Contract Regulation in Selection Markets

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Roadmap

Motivation

- Constraints are common
  - non-purchase fees (US)
  - minimal coverage (US exchanges, "bronze" plans)
  - maximal coverage (US exchanges, "platinum" plans)
  - How do these affect equilibrium and welfare?

- Two common frameworks for studying competitive selection markets
  - Markets for lemons (Akerlof 1970, EFC 2010)
  - Rothschild - Stiglitz 76
  - Are these special cases of a more general model? (yes)

In this paper

- Tractable model of a competitive selection market
  - continuum of types
  - non-purchase fee
  - maximal and minimal coverage
- Comparative statics of welfare wrt regulatory constraints

- Equilibrium typically exhibits partial pooling
  - depends non-trivially on the type distribution
- Welfare increases with maximal allowed coverage
- Sufficient conditions for welfare to increase with the non-purchase fee
- Increasing the minimal coverage has ambiguous (possibly non-monotonic) effects on welfare

Roadmap

Types

- Type $\mu \in [\underline{\mu}, \overline{\mu}]$ (expected cost)
- PDF $f(\mu) > 0$, CDF $F(\mu)$
- Assume f log-concave

Contracts

- Coverage x: insurer covers a share x of the individual's loss
  - no insurance: $x = 0$
  - full insurance: $x = 1$
- Allowed contracts are

$$x \in X = \{0\} \cup [\underline{x}, \overline{x}]$$

- Not buying: $x = 0$
- Minimal coverage: $\underline{x} \geq 0$
- Maximal coverage: $\overline{x} \leq 1$

Cost

- If type μ buys coverage x, expected cost to the insurer is

$$c = x\mu$$

Utility

- $p(x) \geq 0$ is the (endogenous) price of coverage x
- A contract is a pair (x, p)
- Utility is

$$u(\mu, x, p) = x\mu + g(x)\nu - p - T \cdot \mathbb{I}\{x = 0\}$$

- Even a risk neutral buyer transfers to the insurer the expected cost $x\mu$
- Risk aversion $\nu > 0$ implies an additional surplus $g(x) \cdot \nu$
  - $g(x) \geq 0$
  - $g(0) = 0$
  - $g'(x) > 0$ in $[0,1)$, and $g'(1) = 0$
  - $g''(x) < 0$
  - marginal surplus is positive, decreasing and vanishes at full insurance
- Non-purchase fee $T \geq 0$

Equilibrium: Azevedo Gottlieb 2017

- Intuitively, an **equilibrium** is a price $p(x)$ and a set of choices such that
  - individuals maximize utility
  - each contract breaks even
  - the prices of non-traded contracts are “reasonable”

Theorem

Every economy has an equilibrium

The Game

1. Regulator chooses $(\underline{x}, \overline{x}, T)$
2. Insurers set prices competitive, and individuals make choices, with the outcome given by an AG equilibrium

Roadmap

Possible Equilibrium regimes

Lemma

In any equilibrium, if a mass of individuals chooses $x = 0$, then a mass also chooses $x = \underline{x}$.

- The types of possible equilibria are:

Some choose $x > \underline{x}$	Some choose $x = \underline{x}$	Some choose $x = 0$	Regime
Y	Y	Y	Full Dispersion
Y	-	-	RS
Y	Y	-	Perfect Purchase, Partial Pooling (PPPP)
-	Y	Y	Lemons

Uniqueness

Proposition

If f is log-concave, equilibrium is unique.

- Valid for all equilibrium regimes

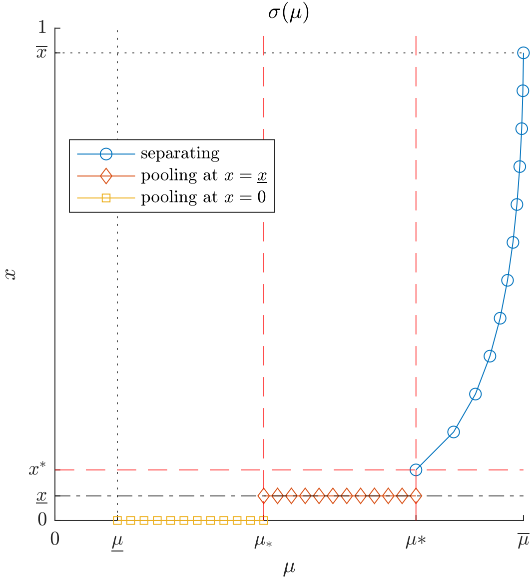
Roadmap

Dispersive Equilibrium

some buy	some buy	some buy
$x > \underline{x}$	$x = \underline{x}$	$x = 0$

- Other regimes are "limits" of "Dispersive"
- Let $\sigma(\mu)$ be the contract chosen by type μ in equilibrium

Dispersive Equilibrium: graphically



Comparative Statics

- ν is homogeneous
- Welfare is proportional to

$$W = [F(\mu^*) - F(\mu_*)]\, g(\underline{x}) + \int_{\mu^*}^{\overline{\mu}} g(\sigma(\mu)) f(\mu) d\mu.$$

Adjusting T

Lemma

If equilibrium is dispersive,

$$\frac{\partial \mu^*}{\partial T} > 0, \qquad \frac{\partial \mu_*}{\partial T} < 0$$

- Effect on welfare is still ambiguous, but:

Proposition

If equilibrium is dispersive,

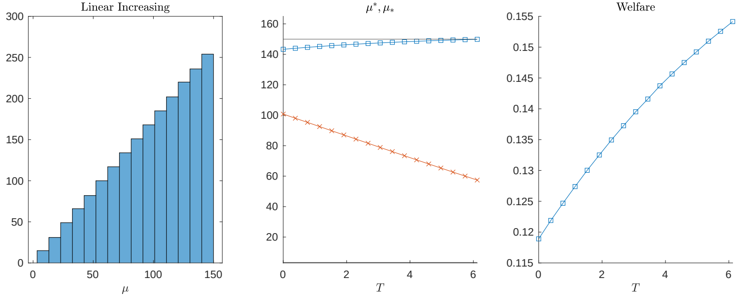
$$f(\mu_*) \geq f(\mu^*) \Rightarrow \frac{\partial W}{\partial T} > 0.$$

If f is weakly decreasing for all μ, then

$$\frac{\partial W}{\partial T} > 0, \forall T.$$

Adjusting T

- Condition is sufficient but not necessary:



Adjusting $\overline{x}$

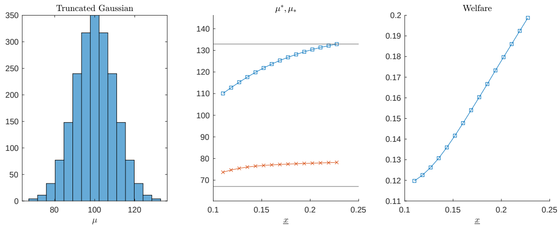
Proposition

If equilibrium is dispersive,

$$\frac{\partial W}{\partial \overline{x}} > 0.$$

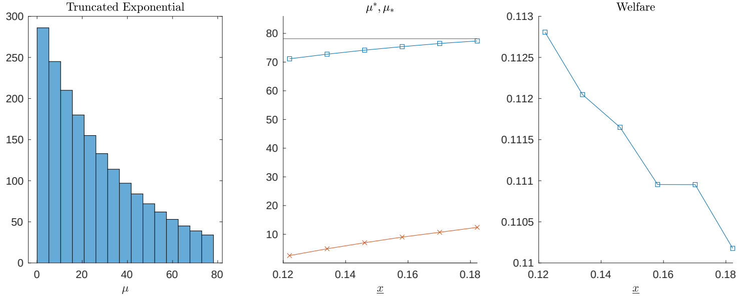
Simulations

- Results for $\underline{x}$ are less clear...
- With most simulated log-concave distributions, $\frac{\partial W}{\partial \underline{x}} \geq 0$



Simulations

- But not always...

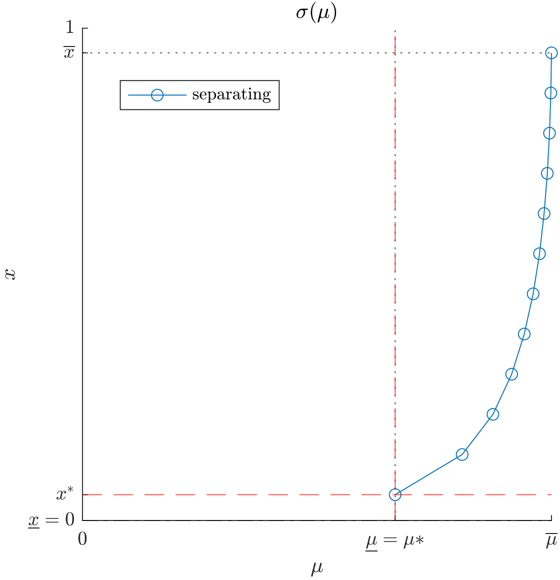


Roadmap

RS Equilibria

- All individuals buy $x > \underline{x}$, as in RS76
- Sufficient condition: $\underline{x} = 0$

Equilibrium graph



Comparative Statics

Lemma

If the equilibrium is RS, then

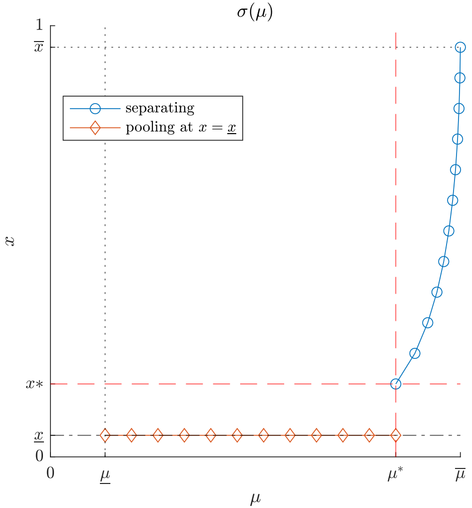
$$\frac{\partial W}{\partial \overline{x}} > 0.$$

Roadmap

PPPP Equilibria

- "Perfect Purchase with Partial Pooling" (PPPP) equilibria
  - some buy $x > \underline{x}$
  - some buy $x = \underline{x}$
- True if T is sufficiently high

Equilibrium graphically



Adjusting $\overline{x}$

- The fee T is irrelevant

Lemma

If the equilibrium is PPPP,

$$\frac{\partial W}{\partial \overline{x}} > 0.$$

Adjusting $\underline{x}$

Proposition

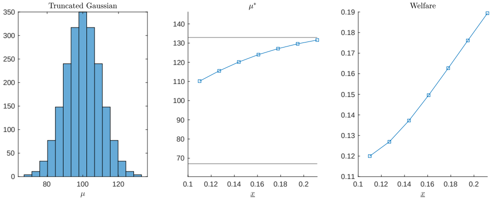
If the equilibrium is PPPP,

$$\frac{F(\mu^*)}{f(\mu^*)} \geq \frac{\nu g'(\underline{x})}{\underline{x}} \Rightarrow \frac{\partial W}{\partial \underline{x}} \geq 0. \tag{1}$$

Suppose f log-concave. Then if (1) holds for some $\hat{\underline{x}}$, it holds for all $\underline{x} > \hat{\underline{x}}$.

Simulations

- In simulations, $\frac{\partial W}{\partial \underline{x}} \geq 0$ for all log-concave distributions (but no proof)...



Roadmap

"Lemons" Equilibria

- All individuals buy $x \in \{0, \underline{x}\}$
  - sufficient condition: $\|\overline{x} - \underline{x}\|$ sufficiently small
- In equilibrium:
  - types $\mu \geq \mu_*$ buy $x = \underline{x}$
  - types $\mu < \mu_*$ buy $x = 0$

Adjusting $\underline{x}$

- As we change $\underline{x}$, assume $\underline{x} = \overline{x}$

Lemma

If the equilibrium is "lemons" and f log-concave,

$$\frac{\partial \mu_*}{\partial \underline{x}} \geq 0.$$

- Higher coverage (and the corresponding adjustment in price) shrinks the set of buyers
  - (due to adverse selection)

Adjusting $\underline{x}$

- Let quantity of buyers be $q(\underline{x}) = 1 - F(\mu_*(\underline{x}))$
- We can show $\underline{x}(q)$ is decreasing...like a an inverse demand function.
- Social welfare is $W = q \cdot g(\underline{x}(q))$
  - This is the monopoly problem!
- Selling insurance to another marginal individual entails:
  - marginal gains: surplus of the marginal individual
  - infra-marginal losses: increasing q requires lowering the coverage enjoyed by all infra-marginal individuals

Full coverage is not optimal

Proposition

Suppose "everyone buying full coverage ($\underline{x} = 1$)" is not an equilibrium. Suppose $X = \{0, \underline{x}\}$. Then, the socially optimal level of mandated coverage is interior ($\underline{x} \in (0,1)$).

- At full insurance ($\underline{x} = 1$)
  - marginal surplus from additional insurance is $g'(1) = 0$
  - reducing coverage implies no loss for buyers and increases number of buyers

Roadmap

Moral Hazard

- E.g., individuals use more healthcare when they receive better insurance, especially high-cost individuals
- So far: $\frac{\partial W}{\partial \overline{x}} \geq 0$
  - Does MH lead to OVER-insurance?
  - Is there a rationale to reduce $\overline{x}$?

Modelling MH

- Utility and cost are

$$u = x\mu + \frac{x^2}{2}M + g(x)\nu - p(x)$$

$$c = x\mu + x^2 M$$

- $M > 0$ captures the importance of MH
- Things are more general in the paper

Social Surplus

- Social surplus of type μ is

$$s(\mu, x) = g(x)\nu - \frac{x^2}{2}M$$

- s concave in x, and maximized at $x = x^{\star\star}$ that satisfies

$$\frac{g'(x^{\star\star})}{x^{\star\star}}\nu = M, \qquad \forall\mu$$

- $M > 0$ implies $x^{\star\star} < 1$
- Full insurance is not optimal

Equilibrium

- There is a maximum purchased coverage $\tilde{x}$,s.t. types $\mu \in [\mu^*, \overline{\mu}]$ purchase contracts
$$x \in [x^*, \tilde{x}]$$

Proposition

In equilibrium, if $\tilde{x} < \overline{x}$, then $\tilde{x}$ satisfies

$$\frac{\partial s(\overline{\mu}, x)}{\partial x} |_{x=\tilde{x}} = 0.$$

Moreover, $\tilde{x} = \overline{x}$ if

$$\frac{\partial s(\overline{\mu}, x)}{\partial x} |_{x=\overline{x}} \geq 0.$$

Over-insurance? No

- At most, type $\overline{\mu}$ buys $\tilde{x}$
- But $\tilde{x} = x^{\star\star}$ is the optimal coverage for all types
- Every type $\mu < \overline{\mu}$ obtains $x < \tilde{x}$.
- So MH leads to UNDER-insurance

Proposition

If $M > 0$, then

$$\frac{\partial W}{\partial \overline{x}} \geq 0$$

- MH should not imply restrictions on $\overline{x}$

Roadmap

- Tractable model of a competitive selection market with
  - continuum of types
  - non-purchase fee
  - exogenous restrictions on the set of allowed contracts:
    - as special cases: Akerlof 1970 and RS 1976
- Sufficient conditions for welfare to increase with the non-purchase fee
- Welfare robustly increases with maximal allowed coverage
  - robust to moral hazard
- Increasing the minimal allowed coverage has ambiguous (possibly non-monotonic) effects on welfare

THANK YOU!

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