Public Economics II: Public Expenditures
Lecture 4: Adverse Selection and Social Insurance

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Spring 2023

Social Insurance

- Social insurance are government transfers that provide insurance against economic risk.
- Governments in modern economies are a large provider of insurance:
  - Health insurance
  - Unemployment insurance
  - Disability insurance
  - Social security
- Key question: Why does the government provide insurance rather than the private market?

Why Social Insurance?

- Motivation for insurance: reduce risk for risk-averse individuals.
  - Health insurance → risk of unplanned illness
  - Unemployment insurance → risk of involuntary unemployment
  - Disability insurance → risk of injury/disability
  - Social security → risk of retirement costs being higher than expected
- Reasons for government involvement:
  1. Macro-economic shocks (Private insurers unable to cover aggregate shocks)
  2. Individual optimization issues (myopia)
  3. Asymmetric information: **adverse selection**
- This lecture: The unique role of adverse selection in generating a role for government in insurance markets.

Quick aside: there be other reasons besides market failures that motivate social insurance

James Mirrlees 1995:

> *From the point of view of insurance, there seem to me to be two compelling theoretical arguments for having the State rather than the market provide a wide range of insurance, for old-age pensions, disability and sickness, unemployment and low income: the first is that the market handles adverse selection badly. The second is that, even if adverse selection were not important, people should take out insurance at an age when they are incapable of doing so rationally, namely zero.*

Why SI? Adverse Selection: Market for Lemons (Akerlof, 1970)

Market for used cars:

- Cars have value x_i where $x_i \sim \text{uniform}[0, 2]$
- N Sellers will sell their car if: $U_s = p - x_i > 0$
- M buyers will buy a car if $U_b = 3/2x_i - p \geq 0$
- Clear gains from trade, so if quality of car is observable then all cars will sell with $p \in [x_i, 3/2x_i]$ for each car.

If there is **asymmetric information** and buyers cannot observe x_i:

- Buyers will now only buy if $E[U_b] = 3/2E[x_i] - p = 3/2 - p \geq 0 \rightarrow p = 3/2$ for all cars.
- Only sellers where $x_i \leq 3/2$ will remain in market $\longleftarrow$ **Adverse Selection**
- But then buyers will now only buy if $p \leq E[3/2x_i | x_i \leq 3/2] = 9/8...$

  $\longrightarrow$ Market unravels (death spiral)

Generalizing Akerlof to Insurance Markets

- Akerlof argued that the market for health insurance above age 65 in the US does not exist because it unraveled due to adverse selection.
- The market for insurance is a **Selection Market**: where consumers not only vary in their willingness to pay but also vary in how costly they are to the seller.
- Therefore sellers care both about how many units they sell and who the buyers are.
- Fixed contract space: Insurers offer either full insurance H at price p or no insurance L at price 0.

Generalizing Akerlof to Insurance Markets: Demand Side

- $G(s)$ is population distribution, as a function of consumer's risk factor s.
- $v^H(s_i, p)$ - utility of purchase of H for person i
- $v^L(s_i)$ - utility of no insurance for person i
- Assume: $\frac{\partial V^H}{\partial p} < 0$ and $v^H(s_i, p = 0) > v^L(s_i)$
- Iinsurance is chosen by i iff d $v^H(s_i, p) > v^L(s_i)$
- Let $\pi(s_i) = \max\{p : v^H(s_i, p) > v^L(s_i)\}$. The highest price i is willing to pay for H.
- Then aggregate demand in this market:

$$D(p) = \int 1(\pi(s) \geq p) dG(s) = Pr(\pi(s_i) \geq p)$$

Generalizing Akerlof to Insurance Markets: Supply side

- Let $c(s_i)$ be the expected cost of supplying H to i.
  - Notice $c(\cdot)$ is determined by consumer characteristics $\leftarrow$ selection market.
- Average cost for insurer of providing H at price p:

$$AC(p) = \frac{1}{D(p)} \int c(s)1(\pi(s) \geq p)dG(s) = E[c(s_i)|\pi(s) \geq p]$$

- Whereas the marginal cost curve in the market is given by:

$$MC(p) = E[c(s)|\pi(s) = p]$$

Assume:

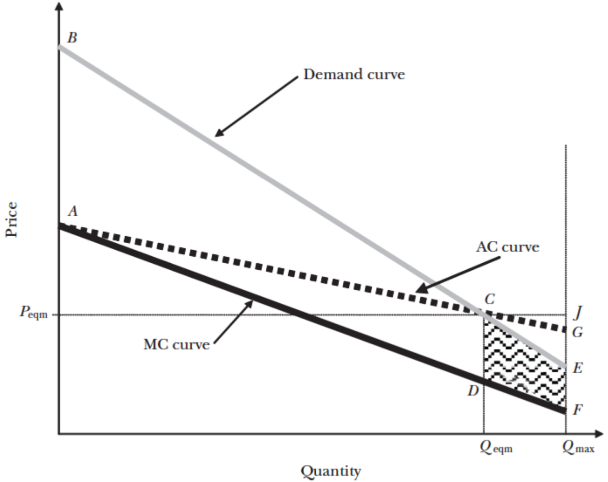
1. $\exists\ \overline{p}$ s.t. $MC(p) < p\ \forall\ p > \overline{p} \rightarrow$ it is profitable to provide H to some i.
2. If $\exists\ \underline{p}$ s.t. $MC(\underline{p}) > \underline{p}$ then $MC(p) > p\ \forall\ p < \underline{p} \rightarrow$ MC(p) crosses D(p) at most once.

- Akerlof (1970): Competitive equilibrium requires demand $=$ average cost,

$$D(pi = AC(p^*) = E[c(p^*)|\pi(s) \geq p^*]$$

Generalizing Akerlof to Insurance Markets

Figure 1
Adverse Selection in the Textbook Setting

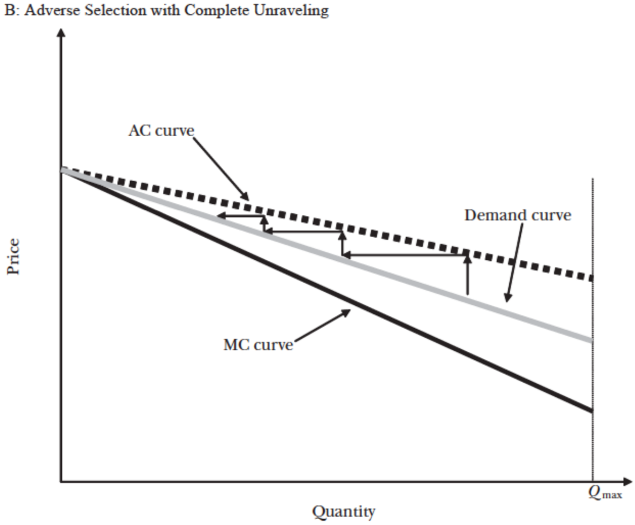


Source:Einav and Finkelstein (2011 JEP)

Generalizing Akerlof to Insurance Markets: Unraveling

- It is not clear that competitive equilibrium involves any insurance.
  - Market can "unravel"
  - Unravelling happens if no one is willing to pay the pooled cost of those with higher with higher willingness to pay

Generalizing Akerlof to Insurance Markets



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Weakness of Akerlof as a Model of insurance

- Only a single contract traded and competition is only on price .
- Insurers could compete on more than one dimension of the contract.
  1. Price of a contract
  2. Level of coverage
- Rothschild and Stiglitz (1976): offer multiple contracts where you can "screen" individuals with different risk into different contracts.

- Agents endowed with wealth w and face a pontential loss of l with probability p

Rothschild and Stiglitz (1976) Model

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- Consumption for each individual in two possible states:
  - Good: w
  - Bad: $w - l$

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  - $p \in \{p_L, p_H\}$ with $p_L < p_H$

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  - $p \in \{p_L, p_H\}$ with $p_L < p_H$
- Agents have vNM preferences

$$V(w) = (1 - p)u(w) + pu(w - l)$$

Insurers

- Assume there is a risk-neutral insurance company seeking to maximize expected profit by offering a menu of insurance contracts:

$$A = \left\{\alpha_1(p), \alpha_2(p)\right\}_{p \in \{p_L, p_H\}}$$

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- Timing:
  - First, insurer offers a menu of contracts
  - Then given the available contracts, individuals choose the bundle that maximizes their utility

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Solution

Set $MRS_{12} = \frac{1-p}{p} \iff u'(c_{NL}) = u'(c_L)$, *i.e. full insurance*

- All types get their expected income $w - pl$ in both states of the world

Rothschild and Stiglitz: First Best

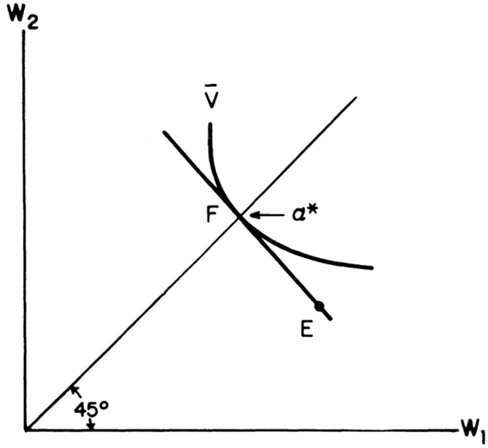

FIGURE I

Source: Rothschild and Stiglitz (1976 QJE)

Rothschild and Stiglitz: Second Best Problem

- Now assume insurers cannot distinguish between types.
- First best contracts above can no longer be offered: high risk types are better off buying the low risk contract, insurer will go out of business.

Rothschild and Stiglitz: Second Best Problem

Result 1

No pooling equilibrium exists when p is private information

- Zero profit condition requires contract $\alpha = \{\alpha_1, \alpha_2\}$ s.t.:

$$\alpha_2 = \frac{1 - \overline{p}}{\overline{p}} \alpha_1$$

- Type L's indifference curve through α will be steeper than type H's
- This results in a profitable deviation for other insurer to enter market and offer contract that makes L types better off.
- Original contract loses money: $p_H > \overline{p}$
- This argument is generalizable to many types.

Rothschild and Stiglitz: No Pooling Equilibrium Exists

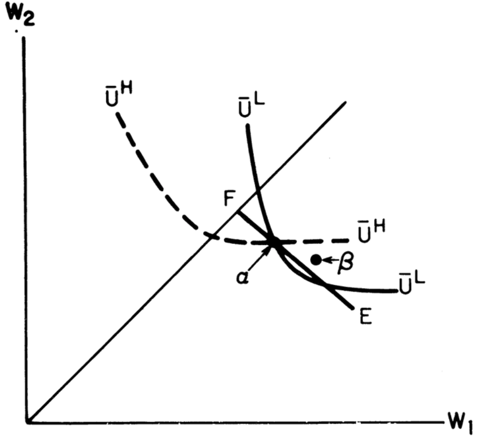

FIGURE II

Source: Haller and Mousavi (2007)

Result 2

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- There is no profitable deviation: for any other menu $\{\tilde{\alpha}_1^i, \tilde{\alpha}_2^i\}_{i \in \{L,H\}}$ it must be that:

$$\sum_{i \in \{L,H\}} [(1 - p^i)u(w - \tilde{\alpha}_1^i) + p^i u(w - l + \tilde{\alpha}_2^i)] \leq 0$$

Rothschild and Stiglitz: Second Best Problem

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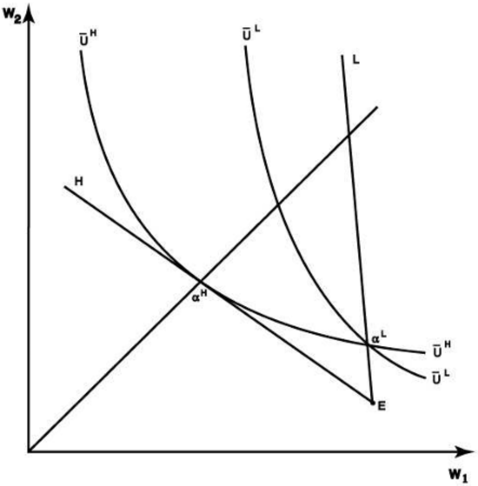
  - L is provided as much insurance as possible without inducing H to deviate and pretend to be low risk.
- "No distortion at the top" - a classic result in mechanism design/asymmetric info models: those with highest willingness to pay receive the efficient outcome.
  - $\rightarrow$ IC constraints always bind downwards

Rothschild and Stiglitz: Separating Equilibrium



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- This extends to multiple *discrete* types. (Try and draw it for 3-types)

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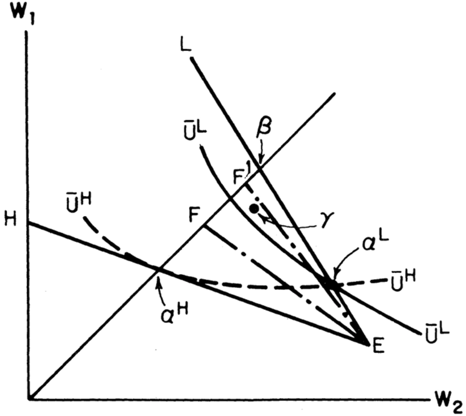

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Akerlof (1970) vs. Rothschild and Stiglitz (1976)

- **Akerlof Unraveling:** (competition in price)
  - Occurs when the demand curve (willingness to pay) falls everywhere below the average cost curve.
  - Market unravels completely no one gets insurance
  - Notice: that this appears to occur when in the discrete Rothschild-Stiglitz model there is a separating equilibrium

- **Rothschild-Stiglitz Unravelling** (competition in price and coverage)
  - Gains from trade → Separating equilibrium does not exist.
  - No stable market for insurance
  - Notice that if competition was only on price for a full insurance contract we would have an equilibrium (everyone is fully insured at price $\bar{p}l$)

- Now we assume is a unit mass of types with p which is distributed with c.d.f. F(p) with support Ψ
- Insurance companies offer a menu of contracts: $A = \left\{c_L^i(p), c_{NL}^i(p)\right\}_{p\in\Psi}$

Definition

An allocation $A = \left\{c_L^i(p), c_{NL}^i(p)\right\}_{p\in\Psi}$ is a Competitive Nash Equilibrium if:

1. A is incentive compatible

$$(1-p)u(c_{NL}(p)) + pu(c_L(p)) \geq (1-\tilde{p})u(c_{NL}(\tilde{p})) + pu(c_{NL}(\tilde{p}))\forall p, \tilde{p}\backslash\{1\}$$

2. A is individually rational

$$(1-p)u(c_{NL}(p)) + pu(c_L(p)) \geq (1-p)u(w) + pu(w-l) \quad \forall p$$

3. A has no profitable deviation.

Akerlof Unravelling in a Rothschild-Stiglitz Word

Theorem (presented without proof)

(Hendren 2013) The endowment, $\{(w\text{-}l, w)\}$, is a competitive Nash equilibrium iff:

$$\frac{p}{1-p}\frac{u'(w-l)}{u(w)} \leq \frac{E[P|P \geq p]}{1-E[P|P \geq p]} \;\; \forall p \in \Psi \backslash \{1\}$$

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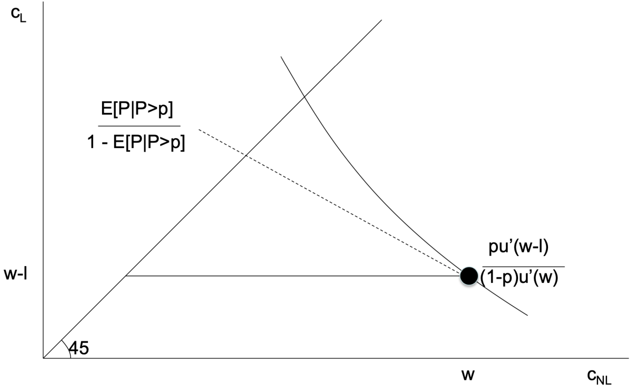
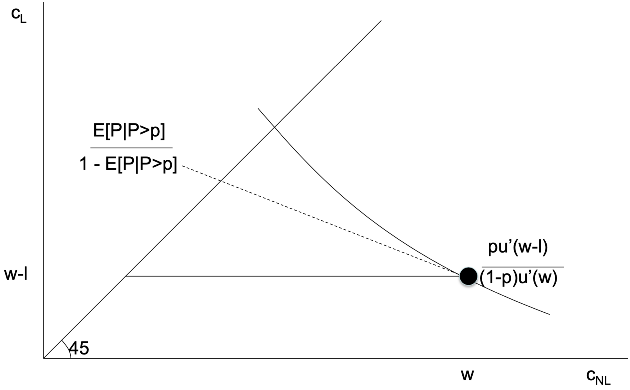
- But wait! Isn't this the condition that we needed for the separating equilibrium in the discrete model?
- When the type space is continuous this theorem extends Akerlof unraveling to the set of all potential traded contracts, as opposed to just a single contract with competition only on price.

Akerlof Unraveling



Source: Hendren lecture notes (2022)

Akerlof Unraveling (2)



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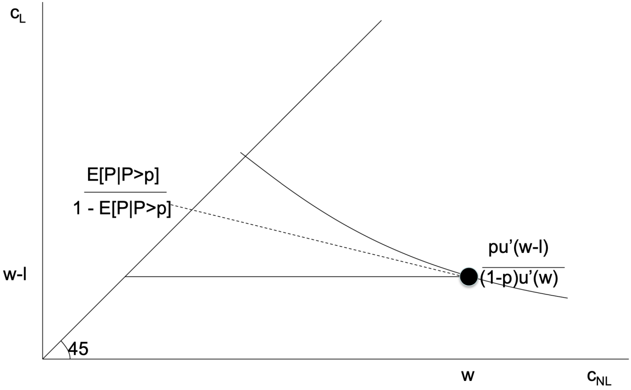
Akerlof Unraveling (3)



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- Gains from trade → No Akerlof unravelling
  - But there are profitable deviations → Rothschild - Stiglitz unravelling
- We don't have a model for insurance

Empirical Evidence of Adverse Selection

1. Positive correlation test
2. Random variation in prices
3. Subjective probability elicitations

Positive Correlation Test (Chiappori and Salanie (2000)

- French auto-insurance market: look for positive correlation between buying extra (comprehensive) coverage and claims
- If there is adverse selection then buying extra coverage should be positively correlated with claims.
- Basic idea of the test:
  - Estimate:

$$Coverage_i = \beta X_i + \epsilon$$
$$Claims_i = \gamma X_i + \eta$$

  - Test for residual private information:

$$H_0 : cov(\epsilon, \eta) = 0$$

- Result: cannot reject that $cov(\epsilon, \eta) = 0 \rightarrow$ No evidence of adverse selection.

Positive Correlation Test (Finkelstein and Poterba (2004)

- Test for adverse selection in annuities market in the UK.
- They find positive correlation between:
  - Back-loaded payment schemes and length of life.
  - Size of gaurantee to family and early death.
- Both are consistent with adverse selection.

Limitations of the Positive Correlation Test

1. Does not account for other dimensions of heterogeneity that may confound the correlation:
   - e.g. "The worried well" may help sustain insurance markets, this could mean that there was some degree of "advantageous selection" in the market
2. Positive correlation does not clearly indicate that there are welfare losses in the market
3. You can only perform a positive correlation test in a market that exists
4. Positive correlation could also be driven by **moral hazard**

Finkelstein and McGarry (2006) (Limitation 1)

- Test for multiple dimensions of private information in the insurance market for long term care (LTC)
- Two forms of ex ante private information:
  - Being high risk → adverse selection
  - Having a strong preference for insurance (e.g. the worried well) → advantageous selection.
- They find evidence for both types of private information.

Finkelstein and McGarry (2006): Procedure

1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage

Table 1—Relationship between Individual Beliefs and Subsequent Nursing Home Use

	No controls	Control for insurance company prediction		Control for application information
	(1)	(2)	(3)	(4)
Individual prediction	0.091***		0.043**	0.037*
	(0.021)		(0.020)	(0.019)
Insurance company prediction		0.400***	0.395***	
		(0.020)	(0.021)	
pseudo-R^2	0.005	0.097	0.099	0.183
N	5,072	5,072	5,072	4,780

Source: Finkelstein and McGarry (2006)

Finkelstein and McGarry (2006): Procedure

1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage
   - Takeaway: individual's have residual information on their risk level.

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1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage
    - Takeaway: individual's have residual information on their risk level.

2. Test if individual's subjective believes about risk are positively correlated with subsequent nursing home use

TABLE 2—RELATIONSHIP BETWEEN INDIVIDUAL BELIEFS AND INSURANCE COVERAGE

	No controls	Control for insurance company prediction		Control for application information
	(1)	(2)	(3)	(4)
Individual prediction	0.086***		0.099***	0.083***
	(0.017)		(0.017)	(0.016)
Insurance company prediction		−0.125***	−0.140***	
		(0.023)	(0.023)	
pseudo-R^2	0.007	0.010	0.019	0.079
N	5,072	5,072	5,072	4,780

Source: Finkelstein and McGarry (2006)

Finkelstein and McGarry (2006): Procedure

1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage
   - Takeaway: individual's have residual information on their risk level.

2. Test if individual's subjective believes about risk are positively correlated with subsequent nursing home use
   - Individual's who believe they are higher risk are more likely to buy insurance, which is the classic issue leading to adverse selection.

Finkelstein and McGarry (2006): Procedure

1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage
    - Takeaway: individual's have residual information on their risk level.
2. Test if individual's subjective believes about risk are positively correlated with subsequent nursing home use
    - Individual's who believe they are higher risk are more likely to buy insurance, which is the classic issue leading to adverse selection.
3. Test for a positive correlation between insurance purchase and subsequent nursing home use

TABLE 3—THE RELATIONSHIP BETWEEN LONG-TERM CARE INSURANCE AND NURSING HOME ENTRY

	No controls (1)	Controls for insurance company prediction (2)	Controls for application information (3)
Correlation coefficient from bivariate probit of LTCINS and CARE	−0.105***	−0.047	−0.028
	(p = 0.006)	(p = 0.25)	(p = 0.51)
Coefficient from probit of CARE on LTCINS	−0.046***	−0.021	−0.014
	(0.015)	(0.016)	(0.016)
N	5,072	5,072	4,780

Source: Finkelstein and McGarry (2006)

Finkelstein and McGarry (2006): Procedure

1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage
   - Takeaway: individual's have residual information on their risk level.
2. Test if individual's subjective believes about risk are positively correlated with subsequent nursing home use
   - Individual's who believe they are higher risk are more likely to buy insurance, which is the classic issue leading to adverse selection.
3. Test for a positive correlation between insurance purchase and subsequent nursing home use
   - Cannot reject that correlation is zero, despite evidence that higher risk individuals select into the market

Finkelstein and McGarry (2006): Procedure

1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage
   - Takeaway: individual's have residual information on their risk level.
2. Test if individual's subjective believes about risk are positively correlated with subsequent nursing home use
   - Individual's who believe they are higher risk are more likely to buy insurance, which is the classic issue leading to adverse selection.
3. Test for a positive correlation between insurance purchase and subsequent nursing home use
   - Cannot reject that correlation is zero, despite evidence that higher risk individuals select into the market
4. Test if preventative behavior is correlated with insurance and subsequent nursing home usage.

Panel B: Preventive health activity						
Preventive activity	−0.106***	0.066***	−0.054***	0.052***	−0.016	0.016
	(0.0118)	(0.017)	(0.018)	(0.017)	(0.019)	(0.017)
Individual prediction	0.095***	0.082***	0.047**	0.095***	0.037*	0.082***
	(0.021)	(0.017)	(0.020)	(0.017)	(0.020)	(0.017)
Panel C: Seat belt use						
Always wear seatbelt	−0.059***	0.053***	−0.031**	0.048***	−0.018	0.029***
	(0.014)	(0.010)	(0.013)	(0.010)	(0.012)	(0.010)
Individual prediction	0.092***	0.084***	0.044**	0.097***	0.038*	0.082***
	(0.021)	(0.017)	(0.020)	(0.017)	(0.019)	(0.016)

Source: Finkelstein and McGarry (2006)

Finkelstein and McGarry (2006): Procedure

1. Test if individual's subjective belief about need for a nursing home in the future is correlated with subsequent usage
   - Takeaway: individual's have residual information on their risk level.
2. Test if individual's subjective believes about risk are positively correlated with subsequent nursing home use
   - Individual's who believe they are higher risk are more likely to buy insurance $\longrightarrow$ adverse selection.
3. Test for a positive correlation between insurance purchase and subsequent nursing home use
   - Cannot reject that correlation is zero, despite evidence that higher risk individuals select into the market
4. Test if preventative behavior is correlated with insurance and subsequent nursing home usage.
   - Those more likely to take preventative health measures are more likely to buy insurance and less likely to need a nursing home $\longrightarrow$ advantageous selection

Finkelstein and McGarry (2006): Procedure

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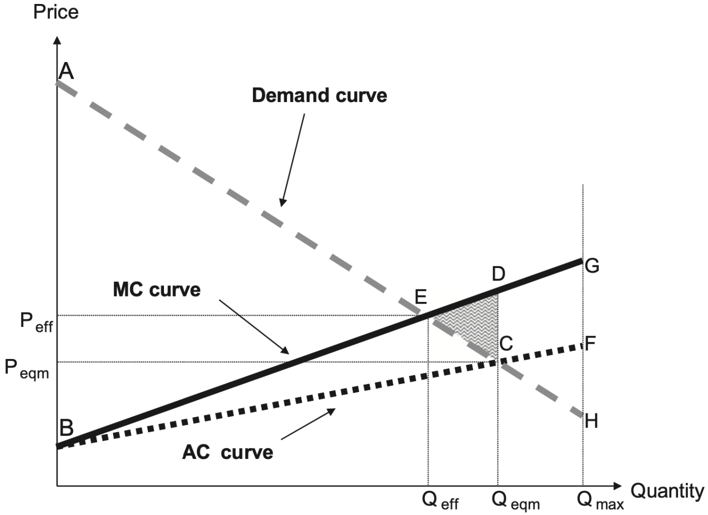
4. Test if preventative behavior is correlated with insurance and subsequent nursing home usage.
   - Those more likely to take preventative health measures are more likely to buy insurance and less likely to need a nursing home $\longrightarrow$ advantageous selection

$\rightarrow$ Final Takeaway: There is both Adverse and advantageous selection in this market leading the PCT to predict no private information.

Advantageous Selection



Source: Chetty and Finkelstein (2013, HPE)

Advantageous Selection: Fan et al (2008)

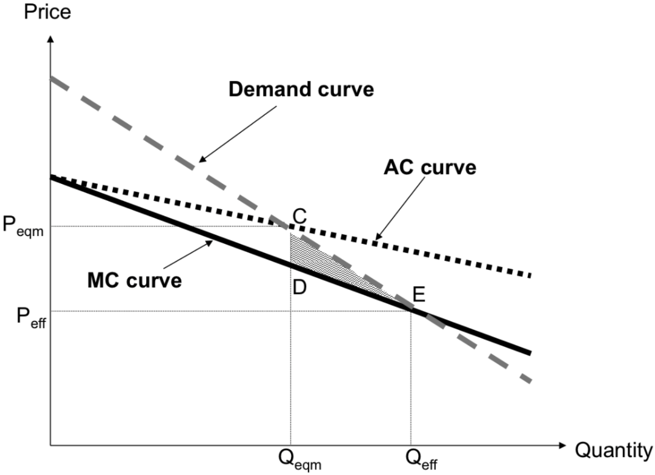
- Also documents advantageous selection in an insurance market.
- In the US people over 65 have health coverage in the form of MediCare which covers $\approx 80\%$ of medical costs.
- MediGap is private insurance policy that covers the remaining 20% of costs.
- Fan et al. find that those predicted to be lower risk are more likely to purchase MediGap.

Welfare Impact of Adverse Selection (Limitation 2)

- Positive correlation test can not tell us "how bad" the adverse selection problem is.
- Even if evidence is found for AS, the PCT gives no information on the welfare costs associated with it
- We need some framework with which to evaluate welfare loss.
- Einav, Finkelstein, and Cullen (2010) propose a new method for identifying the impact of adverse selection using random variation in prices

A slight tweak of the "Textbook Model" of adverse selction:

- Suppose there are two (fixed) insurance contracts:
  - High coverage (H) and low coverage (L)
- Agents choose H or L
  - P is price of H relative to L
  - $D(p)$ is the demand curve: the fraction of people who purchase H instead of L
  - $AC(p)$ is the average cost curve
  - $MC(p)$ is the marginal cost corve



Source: Einav, Finkelstein and Cullen (2010)

Einav, Finkelstein and Cullen (2010): Empirical Design

- Key insight: because insurance markets are a “selection market” you can estimate both the demand curve and the cost curve if you have a source of random variation in prices
- Demand is the % willing to pay at a given price
- Average cost is the average of realized costs at a given price
- Marginal cost is the derivative of average cost
- If average costs go up in response to price increases → adverse selection
  - Why not moral hazard?

Einav, Finkelstein and Cullen (2010): Identification

- Alcoa (aluminum manufacturer) provides exogenous variation in prices
  - They provide all employees basic health insurance and provide the option to buy a more comprehensive plan.
  - The company is split up into many different "business units" and each unit president chooses the prices charged for the high coverage plan.
  - Authors argue that the variation in prices has more to do with idiosyncrasies of the unit president rather than differences in the composition of workers in a unit.

- Using the above variation they estimate demand and cost at different prices using:

$$D_i = \alpha + \beta p_i + \epsilon_i$$

$$c_i = \gamma + \delta p_i + u_i$$

Einav, Finkelstein and Cullen (2010): Results

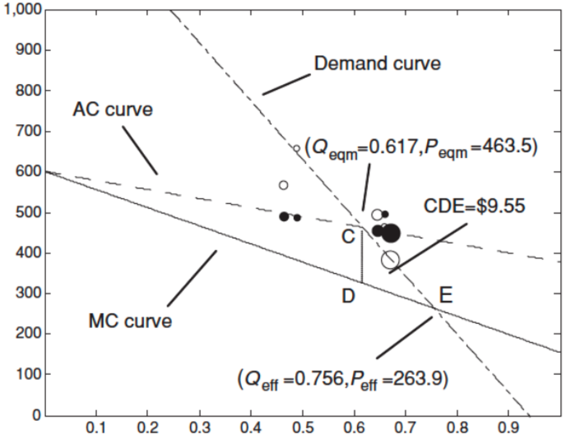


FIGURE V
Efficiency Cost of Adverse Selection—Empirical Analog

Source: Einav, Finkelstein and Cullen (2010)

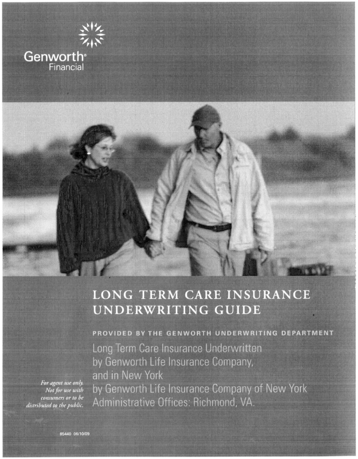
Einav, Finkelstein and Cullen (2010): Results

- Results suggest a relatively small welfare cost: \$9.55/employee ($\approx$ 2% of the average price of the contract)
- Very cool paper: strong link between theory and empirics
- Caveats:
  - Only studies loss from inefficient pricing (hard to implement procedure otherwise though)
  - Likely not generalizable
  - Studies the intensive margin: more vs. less insurance, whereas insurance vs. no insurance might be a more interesting margin.
  - It is not a method that easily transferable, so does not provide a regularly iplementable method for estimating welfare loss due to AS.

Adverse Selection vs. Market Non-Existence

- Literature gives impression that adverse selection is not a large problem.
- But is adverse selection the right thing to look for?
- Would not observe positive correlation between insurance purchase and claims if the market has unraveled a la Akerlof for those with private information.
- There is a literature that suggest private information prevents the existence of insurance markets for some segments of the population
- e.g. Rejections for those with pre-existing conditions in LTC, Life and Disability Insurance (Hendren, 2013)

- 1 in 7 applicats are rejected for individual health insurane
- Rejections also common in Life, LTC and disability insurance
- Hendren: Rejections are market segments (defined by observable characteristics) for which private information has led to market unravelling.



UNINSURABLE CONDITIONS

Acquired Immune Deficiency Syndrome (AIDS)
ADL limitation, present
AIDS Related Complex (ARC)
Alzheimer's Disease
Amputation due to disease, e.g., diabetes or atherosclerosis
Amyotrophic Lateral Sclerosis (ALS) , Lou Gehrig's Disease
Ascites present
Ataxia, Cerebellar
Autonomic Insufficiency (Shy-Drager Syndrome)
Autonomic Neuropathy (excluding impotence)
Behçet's Disease
Binswanger's Disease
Bladder incontinence requiring assistance
Blindness due to disease or with ADL/IADL limitations
Bowel incontinence requiring assistance
Buerger's Disease (thromboangiitis obliterans)
Cerebral Vascular Accident (CVA)
Chorea
Chronic Memory Loss
Cognitive Testing, failed
Cystic Fibrosis
Dementia
Diabetes treated with insulin
Dialysis, Kidney (Renal)
Ehlers-Danlos Syndrome
Forgetfulness (frequent or persistent)
Gangrene due to diabetes or peripheral vascular disease
Hemiplegia
Hoyer Lift
Huntington's or other forms of Chorea
Immune Deficiency Syndrome
Korsakoff's Psychosis
Leukemia-except for Chronic Lymphocytic Leukemia (CLL) and Hairy Cell Leukemia (HCL)
Marfan's Syndrome
Medications
- Antabuse (disulfiram)
- Aricept (donepezil HCl)
- Campral (acamprosate calcium)
- Cognex (tacrine)
- Depade (naltrexone)
- Exelon (rivastigmine)
- Hydergine (ergoloid mesylate)
- Namenda (memantine)
- Razadyne (galantamine hydrobromide)
- Reminyl (galantamine hydrobromide)
- ReVia (naltrexone)
- Vivitrol (naltrexone)

Memory Loss, chronic
Mesothelioma
Multiple Sclerosis (MS)

vi

Source: Chetty and Finkelstein (2013, HPE)

Insurance Rejections

- Hendren's (2013) condition for when private information leads to market unravelling:

$$\frac{u'(w-l)}{u'(w)} \leq \inf_p T(p)$$

where

$$T(p) = \frac{E[P|P \geq p]}{1 - E[P|P \geq p]} \frac{1-p}{p}$$

- $\frac{u'(w-l)}{u'(w)}$ = the markup people are willing to pay for insurance.
- $\inf_p T(p)$ = smallest markup imposed by worse risks adversely selecting the insurance contract.
- Can think of $\inf_p T(p)$ as the smallest markup individuals would have to be willing to pay for the market to exist

- First: obtain a measure of private information among both the rejected and non-rejected populations
  - Use subjective risk elicitations from the Health and Retirement Study in the US.
  - These elicitations ask what your subjective probability (Z) are of some event (L) occurring in the future.
  - e.g. "What's the chance (0-100%) that you will go to a nursing home in the next 5 years?"

Hendren (2013): Empirical Method

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  - e.g. "What's the chance (0-100%) that you will go to a nursing home in the next 5 years?"
- Test if Z is predictive of L conditional on observables
  - If positive and statistically significant indicates presence of private information.

Hendren (2013): Results

Lower Bound Test

	LTC	Disability	Life
Reject	**0.0358*****	**0.0512*****	**0.0587*****
p-value[2]	(0.000)	(0.000)	(0.000)
No Reject	0.0049	0.0240	0.0249
p-value[2]	(0.336)	(0.853)	(0.119)
Difference: Δ_Z	0.0309***	0.0272	0.0338***
p-value[3]	(0.000)	(0.121)	(0.000)
Uncertain, $E[m_Z(P_Z)]$	0.0086***	0.0409***	0.0294***
(p-value)	(0.001)	(0.000)	(0.000)

Source: Hendren (2013)

Hendren (2013): Empirical Method

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  - Use subjective risk elicitations from the Health and Retirement Study in the US.
  - These elicitations ask what your subjective probability (Z) are of some event (L) occurring in the future.
  - e.g. "What's the chance (0-100%) that you will go to a nursing home in the next 5 years?"
- Test if Z is predictive of L conditional on observables
  - If positive and statistically significant indicates presence of private information.
- Use these subjective elicitations to estimate $\inf_p T(p) - 1$.
  - This provides an estimate of the minimum mark-up an individual in this market would have to pay in order to obtain insurance if it is offered.

Tax Rate Equivalence: inf T(p) - 1

	LTC	Disability	Life
Reject	**0.827****	**0.661****	**0.428****
5%	0.657	0.524	0.076
95%	1.047	0.824	0.780
No Reject	**0.163**	**0.069**	**0.350**
5%	0.000	0.000	0.000
95%	0.361	0.840	0.702
Difference	**0.664****	**0.592****	**0.077**
5%	0.428	0.177	-0.329
95%	0.901	1.008	0.535

Source: Hendren (2013)

Hendren (2013): Takeaways

- Very high mark-ups suggest that those rejected from private insurance plans are from segments of the population where the market has unravelled due to private information.

- This represents costs of adverse selection/private information that positive correlation tests, and welfare analysis of functioning markets miss.

$\longrightarrow$ adverse selection is likely a large issue.

- Highly editorialized: Brings us back around to adverse selection as a motivation for the government in providing some social insurance.