Equilibria in Health Exchanges: Adverse Selection vs. Reclassification Risk

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Introduction

- Great deal of interest has focused on the creation and regulation of health insurance exchanges
  - Affordable Care Act in United States (2010)
  - Netherlands (2006), Switzerland (1996)
  - Private employer exchanges (U.S.)

- This type of regulated insurance market, termed managed competition, characterized by:
  - Annual policies
  - “Free entry” of insurers
  - Pre-specified financial coverage levels plans can offer (60%, 70%, 80%, 90% in U.S.)
  - Restrictions on pricing pre-existing conditions, demographics
  - Individual mandate

Introduction

- Use equilibrium framework we develop to study the interplay between two potential sources of inefficiency: **adverse selection** and **reclassification risk.**

- Empirically study with individual-level data on insurance choices / health outcomes from large firm

- **Adverse Selection**: Under-provision of insurance because those who select more comprehensive insurance are more expensive, conditional on information that can be priced

- **Reclassification Risk**: Year to year risk in insurance premiums when health-related information can be included in up front contract pricing

Adverse Selection & Re-Classification Risk

- ACA aims to eliminate reclassification risk (RCR) through pricing regulation, but at possible cost of more adverse selection (within market / into market)

- **Our primary focus:** Study trade-off between these two inefficiencies within an equilibrium framework

-**Ask:** How would alternative pricing regulations (e.g. age, health status) affect market outcomes and welfare?

-**Impact:** As regulation allows more opportunities for insurers to price specific risks (i) reduced welfare loss from within-market adverse selection and (ii) increased welfare loss from RCR

-**Additionally:** Insurer risk-adjustment transfers, market participation, different long-run welfare notions, non-price contract regulation, multi-year contracts

Methodology Overview

1. Use insurance choice and health outcomes data to estimate joint distribution of risk preferences and health risk for population of insured individuals [based on Handel(2013)]

2. Develop equilibrium model of an exchange that provides and algorithm for identifying equilibria

   -Multi-plan competition, free entry

3. Use estimated preferences, plus health / cost information to compute equilibria for this population of insured individuals (actually, a "pseudo-population") under various pricing rules

4. Evaluate welfare for this population under various pricing rules

   -Short-run welfare and AS, long-run welfare and RCR

   -Tradeoff between adverse selection and reclassification risk

Results

1. Baseline results for 90% and 60% contracts:
   -- Substantial adverse selection in community rating
   -- Substantial reclassification risk with full risk rating
   -- Incrementally moving towards full risk-rating leads to incremental welfare losses
   -- Average welfare loss AS with community rating **$619** relative to full risk-rating.
   -- RCR in with health-quartile risk rating has relative avg. loss of **$3,082** relative to community rating.

2. Long-run welfare results from reclassification risk are lower the steeper consumer income profile is over time (reflects imperfect credit markets

3. Age-based pricing does not lead to less adverse selection, but complementary to health status based pricing

Results

4. Minimum Creditable Coverage regulation

   -- Lowering actuarial value of lowest coverage plan increases share of consumers ending up with high coverage

   -- Net welfare impact still negative in static marketplace because though more with higher coverage, some with very low coverage

   -- Losses from RCR still well exceed losses from AS

5. Participation

   -- In main model, individual mandate enforced

   -- If not, 26% of people opt out of baseline market (young)

   -- Premiums 30% higher than with full participation

6. Risk-adjustment transfers reduce welfare loss AS by 45%

7. Results robust to using data reweighted by MEPS

Related Literature

Dynamic / Long-Run Risk in Insurance Markets:

- Pauly et al. (1995), Hendel & Lizzeri (2003), Finkelstein et al. (2005), Hoffman et al. (2010) Dionne & Rothschild (2011), Koch (2011) , Cochrane (1995), Bundorf et al. (2012)

Welfare Consequences of Adverse Selection:

- Cutler & Reber (1998), Carlin & Town (2009), Lustig (2009),Einav et al. (2010), Cardon & Hendel (2001), Chiappori & Salanie (2001), Handel (2013), Einav et al. (2011), Bundorf et al. (2012)

Health Exchange Regulation

- Ericson and Starc (2012), Kolstad and Kowalski (2013), Aizawa and Fang (2013)

New: Multi-plan competition and exchange equilibria, long-run welfare analysis of price regulation, empirics

Empirical Methodology

Data

- Individual-level panel dataset: provided by large employer (10,000 emp. / 25,000 covered lives) from 2004-2009
  - Plan choices, plan characteristics and consumer demographics
  - Detailed claims data, medical and financial, for every person covered in PPO (65%)
  - Derived *predictive* medical risk measures from ACG program

- What do we get from the data?
  - Ex ante health risk of each individual
  - Risk preference estimates (distribution) for population
  - Joint distribution, risk prefs. conditional on health risk, age, income, gender, job type

Summary Stats

Full sample	
Variable	**Value**
N (families)	11,253
N (individuals)	20,963
Mean Age	40.1
% Male	46.7
% Income Tier 1 (0-41K)	33.9%
% Income Tier 2 (41K-74K)	39.5%
% Income Tier 3 (74K-122K)	17.9%
% Income Tier 4 (122K-176K)	5.2%
% Income Tier 5 (>176K)	3.5%
Family Size:	
1	58.0%
2	16.9%
3	11.0%
4+	14.1%
Manager	23.2%
White collar	47.9%
Blue collar	28.9%

PPO ever Sample	
Variable	**Value**
N (families)	5,667
N (individuals)	10,713
Mean Age	40.0
% Male	46.3
% Income Tier 1 (0-41K)	31.9%
% Income Tier 2 (41K-74K)	39.7%
% Income Tier 3 (74K-122K)	18.6%
% Income Tier 4 (122K-176K)	5.4%
% Income Tier 5 (>176K)	4.4%
Family Size:	
1	56.1%
2	18.8%
3	11.0%
4+	14.1%
Manager	25.1%
White collar	47.5%
Blue collar	27.3%

Estimation Sample	
Variable	**Value**
N (families)	2,033
N (individuals)	4,544
Mean Age	42.3
% Male	46.7
% Income Tier 1 (0-41K)	19.0%
% Income Tier 2 (41K-74K)	40.5%
% Income Tier 3 (74K-122K)	25.0%
% Income Tier 4 (122K-176K)	7.8%
% Income Tier 5 (>176K)	7.7%
Family Size:	
1	41.3%
2	22.3%
3	14.1%
4+	22.3%
Manager	37.5%
White collar	41.3%
Blue collar	21.1%

Preference Estimation: Similar to Handel (2013)

- Each family *k* faces uncertainty about future health expenditures

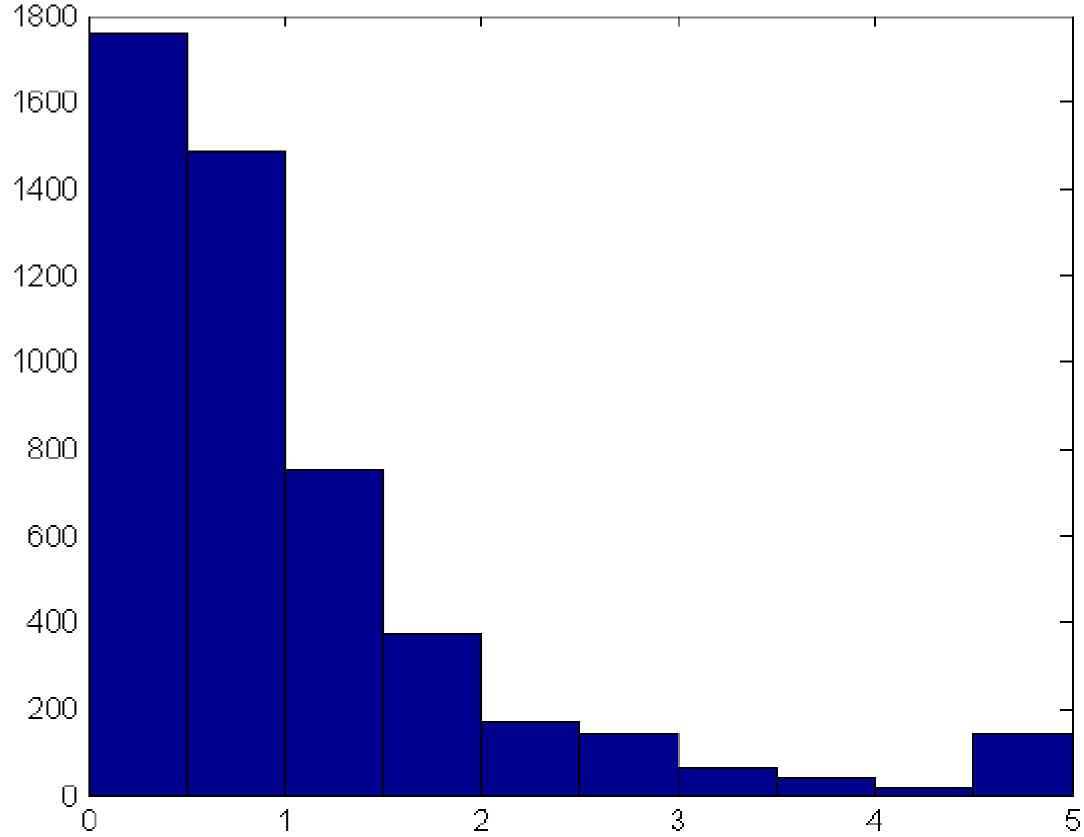
- Cost model estimates distribution of *plan-specific out-of-pocket expenditures* $H_k(X_{jt} \mid \lambda_t, Z_{jt})$ conditional on health status (derived Johns Hopkins ACG software using past health outcomes / medical information.

- Consumers choose best plan with knowledge of H_k – *allows estimation of risk preferences*
  - -- Plans have same provider network (3 PPO options)
  - -- “Active” choice year in data avoids confounding with inertia

- Estimate structural “realized” expected-utility model with constant absolute risk aversion (CARA) (controls for inertia, other prefs.)

$$\gamma_k \sim N(\mu(\text{age, health, mngr, ability}), \sigma^2)$$

Health Risk in Estimation Sample



- Mean expected health expenses per individual
- 1 = $4,878, or population average of mean expected expenditures

Health Risk in Simulation Sample

R is ratio of variance of total expenditures to mean
ϕ captures how much health status info known at contracting

Final Sample Total Health Expenditure Statistics

Ages	Mean	S. D.	S. D. of mean	S. D. around mean	R	ϕ
All	6,099	13,859	6,798	9,228	31,369	0.24
25-30	3,112	9,069	4,918	5,017	26,429	0.29
30-35	3,766	10,186	5,473	5,806	27,550	0.29
35-40	4,219	10,753	5,304	6,751	27,407	0.24
40-45	5,076	12,008	5,942	7,789	28,407	0.25
45-50	6,370	14,095	6,874	9,670	31,149	0.24
50-55	7,394	15,315	7,116	11,092	31,722	0.22
55-60	9,175	17,165	7,414	13,393	32,113	0.19
60-65	10,236	18,057	7,619	14,366	31,854	0.18

Preference Estimation:

- Choice model has consumers k making choices under uncertainty with discrete utility for each of j plans

$$U_{jkt} = \int_0^\infty u_j(M_{jkt}(X_{jt}, \mathbf{Z}_{jt}))dH_k(X_{jt}|\boldsymbol{\lambda}_{\mathbf{jt},}\mathbf{Z}_{jt})$$

$$M_{jkt} = W_j - P_{jkt} - X_{jt} + \eta(\mathbf{Z}_j^B)\mathbf{1}_{jk,t-1} + \delta_j(A_j)\mathbf{1}_{1200} + \alpha HTC_{j,t-1}\mathbf{1}_{250} + \varepsilon_{jkt}(A_j)$$

- Constant Absolute Risk Aversion (CARA) sets:

$$u_j(M_{jkt}) = -\frac{1}{\gamma_j}e^{-\gamma_j M_{jkt}}$$

- Mean of risk preference distribution in population depends flexibly on demographics:

$$\mu_\gamma(\mathbf{Z}_j^A, \boldsymbol{\lambda}_j) = \beta_0 + \beta_1 \log(\Sigma_{i\epsilon j}\lambda_i) + \beta_2 age_j + \beta_3 \log(\Sigma_{i\epsilon j}\lambda_i) * age_j + \beta_4 1_{mj} + \beta_5 1_{mj}\widehat{\upsilon}_{mj} + \beta_6 1_{nmj}\widehat{\nu}_{nmj}$$

Summary Stats / Estimates

- Mean CARA risk aversion coefficient ~ 0.0004

$$\frac{1}{2} \circ 1000 + \frac{1}{2} \circ (-693) \sim 0$$

- Risk aversion:
  -- Increases with age
  -- Negatively correlated with health risk
  -- Increases with age more slowly for healthy
  -- Greater for managers and those w/ high ability
  -- Population std. dev. of observable risk pref. heterogeneity $6 * 10^{-5}$

- Unobserved heterogeneity in risk preferences normally distributed with standard deviation = 0.0001

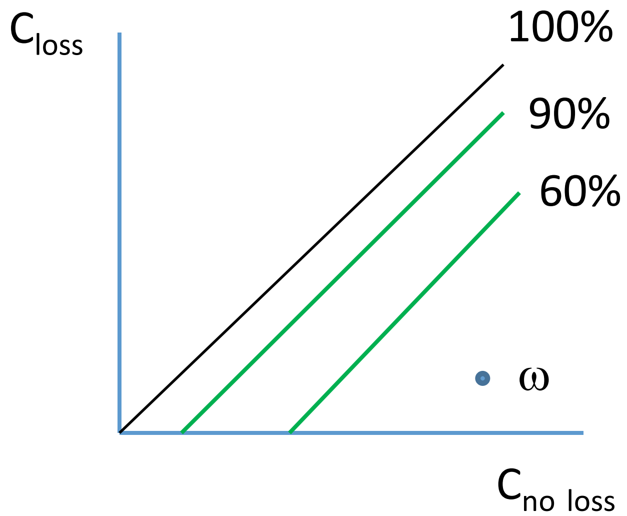
- Joint distribution of risk preferences, ex ante health status, ex post health outcomes taken to exchange model (w/ demographics)

Health Exchange Model

Health Exchange Model

- Two policy types: 60% and 90% for main analysis
- We construct a standard policy of each type:

Plan:	Deductible	Coinsurance %	OOP Max
60	$3,000	20%	$5,950
90	$0	20%	$1,500



Premium changes move a policy along its green line (so restricted policies relative to RS)

Health Exchange Model

- Assume mandate enforced, free entry of insurers for both policies
- Use empirical joint distribution of H, λ, and γ to find each individual's CE_{90} and CE_{60} (gross of premiums)
- Define individual's WTP "type": $\theta = CE_{90} - CE_{60}$
- Costs of type θ are $C_{90}(\theta)$ and $C_{60}(\theta)$
- Define $\Delta P = P_{90} - P_{60}$
- Define: $$AC_{90}(\Delta P) = E[C_{90}(\theta) \mid \theta \geq \Delta P]$$ $$AC_{60}(\Delta P) = E[C_{60}(\theta) \mid \theta < \Delta P]$$

Health Exchange Model

Adverse Selection Property:

$C_{90}(\theta), C_{60}(\theta)$ are continuous and increasing

-- Implies that $AC_{90}(\Delta P), AC_{60}(\Delta P)$ are increasing

-- Define $\underline{AC}_{90}, \underline{AC}_{60}, \overline{AC}_{90}, \overline{AC}_{60}$

θ has atomless distribution F on $[\underline{\theta}, \overline{\theta}]$

$\theta > C_{90}(\theta) - C_{60}(\theta)$ for all $\theta \in [\underline{\theta}, \overline{\theta}]$

Relative to Rothschild-Stiglitz: restricted policies, continuum of types, many states

Health Exchange Model

- Define profits:

$$\Pi_{90}(P_{90}, P_{60}) = [P_{90} - AC_{90}(\Delta P)][1 - F(\Delta P)]$$

$$\Pi_{60}(P_{90}, P_{60}) = [P_{60} - AC_{60}(\Delta P)]F(\Delta P)$$

$$\Pi(P_{90}, P_{60}) = \Pi_{90}(P_{90}, P_{60}) + \Pi_{60}(P_{90}, P_{60})$$

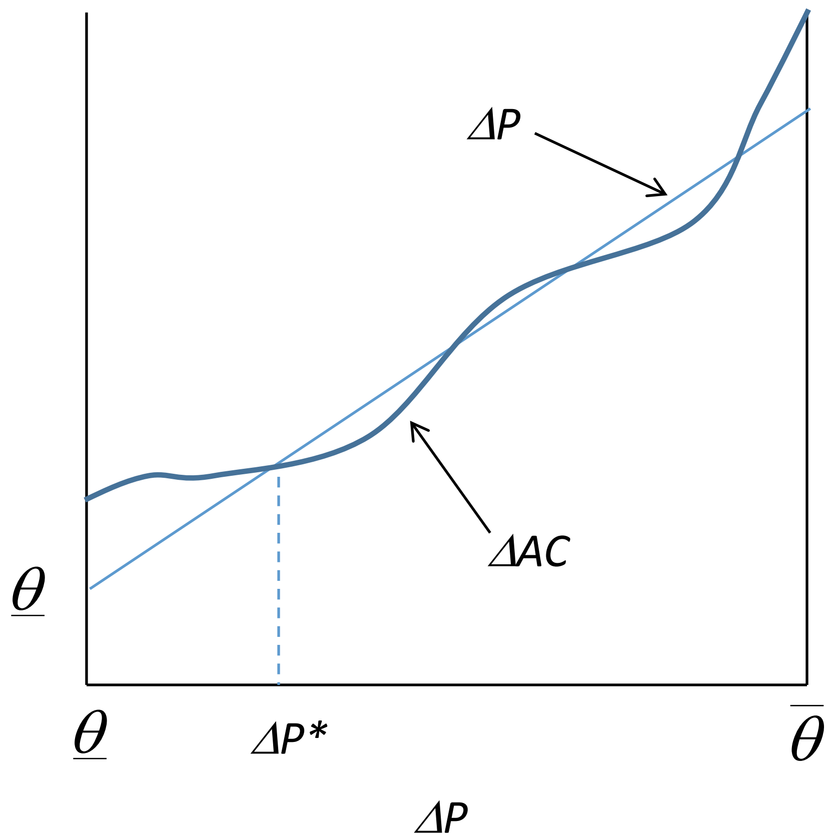
Health Exchange Model

- **Single-policy Nash equilibria:**
  - Both policies break even: $\Delta P = \Delta AC$
  - "All-in-90" is the (unique) sp-NE iff $P_{90} = \underline{AC}_{90}$ leaves no room for a profitable deviation in 60; i.e., if

$$\Pi_{60}(\underline{AC}_{90}, \underline{AC}_{90} - \Delta P) \leq 0 \text{ for all } \Delta P$$

  - *If "all-in-90" is not a sp-NE:* Then a sp-NE must involve the lowest "break-even" ΔP (i.e., satisfying $\Delta P = \Delta AC$ *for interior* ΔP *)* that has positive sales of the 60 policy
  - This ΔP, say ΔP^*, is a sp-NE iff no deviation in P_{90} is profitable:

$$\Pi_{90}(P_{60}^{*} + \Delta P, P_{60}^{*}) \leq 0 \text{ for all } \Delta P \leq P_{90}^{*} - P_{60}^{*}$$



ΔP
ΔAC
$\underline{\theta}$
$\underline{\theta}$
ΔP*
$\overline{\theta}$
ΔP

Health Exchange Model

Multi-policy Nash Equilibria:

In addition to sp-NE results:

- The lowest break-even ΔP , ΔP *, is a mp-NE iff a multi-policy deviation that slightly undercuts P_{60} is not profitable; that is, iff:

$$\Pi(P_{60}^{*} + \Delta P, P_{60}^{*}) \leq 0 \text{ for all } \Delta P \leq P_{90}^{*} - P_{60}^{*}$$

- Equilibrium does not exist in many cases
- All-in 60 cannot be a mp-NE with risk averse consumers

Health Exchange Model

Riley Equilibria (RE):

- (P_{90},P_{60}) is a Riley equilibrium if there is no profitable deviation that remains profitable after any "safe" profitable reaction
  - RE exist and are unique
  - It is "all-in-90" when Nash is also "all-in-90"
  - Otherwise, it is the lowest break-even *DP* that has positive sales of the 60 policy

- Also consider Wilson equilibrium concept in additional analysis

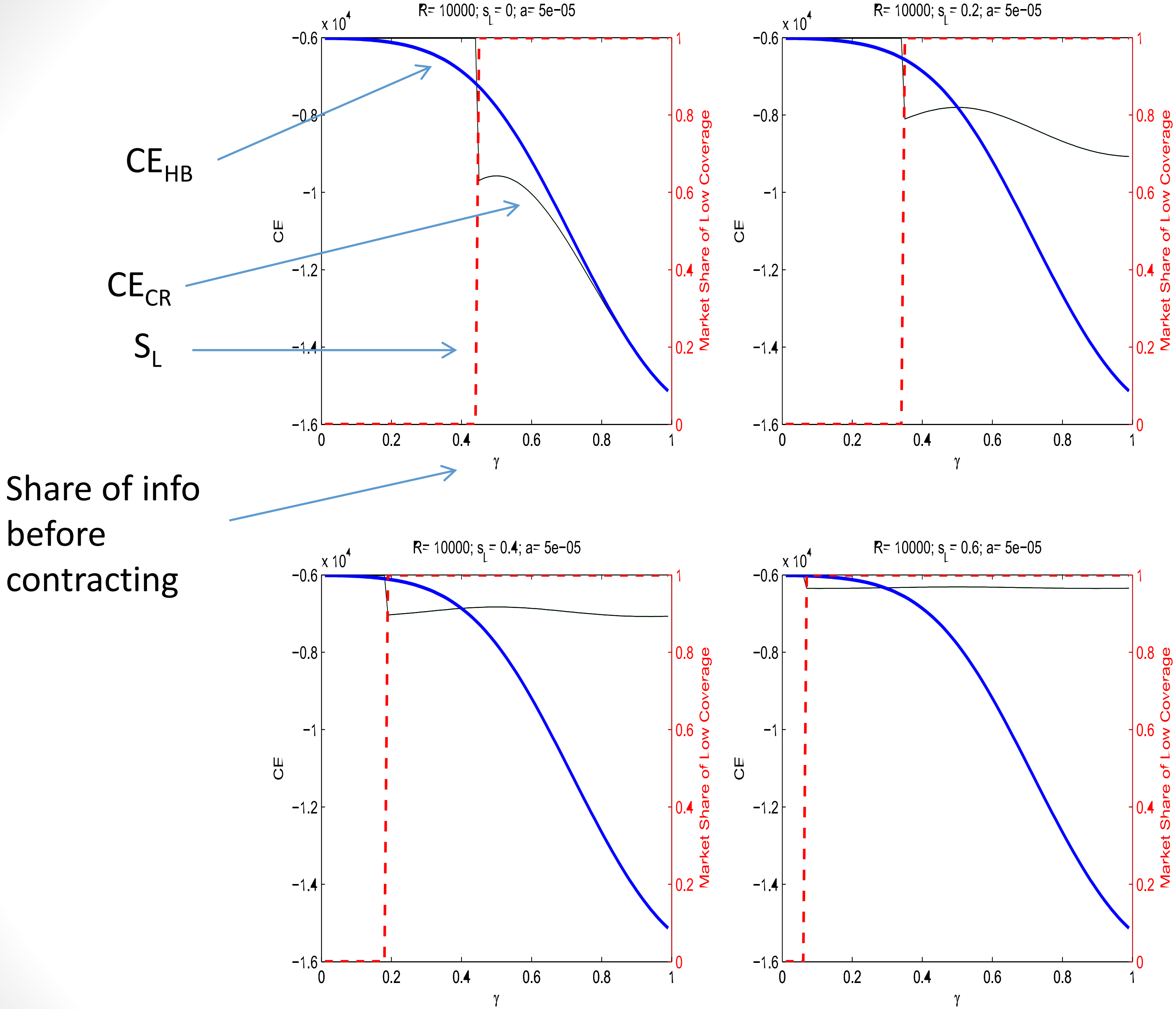
Model: Comparison to Literature

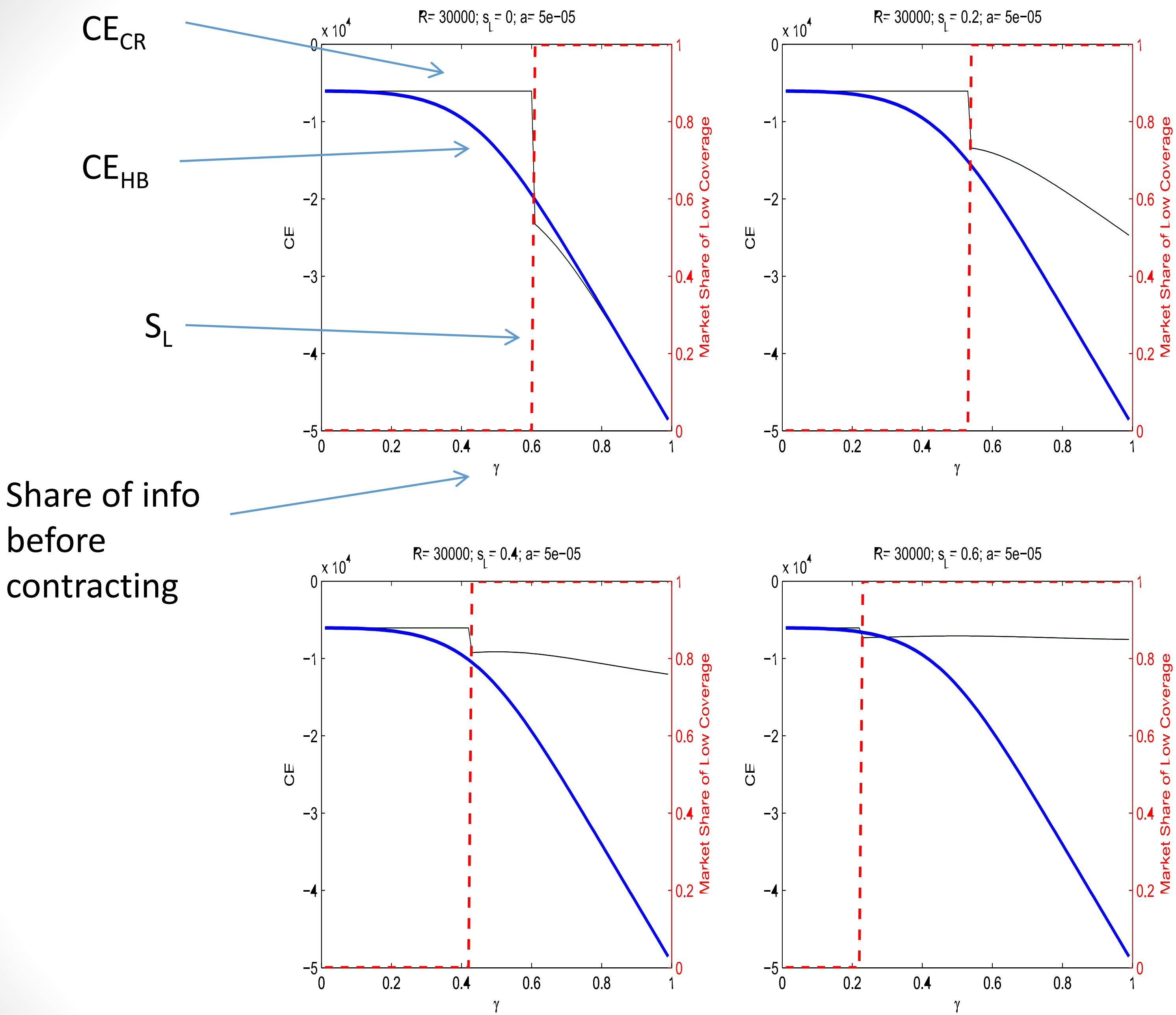
Einav-Finkelstein-Cullen (2010): pricing of one “add-on” policy given fixed price of base policy. Always get existence of NE. Never get full unraveling with strict risk aversion and Pr(loss)>0.

> **Here:** pricing of two policies allows cream skimming, which undermines existence
> Can get complete unraveling with strict risk aversion and Pr(loss)>0 (Intuition: high WTP consumers now benefit from pooling with low WTP consumers at low coverage)

Hendren (2013): Sufficient condition for no incentive-feasible insurance contract in two-state model with asymmetric info about prob(loss). Can’t hold with strict risk-aversion and strictly positive Pr(loss).

> **Here:** Can’t get complete unraveling if low coverage is no coverage.
> **C**an get complete unraveling in RE (which is incentive feasible) if low coverage has some coverage.


CE_HB
CE_CR
S_L
Share of info before contracting
R= 10000; s_L = 0; a= 5e−05
R= 10000; s_L = 0.2; a= 5e−05
R= 10000; s_L = 0.4; a= 5e−05
R= 10000; s_L = 0.6; a= 5e−05
x 10^4
CE
Market Share of Low Coverage
γ



CE_CR
CE_HB
S_L
Share of info before contracting
R= 30000; s_L = 0; a= 5e−05
R= 30000; s_L = 0.2; a= 5e−05
R= 30000; s_L = 0.4; a= 5e−05
R= 30000; s_L = 0.6; a= 5e−05
x 10^4
CE
Market Share of Low Coverage
γ
0
−1
−2
−3
−4
−5
0.2
0.4
0.6
0.8
1

Empirical Equilibrium Results

Simulation Sample

Estimation Sample Variable	Value
N (families)	2033
N (individuals)	4544
Mean Age	42.3
% Male	46.7
% Income Tier 1 (0-41K)	19.0%
% Income Tier 2 (41K-74K)	40.5%
% Income Tier 3 (74K-122K)	25.0%
% Income Tier 4 (122K-176K)	7.8%
% Income Tier 5 (>176K)	7.7%
Family Size:	
1	41.3%
2	22.3%
3	14.1%
4+	22.3%
Manager	37.5%
White collar	41.3%
Blue collar	21.1%

Simulation Sample Variable	Value
N (families)	NA
N (individuals)	10372
Mean Age	44.5
% Male	44.6
% Income Tier 1 (0-41K)	20.2%
% Income Tier 2 (41K-74K)	40.4%
% Income Tier 3 (74K-122K)	24.5%
% Income Tier 4 (122K-176K)	7.9%
% Income Tier 5 (>176K)	7.1%
Family Size:	
1	NA
2	NA
3	NA
4+	NA
Manager	35.9%
White collar	44.3%
Blue collar	19.8%

Quantile	Age
0.05	26
0.1	28
0.2	33
0.3	37
0.4	41
0.5	45
0.6	49
0.7	52
0.8	56
0.9	60
0.95	62

- Simulation sample is used in equilibrium counterfactuals
- Preferences fit with estimates of family choice model (coming up)
- Individuals 25 to 65, including individuals from families
- Similar to market where everyone priced independently, even if in family
- Counterfactual simulations: **private exchange**, or **regulated exchange**

Pure Community Rating:
Equilibrium Determination Steps

- First, static equilibrium, then re-classification risk

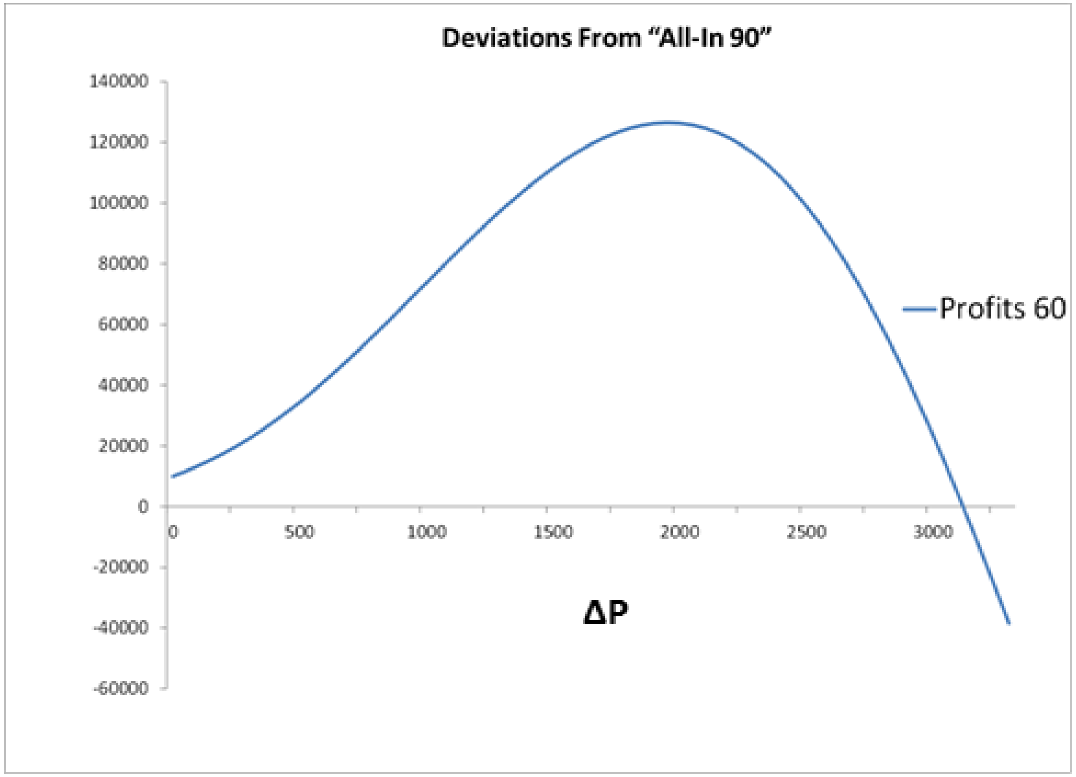
- **Step 1:** check if ‘all-in’ 90 survives single policy 60 deviation
  - If it does, it is sp-NE, mp-NE, and RE, if not……

- **Step 2:** find lowest break-even ΔP^* with positive sales of the 60 policy…
  - ……this is the Riley Equilibrium
  - …….these are candidates for sp-NE and mp-NE

- **Step 3:** check if ΔP^* is sp-NE or mp-NE

Pure Community Rating:
Equilibrium Determination Steps

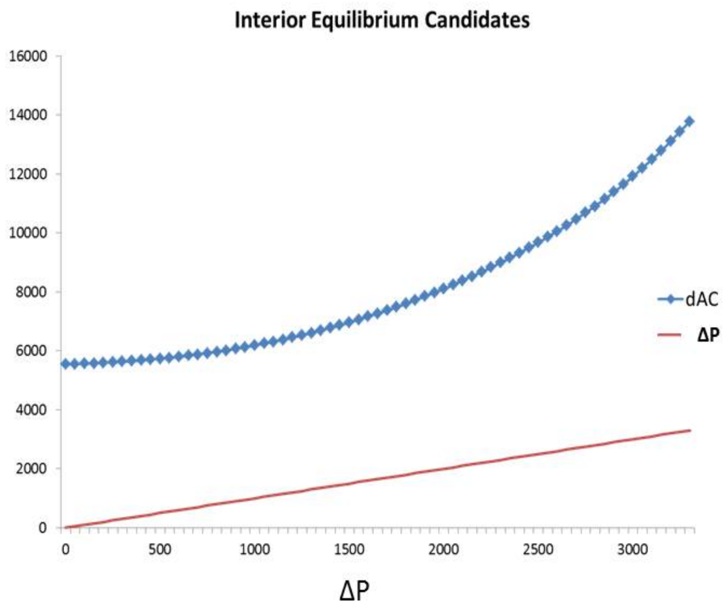
- **Step 1:** check if ‘all-in’ 90 survives single policy 60 deviation

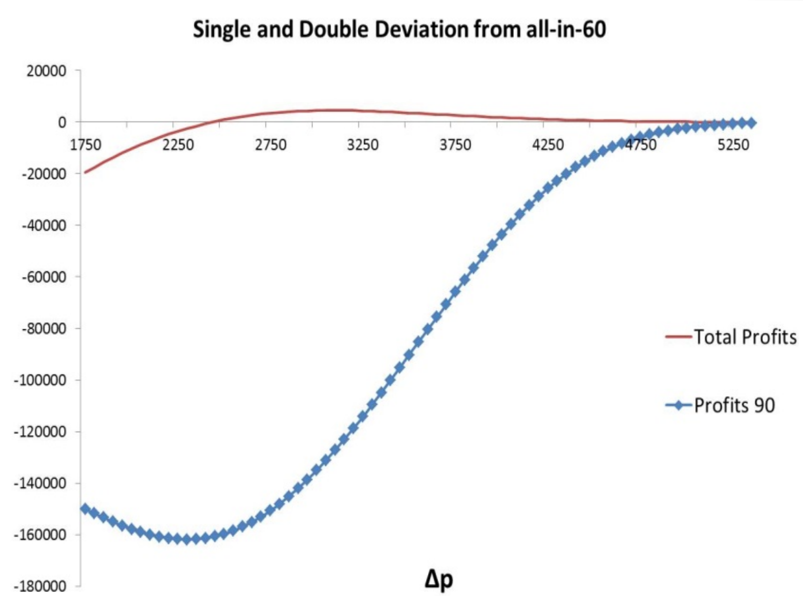


Pure Community Rating

- **Step 2**: there is no interior break-even *DP* , so “all-in-60” is RE (and may be sp-NE and mp-NE) – *if equilibrium exists, market has to completely unravel*

- **Step 3:** check deviations: all-in-60 is sp-NE, but not mp-NE





Equilibrium Concept	P_{60}	P_{90}	s_{60}	s_{90}	AC_{60}	AC_{90}
Single policy-NE	4051		100	0	4051	
Multi-policy NE	No equilibrium					
Riley	4051		100	0	4051	

Health-Status Pricing: ACG Quartiles

- Now, as example of limited health-status based pricing, suppose pricing can be based on ACG-quartiles.

  --Creates 4 separate sub-markets.

  --Follow the same steps for each sub-market

- Increases re-classification risk, decreases adverse selection

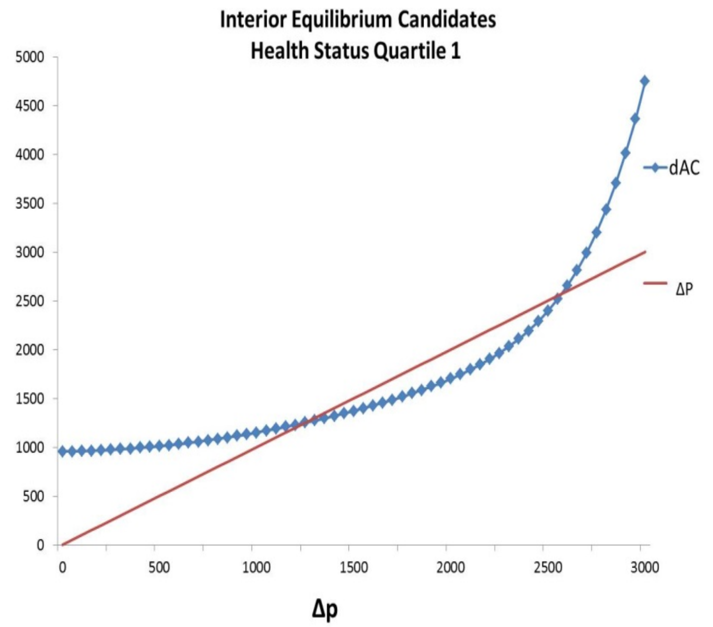
- Summary for pricing by health-status quartiles:

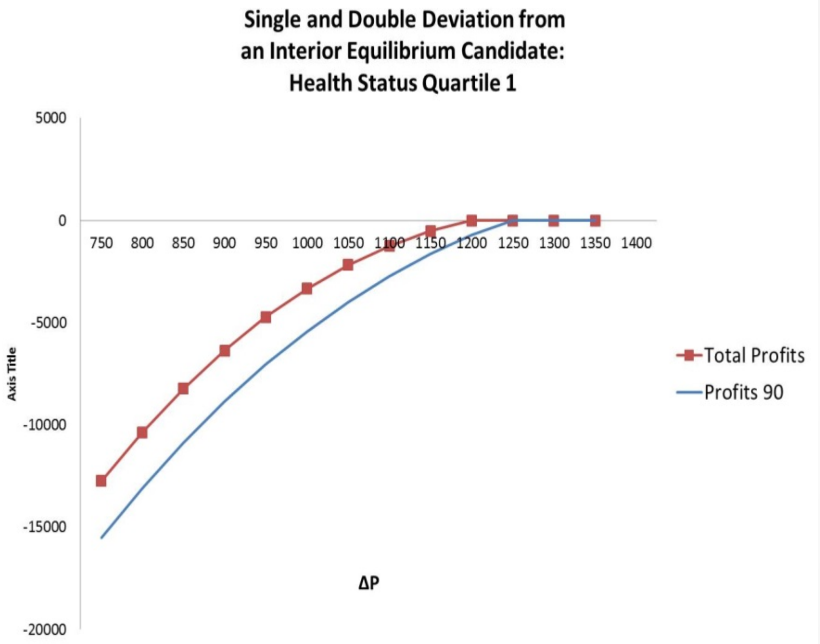
  --For every quartile, a 60 deviation is profitable against “all-in 90”

  --Reduced unraveling in healthiest quartile, still full unraveling in other 3

  --At risk of moving to one of four premiums next year (RCR)

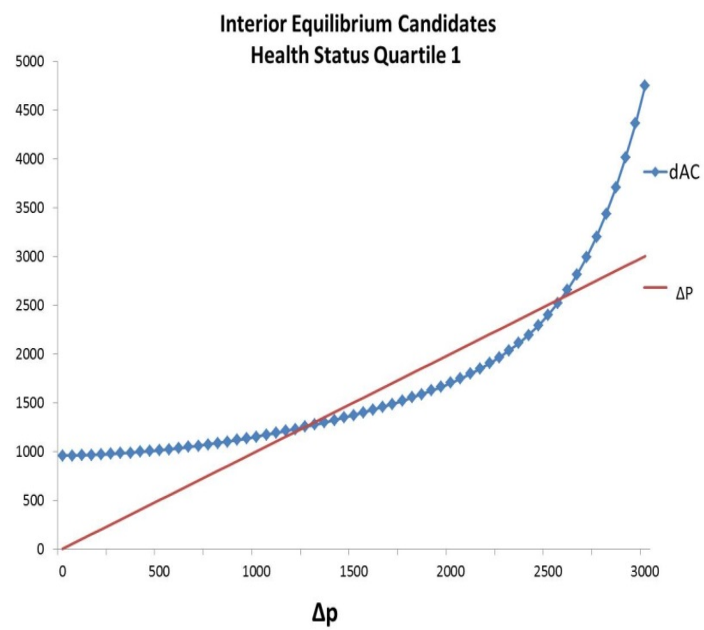
Equilibria with Health Pricing: Health Status Quartiles

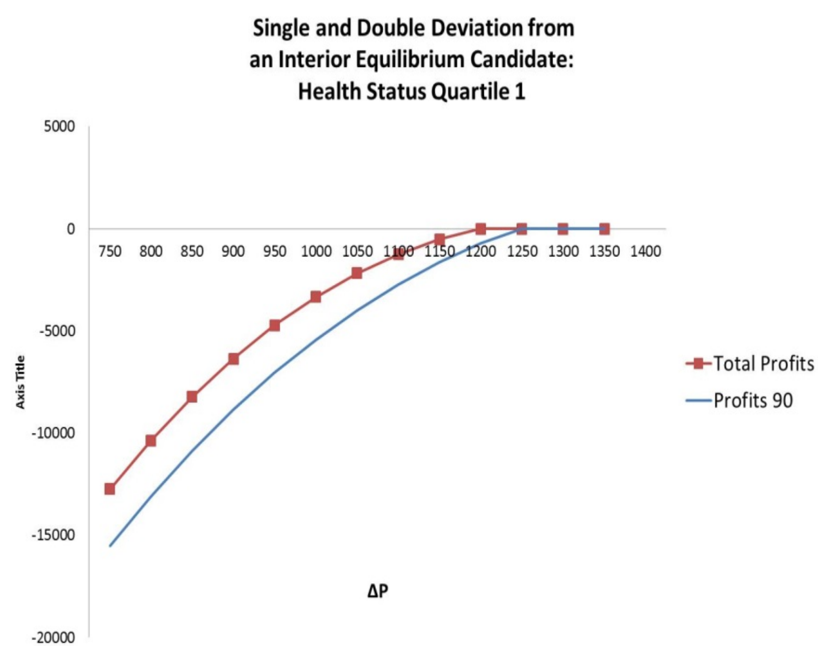




Market	Equilibrium Type	P_{60}	P_{90}	s_{60}	s_{90}	AC_{60}	AC_{90}
Quartile 1	RE/sp-NE/mp-NE	289	1550	64.8	35.2	289	1,550
Quartile 2	RE/sp-NE	1467	1467	100	0	1467	
Quartile 3	RE/sp-NE	4577	4577	100	0	4577	
Quartile 4	RE/sp-NE	9802	9802	100	0	9802	

Equilibria with Health Pricing: Health Status Quartiles





Market	Equilibrium Type	P_{60}	P_{90}	s_{60}	s_{90}	AC_{60}	AC_{90}
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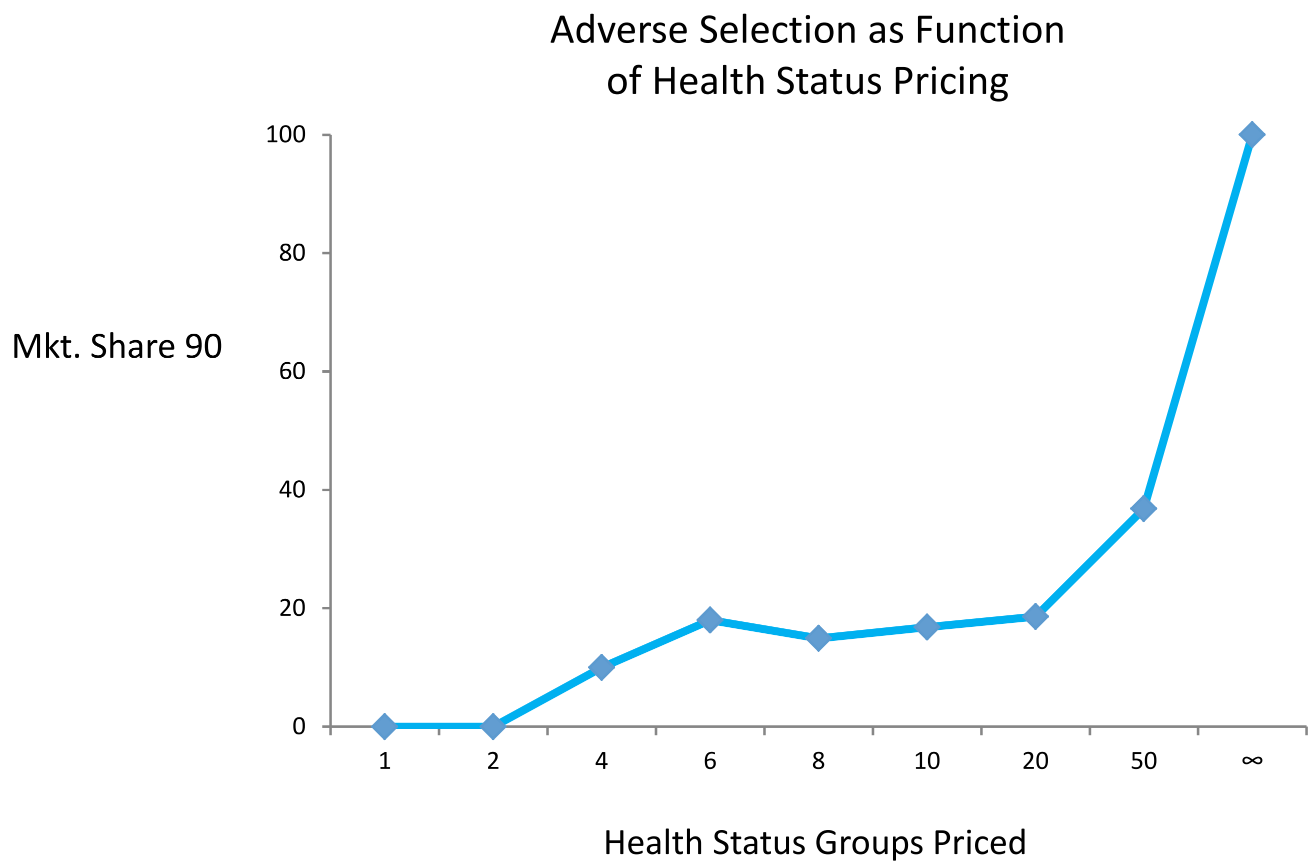
Quartile 4	RE/sp-NE	9802	9802	100	0	9802	

Reclassification risk

Equilibria with Health Pricing: Adverse Selection



Welfare Results (AS-RCR)

Welfare Analysis: AS and RCR

- **Goal:** Evaluate the ex ante utility of an ***unborn individual***
  - Uncertainty about health status transitions in lifetime
  - Within-year uncertainty after purchasing insurance contract

- Lifetime welfare calculation depends on pricing regime *x* and equilibrium notion *e*

- **Step 1:** compute certainty equivalent of equilibrium choice in one-year market for each individual in data, characterized by (λ,γ):

$$CE_{e,x}(\lambda,\gamma)$$

- Also compute CE if all are in 90 policy at $P_{90}{}^{e,x} = \underline{AC}_{90}$:

$$CE_{all90}(\lambda_t,\gamma)$$

Welfare Analysis: AS and RCR

Integrate one-year at a time market outcomes into lifetime analysis

Step 2: Compute the **fixed annual payment $y_{x,x',e}(\gamma)$** that would make ex ante lifetime expected utility in pricing regime x equal to that in pricing regime x':

$$\sum_t \delta^t E_{x_t}[-e^{-\gamma\{I_t - CE_x(\lambda_t,\gamma) + y_{x,x'}(\gamma)\}} \mid \gamma] = \sum_t \delta^t E_{x_t}[-e^{-\gamma\{I_t - CE_{x'}(\lambda_t,\gamma)\}} \mid \gamma]$$

Key Assumptions for computing $y_{x,x',e}(\gamma)$:

- Discount factor = 0.975
- Steady state population, represented by our sample
- γ is age 25 risk aversion (individual assumes no change in risk aversion, but true evolution of health conditional on γ)
- Get distribution of health at each age t conditional on γ by pulling all individuals of age t whose (acg, γ) lies in a band around the relation we estimated (Idea: γ at birth determines health process and also evolves with age).
- I_t either fixed or follows manager/non-manager age profile

Welfare Comparisons

Example: Compare relative long-run welfare under case of pure community rating to case of pricing on health status quartiles.

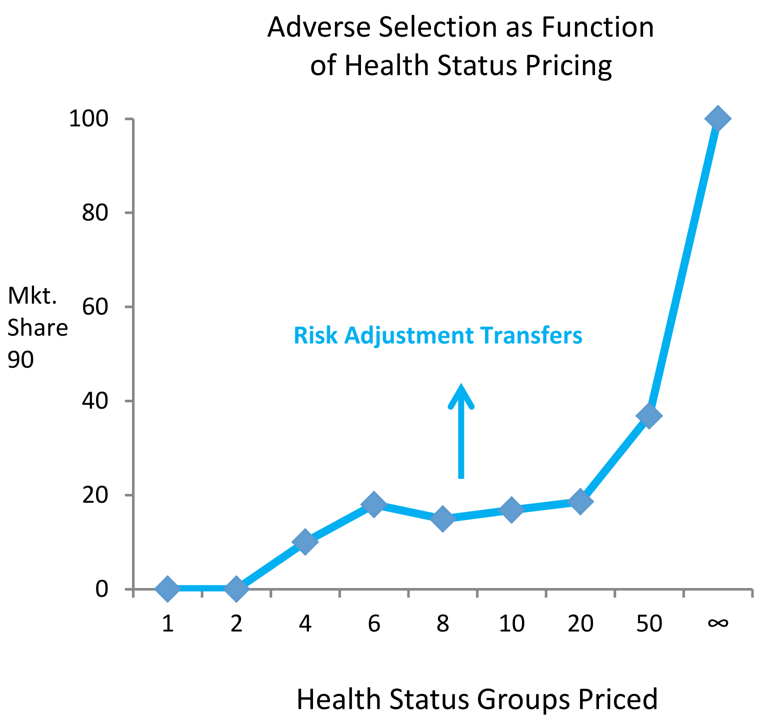
- Solution concept is Riley equilibrium

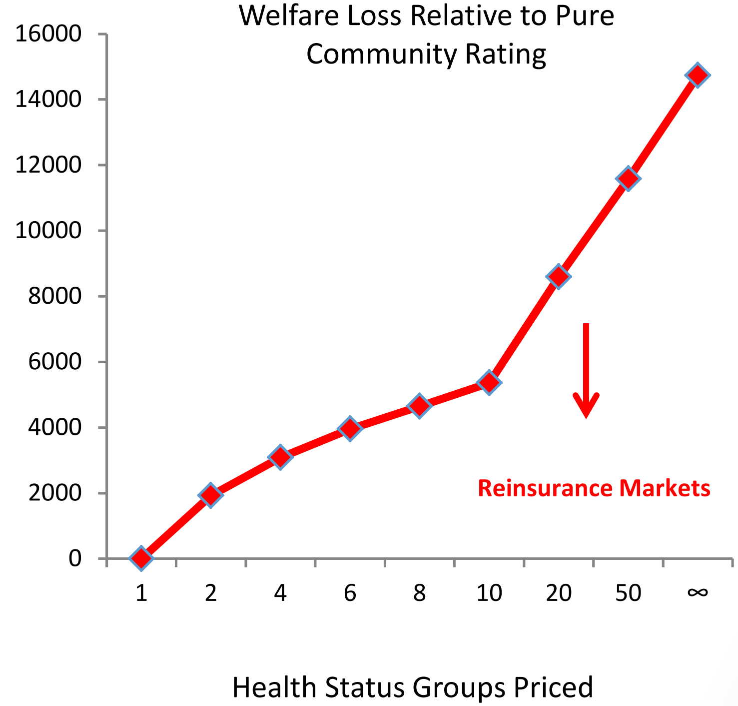
Compare to:

- $6559 average annual total expenses
- Fixed income, mean risk aversion, willing to pay **$619 for 90 at pop. AC**

Welfare Loss from ACG-quartile Pricing in Riley/sp-NE ($/year)			
Risk Parameter	Fixed income	Non-manager Income Path	Manager Income Path
0.0002	2200	1499	-384
0.0003	2693	1688	-613
0.0004	3082	1821	-886
0.0005	3399	1764	-973
0.0006	3626	2115	-891

Varying the Extent of Health-Based Pricing: Adverse Selection vs. RCR





Regulated Contract Variation

Alternative Market Contracts

- Baseline analysis looks at insurers with free entry into 90% and 60% actuarial value contracts

- Interesting to think about how adverse selection and reclassification risk change as market regulator or firm setting up private exchange changes minimum coverage allowed

- Look at alternatives:

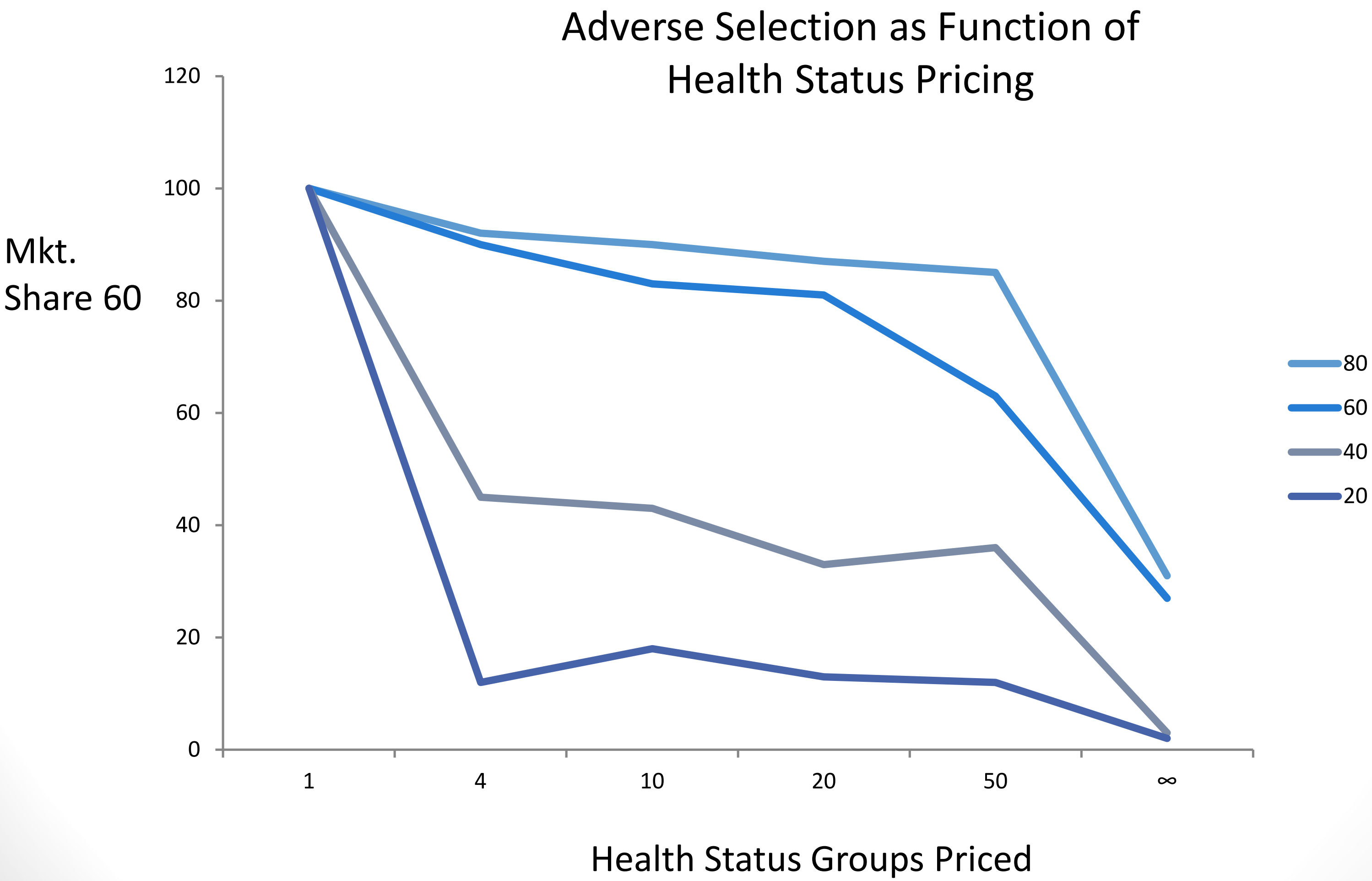
  -- 90% and 80%

  -- 90% and 40%

  -- 90% and 20%

- As minimum coverage becomes lower, market share in the 90% plan increases, but welfare is lower because proportion of people who enroll in lower coverage plans are much worse off

Alternative Contracts: Share in Comprehensive Coverage



Extensions & Next Steps

Extensions I

- Age-based pricing + community rating:
  - Full unraveling for all 5 yr age groups
  - 3:1 ratio binding for two youngest age groups 25-29, 30-34 (60 premiums 1784, 2215) relative to 60-64 (premium 7259)
- Insurer risk-adjustment transfers:
  - Use HHS transfer formula
  - RE prices now have lowest break-even ΔP *given HHS transfers*
  - Pure community rating: ΔP = 2050, P = (4139, 6189), share in 60 = 51.0%
- MEPS ‘reweighting’ of population (income, age, gender)
  - Reweight population using common demographics from MEPS
  - Nationally representative panel, individual in panel for 2 years
  - We use data from years 2004-2008
  - Use full 25-64 sample as well as uninsured / unemployed / without insurance
  - Find equilibrium results similar to our earlier results, our sample not too far off

Risk Adjustment

- HHS transfer formula (per member):

$$T_i = \left\{ \left(\frac{R_i}{\sum_i s_i R_i} \right) - \left(\frac{AV_i}{\sum_i s_i AV_i} \right) \right\} \overline{P}$$

$$where$$

$$R_i \text{ is plan's "risk score"} = AC_i(\Delta P)$$

$$AV_i \text{ is plan's "actuarial value"} = 0.i$$

$$\overline{P} \text{ is market avg premium} = s_{90}(\Delta P) AC_{90}(\Delta P) + s_{60}(\Delta P) AC_{60}(\Delta P)$$

- RE prices have lowest break-even Δ*P given HHS transfers*, while transfer depend on Δ*P* :

$$\Delta P^{RA} \text{ is fixed point: } \Delta P^{RA} = (0.3)\left(\frac{s_{90}(\Delta P^{RA}) AC_{90}(\Delta P^{RA}) + s_{60}(\Delta P^{RA}) AC_{60}(\Delta P^{RA})}{s_{90}(\Delta P^{RA}) \cdot 0.9 + s_{60}(\Delta P^{RA}) \cdot 0.6} \right)$$

- Find Δ*P* =2050 and s_{60} = 51.0% with no pre-existing conditions. Prices are (P_{60}, P_{90}) = (4139,6189), compared to (4051,--) before

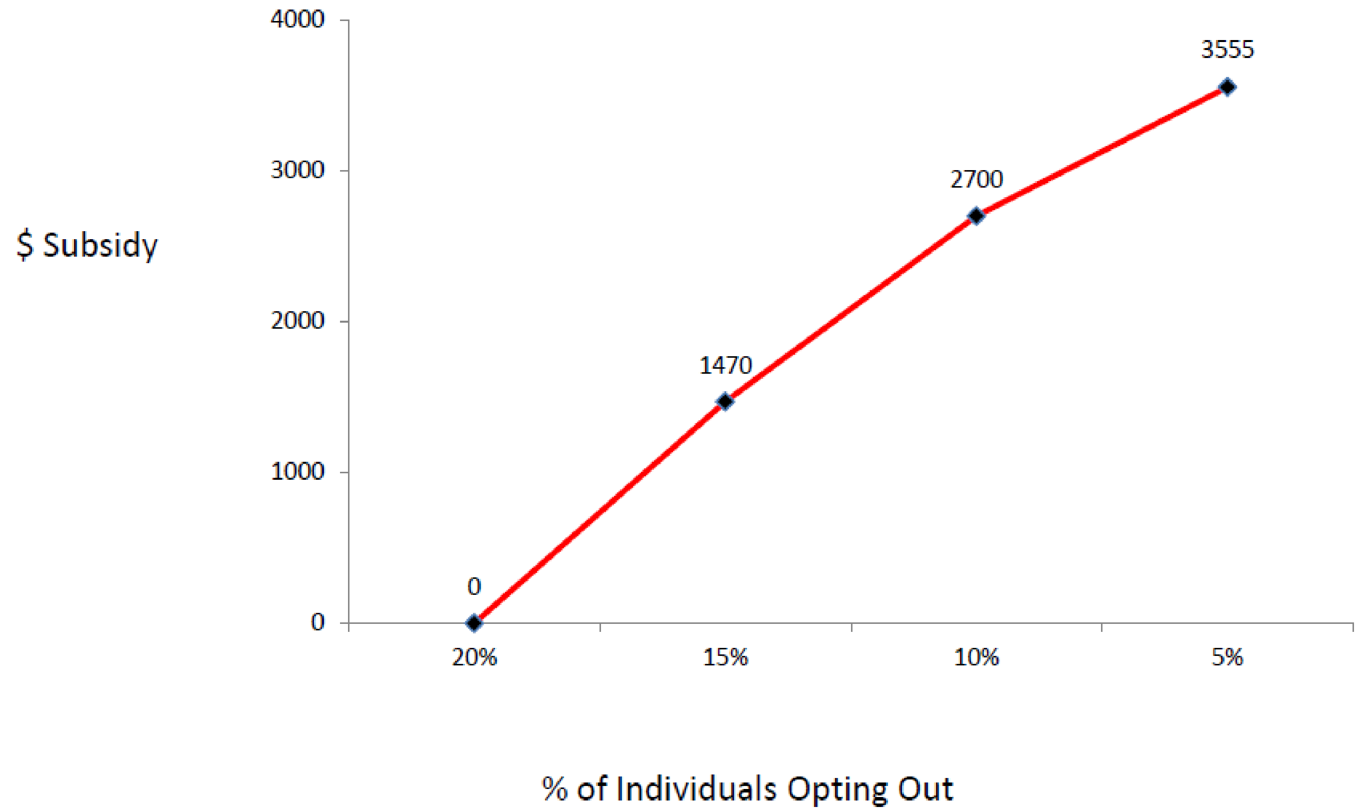
Extensions II

- Alternative solution concept (Wilson equilibrium)

- Participation and subsidies
  - 25% would opt-out in our population and market setup with no subsidies (premium in market ~25% higher)
  - Subsidy of $3,000 per person get’s opt-out share down to 12%, $4,000 gets up to 97%.

- Different long-run versus short-run risk preferences (implying lower aversion to reclassification risk)

Participation and Subsidies



Conclusions

- Develop framework for modeling equilibrium and long-run welfare in health insurance exchanges
- Use framework to investigate trade-off between adverse selection (shot-run risk exposure) and reclassification risk (long-run risk exposure) as a function of health-status pricing regulation
- Empirical calibration / study using detailed health claims / insurance choice data from population at a large firm, reweighted to nationally representative on some demographics in MEPS robustness exercise
- Counterfactual private exchange at firm, or public exchange with similar population

Conclusions

- Empirical analysis of this sample with market regulations reminiscent of ``typical'' exchange environment reveals:
  - Substantial adverse selection, no reclassification risk (by design), $619 welfare loss per person from AS
  - Age-based pricing does not substantially reduce adverse selection despite differences in mean expenses across age brackets. Essentially just redistributes across ages.
- Analysis of health-status pricing regulation reveals:
  - Lower adverse selection, but benefit outweighed by higher reclassification risk (unless substantial borrowing frictions)
  - $3,082 per person welfare loss from health status quartile pricing
- Proposed risk-adjustment would substantially reduce unraveling (by 49% market share for 90 plan)

Next Steps

- Other pricing regimes:
  - Pre-Existing Conditions (individual market)
  - Multi-year contracts / long-term contracts
  - Price Bands
- Product differentiation (providers, branding)
- Consumer choice frictions
- Moral hazard adjustment

Appendix

Preference Estimation: Model

- Consumers have CARA preferences:

$$u_k(m_j, OOP_j) = -\frac{1}{r_k} e^{-\gamma_k (m_j - OOP_j)}$$

where:

$$\gamma_k \sim N(\mu(X_k), \sigma_r)$$

$$m_j = W_{kt} - P_{kjt} + \underbrace{\eta(X_k) 1_{j=j-1}}_{\text{switch cost}} + \underbrace{\delta_k(Y_k) 1_{PPO_{1200}}}_{\text{CDHP dummy}} + \underbrace{aH_{jk}}_{\text{high-cost indicator}} + \varepsilon_{kjt}(\underbrace{Y_k}_{\text{family status}})$$

Results in Handel (2011), Mean risk aversion:

$$\frac{1}{2} \circ 100 + \frac{1}{2} \circ (-93.6) \sim 0$$

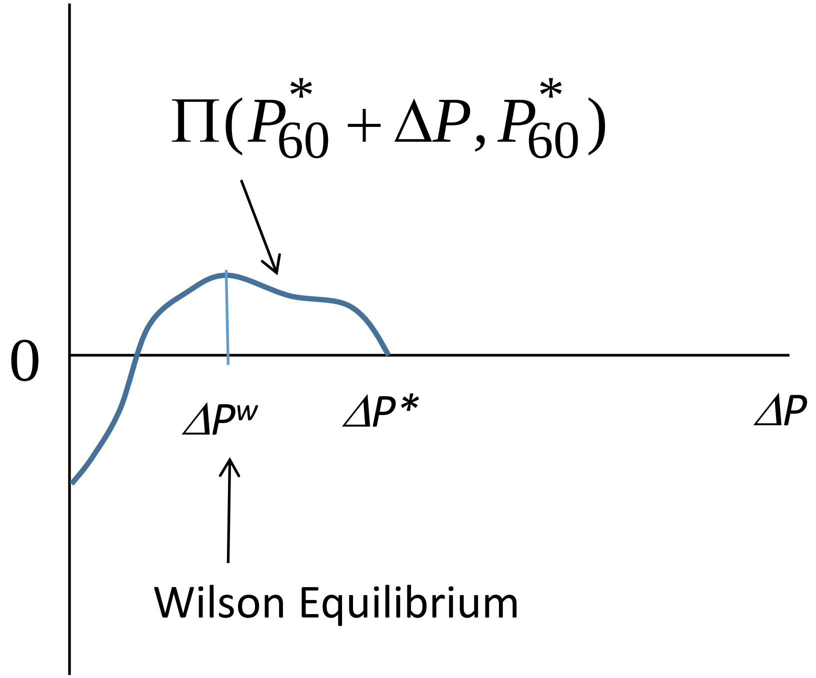
Health Exchange Model

Wilson Equilibria (WE): (P_{90}, P_{60}) is a Wilson equilibrium if there is no profitable deviation that remains profitable after any firm that is made unprofitable by the deviation drops its policies.

- (P_{90}^{w}, P_{60}^{w}) with $\Delta P \in [\underline{\theta}, \overline{\theta}]$ is a WE iff it solves:

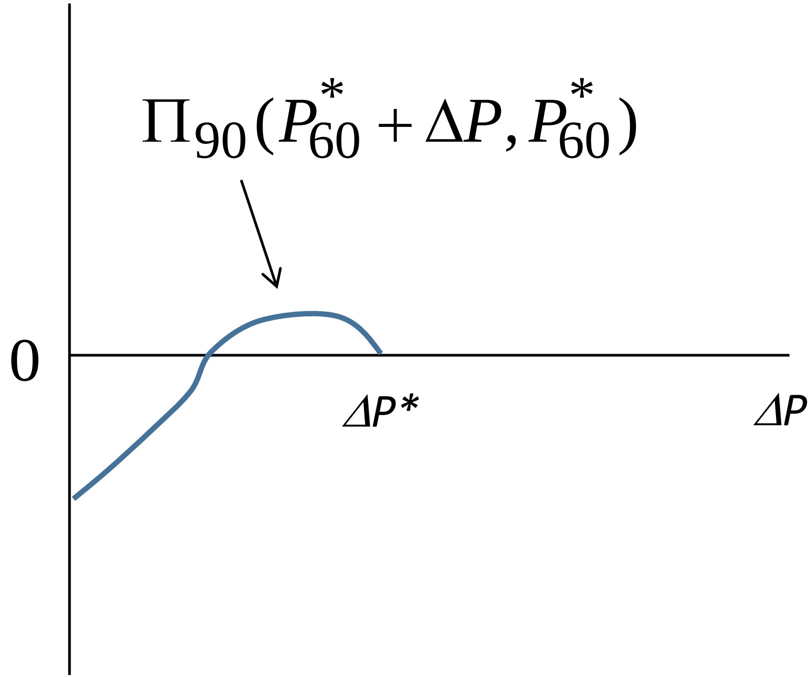
$$
\begin{array}{lll}
\min_{(P_{90}, P_{60})} & & P_{60} \\
s.t. & (i) & \Pi_{90}(P_{90}, P_{60}) \leq 0 \\
 & (ii) & \Pi(P_{90}, P_{60}) = 0 \\
 & (iii) & \Delta P \in [\underline{\theta}, \overline{\theta}]
\end{array}
$$

Any Wilson Equilibrium ΔP is at or below the lowest break-even ΔP, if such a ΔP exists.

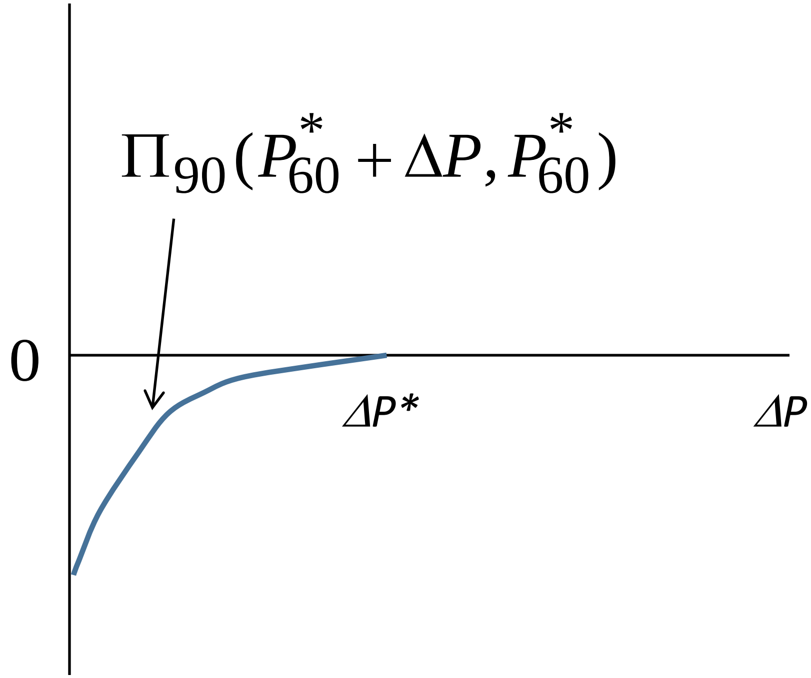


- RE exists and is the same as sp-NE
- Finally: if a mp-NE exists, it is also sp-NE, RE, and WE.

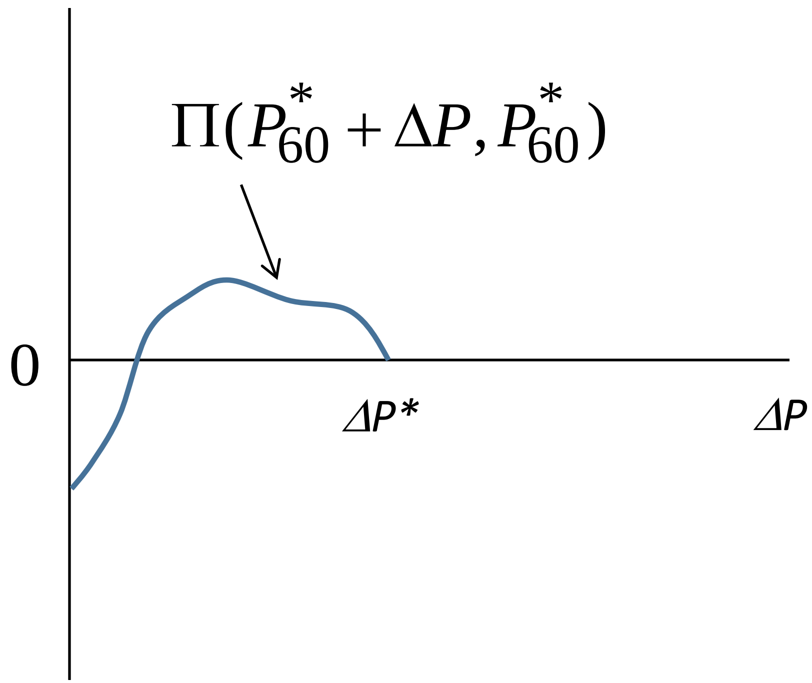
A single-policy deviation in policy 90 is profitable



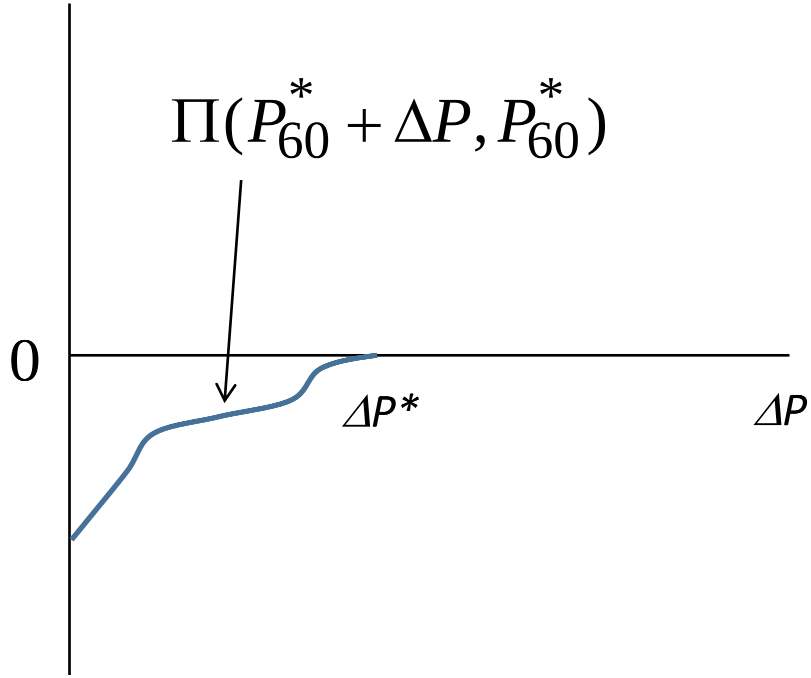
No single-policy deviation is profitable



A multi-policy deviation is profitable



No multi-policy deviation is profitable



Considerations for Exchange Regulators

- Formal setup for regulators to confront key welfare trade-offs across spectrum of possible regulations
  - States face different multi-dimensional exchange design problems

- Even with substantial adverse selection, exchange regulations may be close to optimal due to reclassification risk

- What are the consequences of an un-enforceable mandate?

- What are consequences if exchange not set up leaving reclassification risk / individual market?

MEPS Population Calibration

- Difficult to use MEPS data to measure risk preferences (and health risk to some extent)

- We 'weight' our data according to income, age, and gender in order to match MEPS sample
  - Can't get around fact that most data from one state, specific employer
  - Weighting is (i) robustness check and (ii) check on representativeness
  - Currently *not* weighting by health expenditures, but will going forward

- Results:
  - Equilibrium and welfare results have slight changes, but altogether quite close to our results, similar in spirit
  - Not a big surprise: direct comparison show age /gender/income mixture for 25-65 quite representative