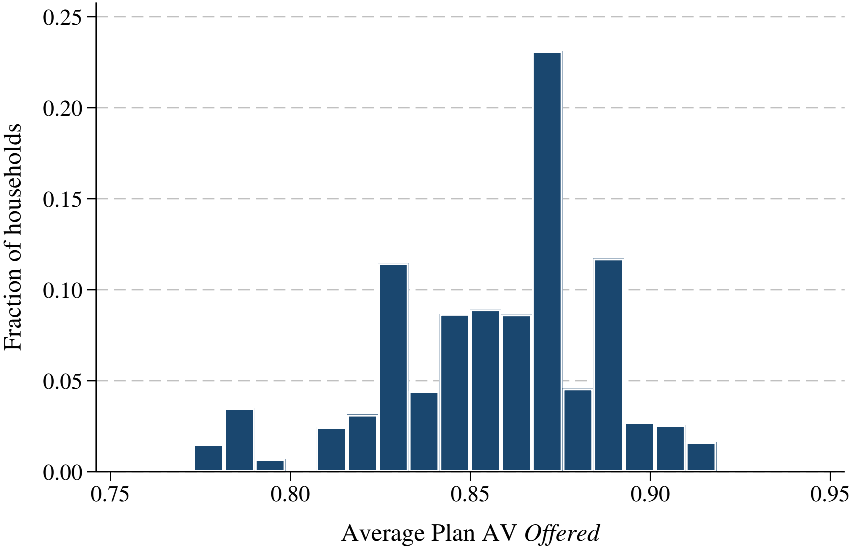
Variation in plan menu generosity

2009



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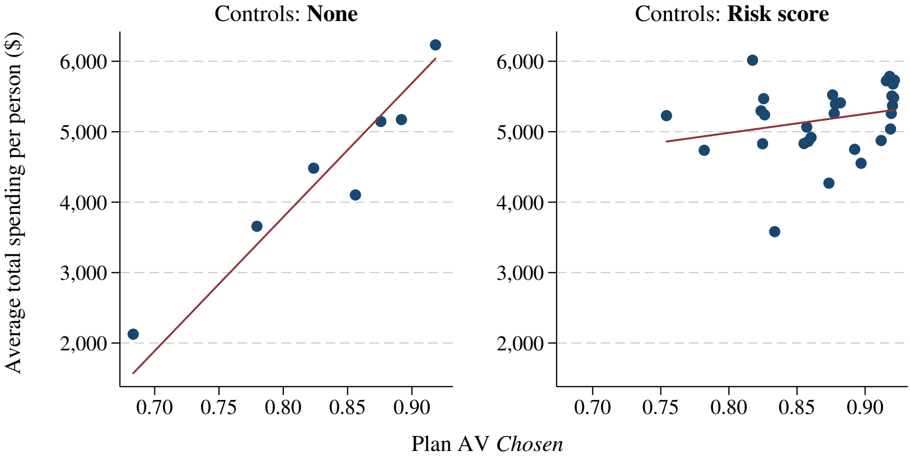
Households with higher coverage spend more, even conditional on risk score

2009, Moda plans only



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Key identifying variation: Plan menus

- Plan choice set and employee premiums vary by
  - School district ($n = 187$)
  - Employee type ($n = 18$)
  - Family structure ($n = 4$)
- Determined by administrative committees in each school district
  - Cap of 4 plans (2008–2011)
  - Part of negotiations with local teachers union

Key identifying assumption:

$\Rightarrow$ Variation in plan menu generosity not correlated with household health, conditional on household observables

Key support:

$\Rightarrow$ Plan menu generosity not correlated with observable health (risk score)

Key identifying assumption

⇒ Variation in plan menu generosity not correlated with household health conditional on household observables

- **Support:** Districts independently choose plans and contributions
  - Cap of 4 plans contributes some noise
  - Influenced by negotiation with local teacher's union
    - Plan menu generosity correlated with certain union affiliations
    - ... lower for part-time and non-licensed employees
    - ... negatively correlated with house price index
    - ... negatively correlated with percent Republicans

→ But **not** correlated with observable health (risk score)

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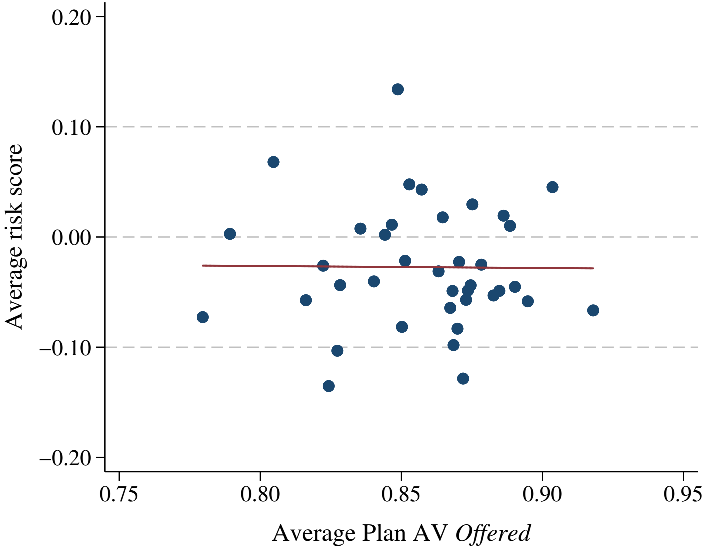
Variation in plan menus not driven by observable health

2009



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Parameter estimates

	(1)		(2)		(3)	
Variable	Parameter	Std. Err.	Parameter	Std. Err.	Parameter	Std. Err.
Employee Premium ($000s)	$-1.000^{\dagger}$		$-1.000^{\dagger}$		$-1.000^{\dagger}$	
Out-of-pocket spending, $-\alpha^{OOP}$	-1.628	0.023	-1.661	0.024	-1.469	0.019
HRA/HSA contributions, α^{HA}	0.255	0.021	0.259	0.020	0.259	0.020
Vision/dental contributions, α^{VD}	1.341	0.024	1.302	0.022	1.209	0.021
Plan inertia intercept, γ^{plan}	4.763	0.060	4.431	0.056	4.630	0.063
Plan inertia * $\mathbf{1}$[Children], γ^{plan}	-0.129	0.039	-0.102	0.037	-0.138	0.038
Insurer inertia intercept,γ^{ins}	2.605	0.107	2.509	0.102	2.413	0.097
Insurer inertia * Risk score, γ^{ins}	-0.074	0.083	-0.120	0.078	-0.037	0.080
Narrow net. plan, $\nu^{NarrowNet}$	-2.440	0.155	-2.286	0.145	-2.334	0.151
Providence utiliz. multiplier, ϕ_P	1.022	0.018	1.072	0.017	1.063	0.002
Risk aversion intercept, $\boldsymbol{\beta}^{\psi}$	-0.706	0.046	-1.018	0.059	-0.251	0.052
Risk aversion * $\mathbf{1}$[Children], $\boldsymbol{\beta}^{\psi}$	0.005	0.031	-0.367	0.083	-0.361	0.050
Moral hazard intercept, $\boldsymbol{\beta}^{\omega}$					1.028	0.038
Moral hazard * $\mathbf{1}$[Children], $\boldsymbol{\beta}^{\omega}$					0.671	0.008
Std. dev. of private health info., σ_{μ}	0.683	0.002	0.331	0.064	0.225	0.005
Std. dev. of log risk aversion, σ_{ψ}	0.701	0.062	1.140	0.012	0.833	0.021
Std. dev. of moral hazard, σ_{ω}					0.281	0.013
Corr(μ, ψ), $\rho_{\mu,\psi}$	0.130	0.018	-0.365	0.049	0.227	0.005
Corr(ψ, ω), $\rho_{\psi,\omega}$					-0.137	0.042
Corr(μ, ω), $\rho_{\mu,\omega}$					0.062	0.017
Scale of idiosyncratic shock, σ_{ϵ}	2.313	0.025	2.160	0.023	2.116	0.024
Insurer * {Region, Age, $\mathbf{1}$[Child.]}	Yes		Yes		Yes	
Observable heterogeneity in health			Yes		Yes	
Number of observations	451,268		451,268		451,268	

†Coefficient on employee premium normalized to -1.

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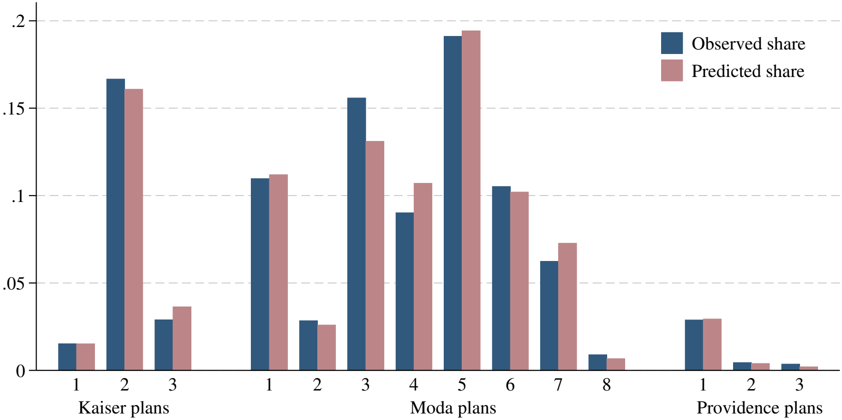
Model fit: Plan choices



Among switchers
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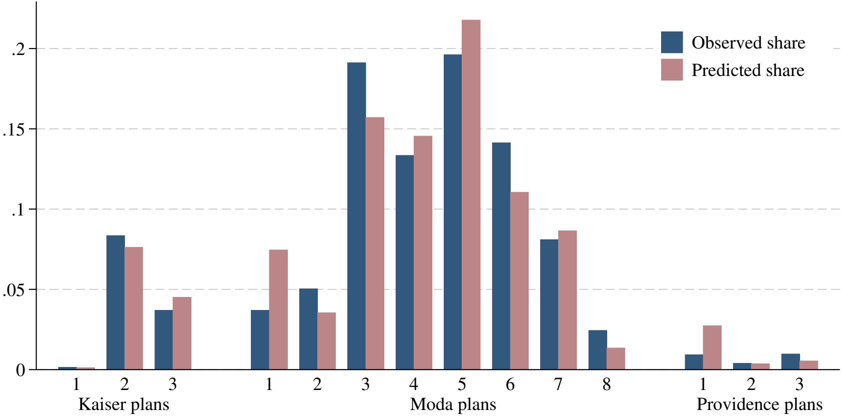
Model fit: Plan choices among switchers



Among 36 percent of household-years not enrolled in same plan as last year

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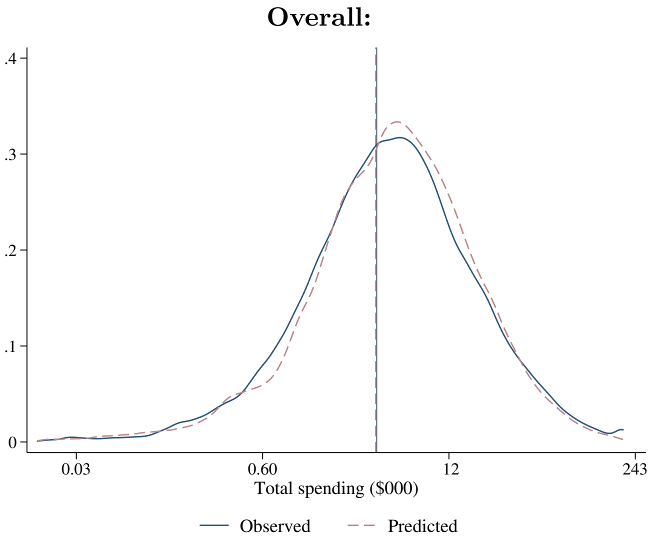
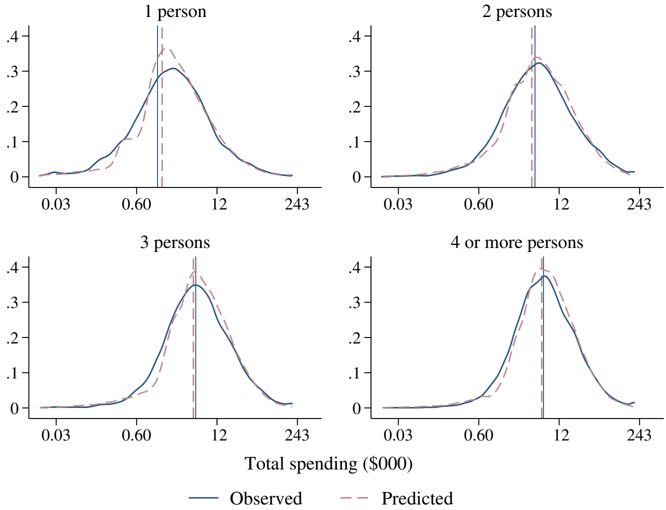
Model fit: Spending distributions



By insurer | By household risk | Back

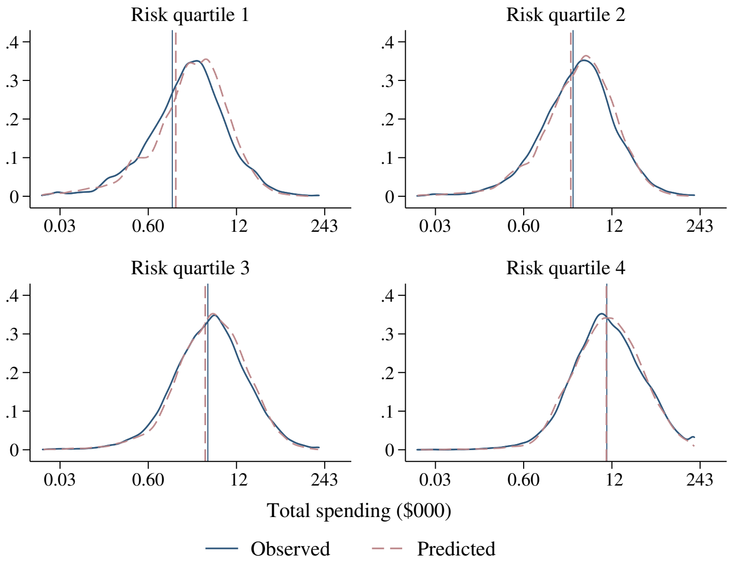
Model fit: Spending distributions

By number of household members:



By insurer | By household risk | Back

Model fit: Spending distributions, by household risk



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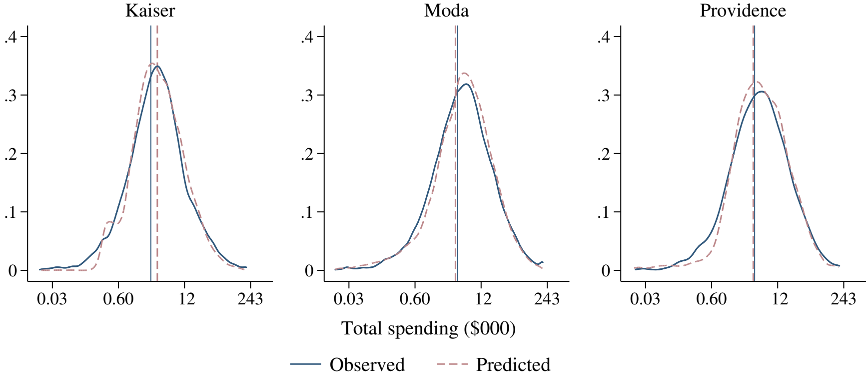
Model fit: By insurer



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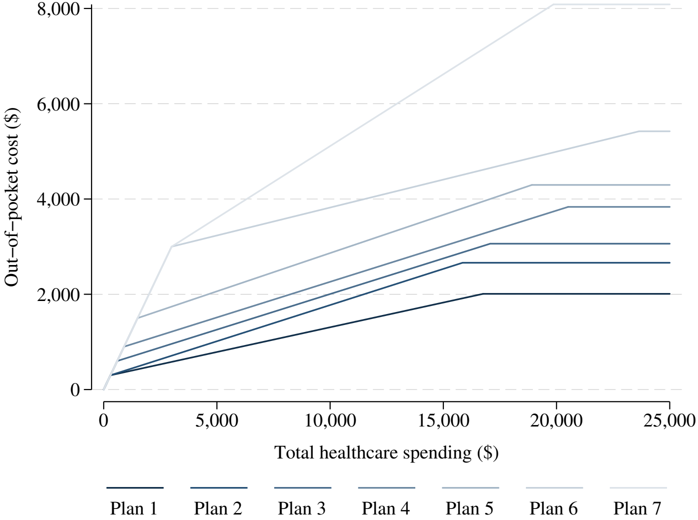
Example Moda plans

Family households, 2009



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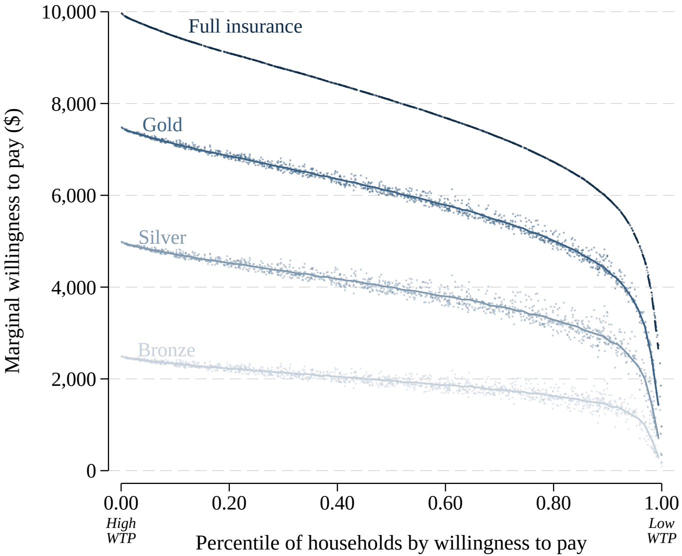
Construction of WTP plots



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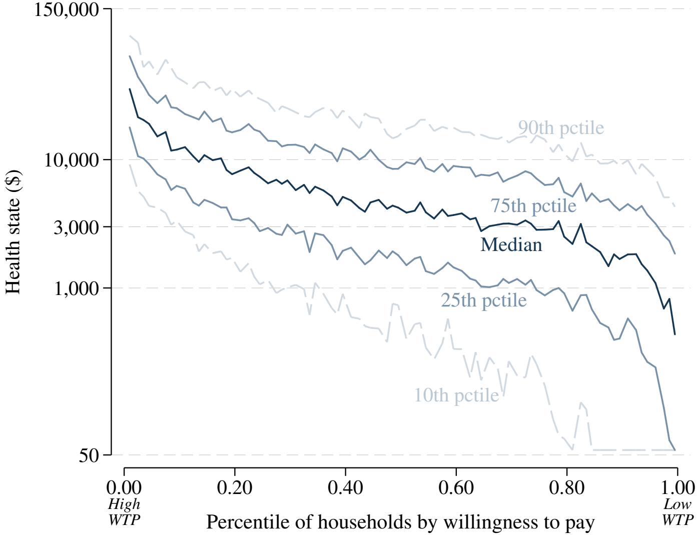
Health state distributions by willingness to pay



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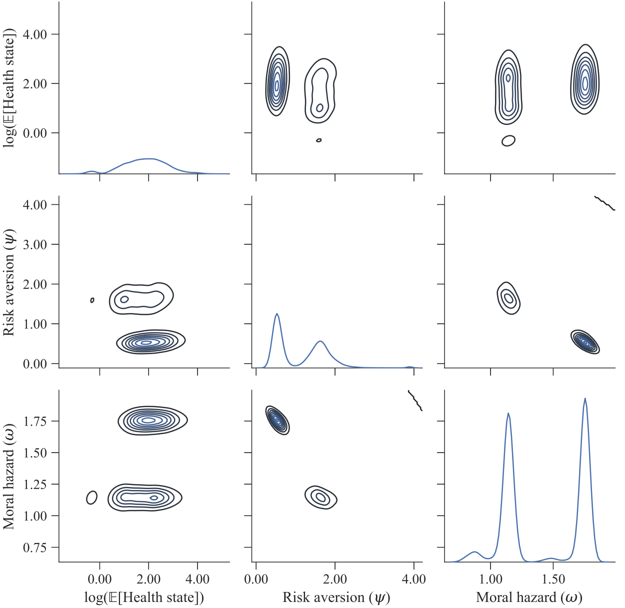
Joint distribution of household types



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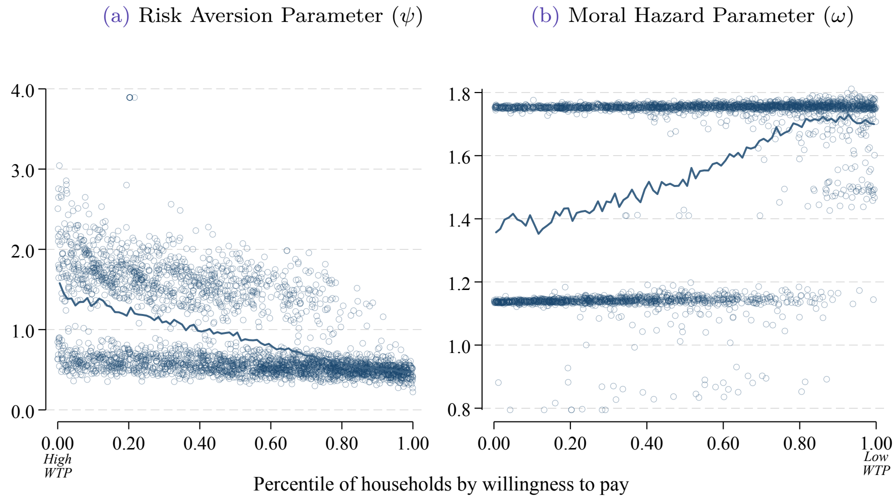
Risk aversion and moral hazard type by *WTP*



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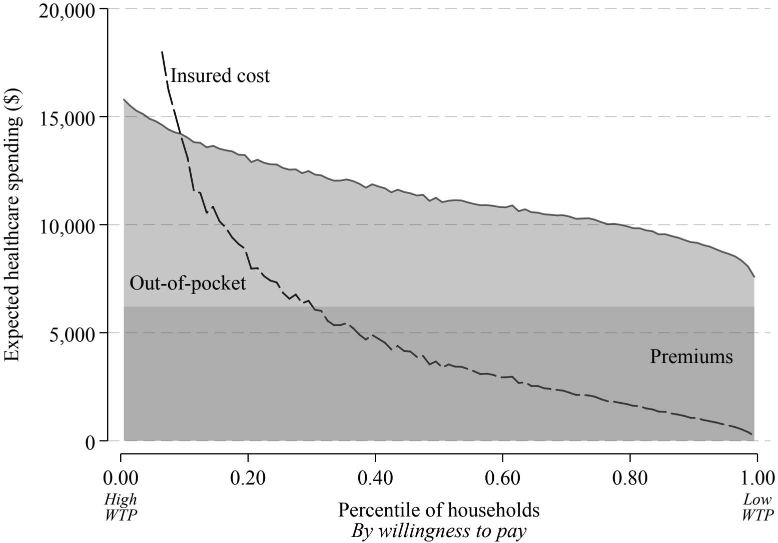
Distribution of expected healthcare spending by WTP if everyone in **Catastrophic**



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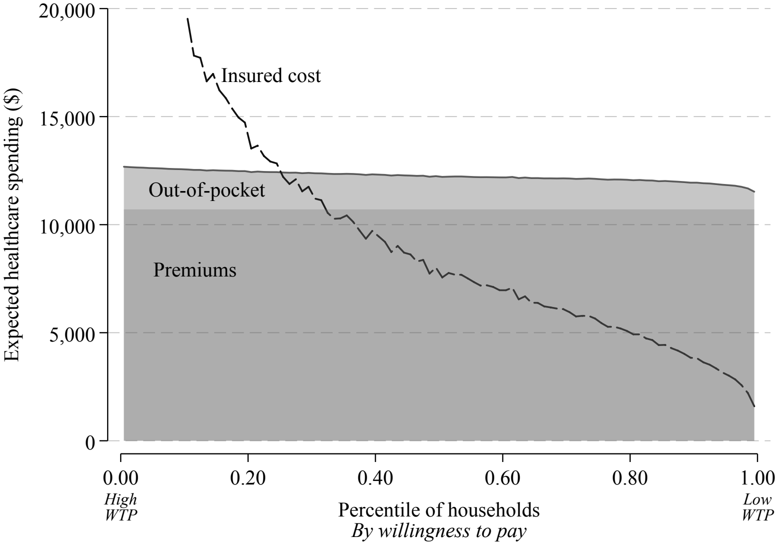
Distribution of expected healthcare spending by WTP if everyone in **Gold**



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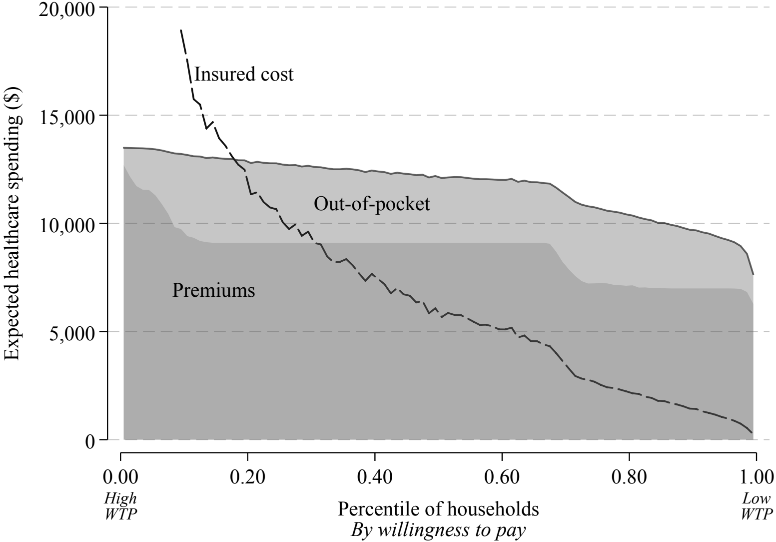
Distribution of expected healthcare spending by WTP if **Vertical Choice**



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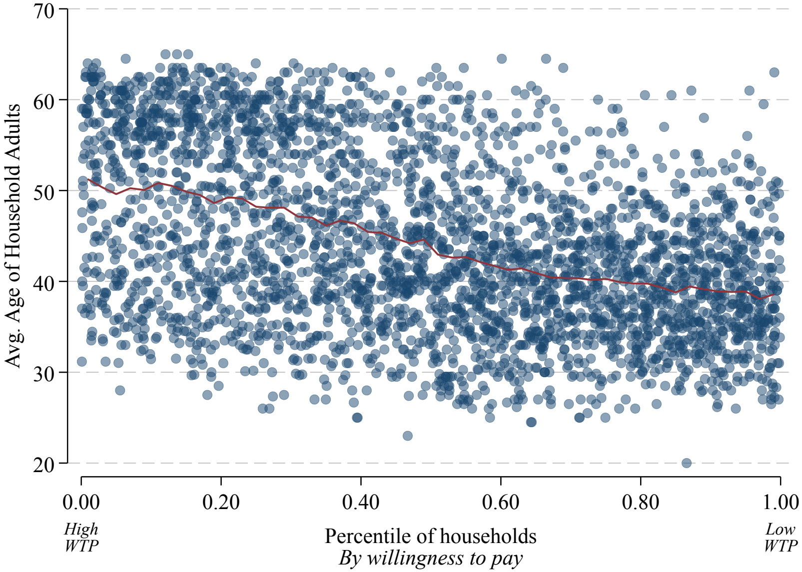
Age by willingness to pay



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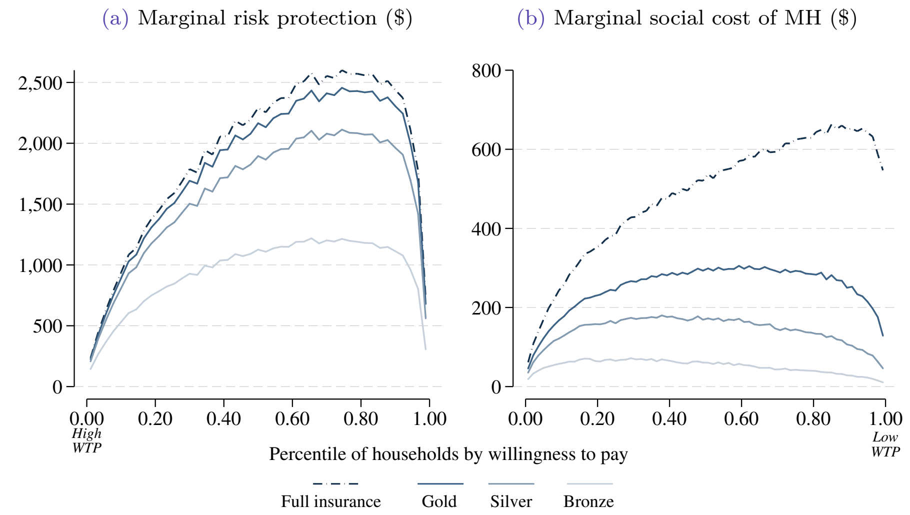
Risk protection and social cost of moral hazard



Types
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