Why Insurance Works Better With Some Adverse Selection

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About the speaker

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- Research Interests:
  - Loss coverage and public policy aspects of risk classification
  - Economic capital and financial risk management of financial services firms

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Agenda

- Background
- Motivating Examples
- Insurance Market Model
- Iso-elastic Demand
- Summary

Background

Background

- Usual adverse selection argument: Pooling of risks implies
  - higher risks buy more insurance
  - lower risks buy less insurance
  - **raising pooled price** of insurance
  - **lowering demand** for insurance.

- Usually portrayed as a bad outcome!
  - Both for insurers and for society.

Background

- In practice:
  - EU ban on using gender in insurance underwriting
  - Moratoria on the use of genetic test results in underwriting

- We argue that pooling implies:
  - A shift in coverage towards higher risks
  - Loss coverage can increase
  - Good outcome from adverse selection!

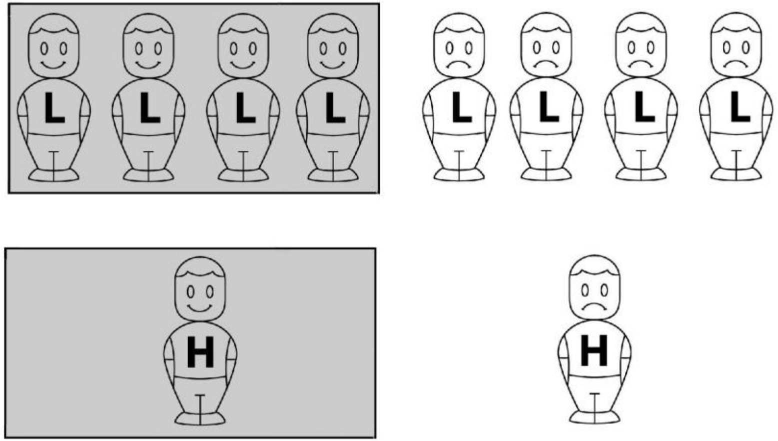
Motivating Examples

Motivating Example 1

1. No adverse selection

Risk-differentiated premiums = 0.01

Risk-differentiated premiums = 0.04



Weighted average premium	Loss coverage
0.016	50%
$\frac{(4\times 0.01+1\times 0.04)}{5}$	$\frac{(4\times 0.01+1\times 0.04)}{(8\times 0.01+2\times 0.04)}$

Motivating Example 2

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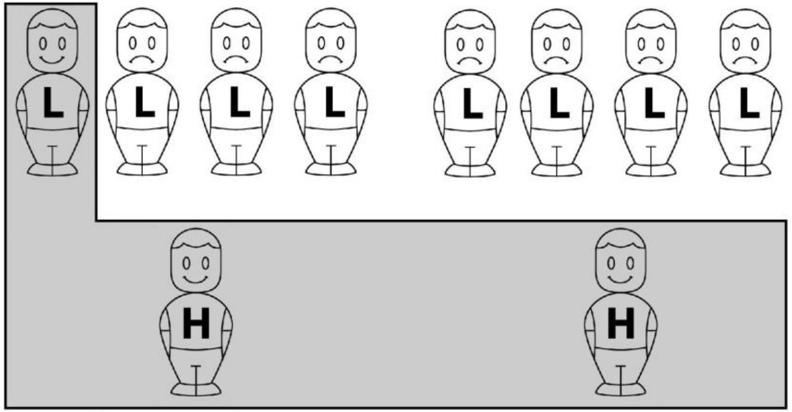
2. Some adverse selection

Pooled premiums = 0.03

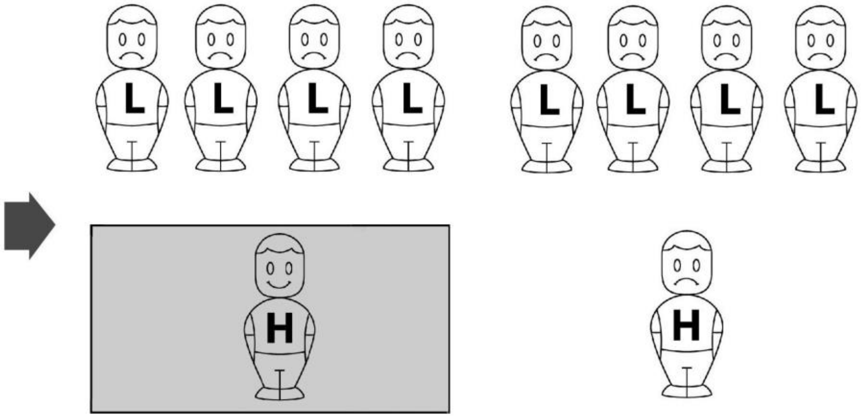


Weighted average premium	Loss coverage
0.03	56%
$\frac{(1\times 0.01+2\times 0.04)}{3}$	$\frac{(1\times 0.01+2\times 0.04)}{(8\times 0.01+2\times 0.04)}$

Motivating Example 3

3. Severe adverse selection

Pooled premiums = 0.04



	Weighted average premium	Loss coverage
	0.04	25%
	$\frac{(1\times 0.04)}{1}$	$\frac{(1\times 0.04)}{(8\times 0.01+2\times 0.04)}$

Insurance Market Model

Insurance Demand

- Consider individuals in a particular risk-group
  - with **probability of loss** μ;
  - offered insurance at **premium rate** π.
  - proportional **demand** for insurance: $d(\mu, \pi)$

- Consider n risk-groups where for each risk-group $i = 1, 2, \ldots, n$:
  - population proportion: p_i
  - insurance demand: $d(\mu_i, \pi_i)$

Insurance Market and Equilibrium

- Q : Indicator of insurance purchase (1=purchase, 0 otherwise)
- L : Indicator of loss event (1= loss occurs, 0 otherwise)
- Π : Premium offered (π_i = premiums on purchase, 0 otherwise)

- Expected premium income: $E[Q\Pi]$
- Expected insurance claim: $E[QL]$

- Market equilibrium: $E[Q\Pi] = E[QL]$

Loss Coverage

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At market equilibrium **loss coverage** is defined as:

$$E[QL]$$

Note: $QL = 1$ if an individual both incurs a loss and has cover.

Loss coverage ratio is defined as:

$$C = \frac{E[QL]}{E_0[QL]}$$

where $E_0[QL]$ is the loss coverage under full risk-differentiation.

Iso-elastic Demand

Iso-elastic Demand

- Iso-elastic demand: $d(\mu_i, \pi_i) = \tau_i \left(\frac{\mu_i}{\pi_i}\right)^{\lambda_i}$

- Fair-premium demand: $d(\mu_i, \mu_i) = \tau_i$

- Constant demand elasticity: $\left|\frac{\partial \log[d(\mu_i,\pi_i)]}{\partial \log \pi_i}\right| = \lambda_i$

Same Constant Demand Elasticity: λ

- Pooled equilibrium premium: $\pi_1 = \pi_2 = \cdots = \pi_n = \pi_0$.

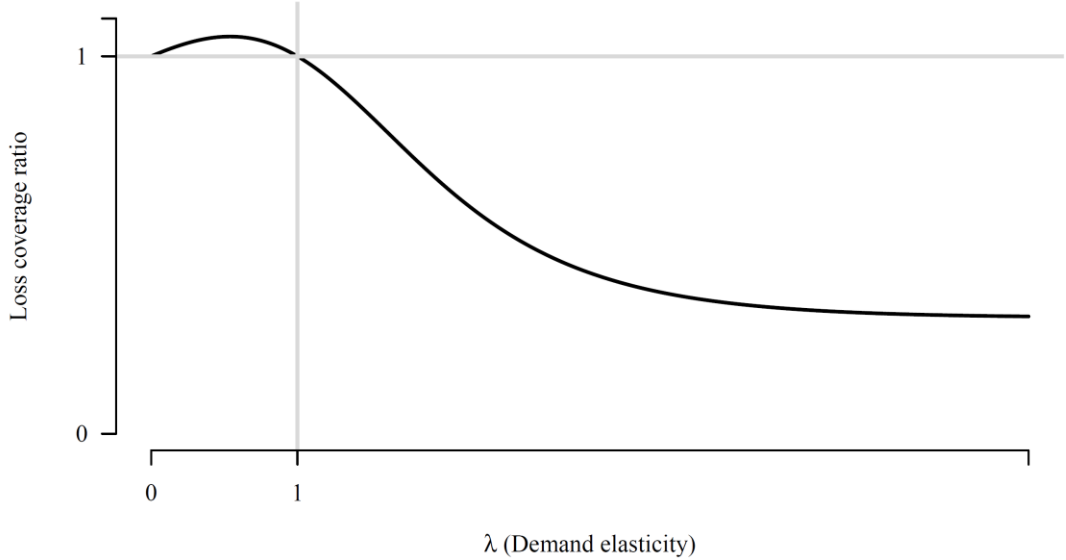
$$\pi_0 = \frac{\sum_{i=1}^{n} \alpha_i \mu_i^{\lambda+1}}{\sum_{i=1}^{n} \alpha_i \mu_i^{\lambda}}$$

- Loss coverage ratio:

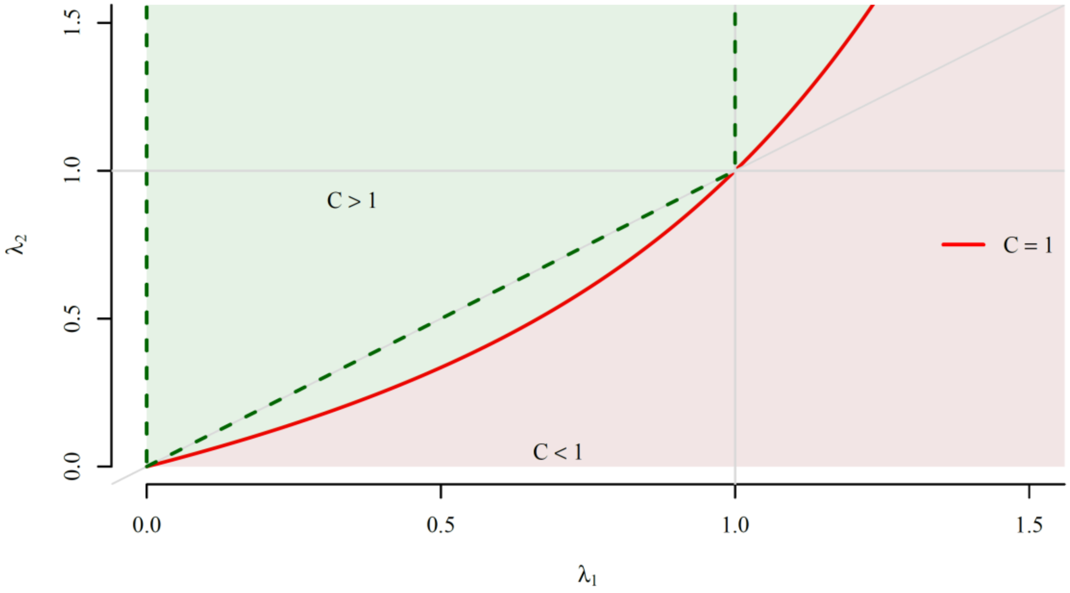
$$C = \frac{1}{\pi_0^{\lambda}} \frac{\sum_{i=1}^{n} \alpha_i \mu_i^{\lambda+1}}{\sum_{i=1}^{n} \alpha_i \mu_i^{\lambda}}$$

where α_i is the fair-premium demand share for risk-group i.

Same Constant Demand Elasticity: λ
Result 1: $\lambda \leq 1 \Rightarrow C \geq 1$



Different Constant Demand Elasticities: λ_1, λ_2
Result 2: $\lambda_1 \leq 1$ and $\lambda_2 \geq \lambda_1 \Rightarrow C \geq 1$



Empirical Evidence on Demand Elasticities

Market and country	Estimated Demand Elasticities	Authors
Yearly renewable term life insurance, USA	0.4 to 0.5	Pauly et al (2003)
Term life insurance, USA	0.66	Viswanathan et al (2007)
Whole life insurance, USA	0.71 to 0.92	Babbel (1985)
Health insurance, USA	0 to 0.2	Chernew et al (1997), Blumberg et al (2001), Buchmueller and Ohri (2006)
Health insurance, Australia	0.35 to 0.50	Butler (1999)
Farm crop insurance, USA	0.32 to 0.73	Goodwin (1993)

Insurance demand elasticity $\lambda < 1$ has been observed in a number of studies.

Summary

Summary

- Pooling increases loss coverage if $\lambda < 1$.
- From a social policy perspective, a shift in coverage towards higher risks by pooling can sometimes more than offset the fall in numbers insured.
- Adverse selection need not always be adverse!

References

http://blogs.kent.ac.uk/loss-coverage/

Thank you very much for your attention!

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