Topic 8: Adverse Selection and Insurance Market Failures

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Social Insurance

- The government is a large provider of social insurance
  - Health Insurance (Medicaid, Medicare)
  - Unemployment insurance
  - Disability insurance
  - Annuities (Social security)
- Why does the government provide this insurance?
  - Why not private markets?

- Potential market failures:
  - Moral hazard?
  - Adverse selection?
  - Irrationality?
  - Others?
- This lecture: unique role of adverse selection in generating role for government intervention

Outline

1. Modeling insurance markets
   - Akerlof (1970) vs. Rothschild and Stiglitz (1976) vs Wilson (1977) and Miyazaki (1979)
     - Market unraveling and equilibrium non-existence (see also Hendren (2014, "Unraveling vs. Unraveling"...))
2. Empirical analysis of insurance markets
   - Positive correlation test (Chiappori and Salanie, 2000)
   - Exogenous variation in prices (Einav, Finkelstein, and Cullen, 2010)
   - Subjective probability elicitations (Hendren, 2013, 2017)
   - Variation in public subsidies (Landais, Nekoei, Nilsson, Seim, and Spinnewijn 2021 AER).

Akerlof (1970)

- Begin with classic model of Akerlof (1970)
  - As adapted to insurance markets by Einav and Finkelstein (2011, JEP)
- Individuals have demand $D(s)$, where $s \in [0,1]$
  - WLOG $D' < 0$ (by definition of s)
- Individuals with demand $D(s)$ have cost $C(s)$ that they impose on the insurance company
- Akerlof (1970): Competitive equilibrium requires demand = average cost,

$$D\left(s^{CE}\right) = AC\left(s^{CE}\right) = E\left[C(s) \,|\, s \leq s^{CE}\right]$$

Figure 1

Adverse Selection in the Textbook Setting

Source: Einav and Finkelstein (2011 JEP)

Unraveling in Akerlof
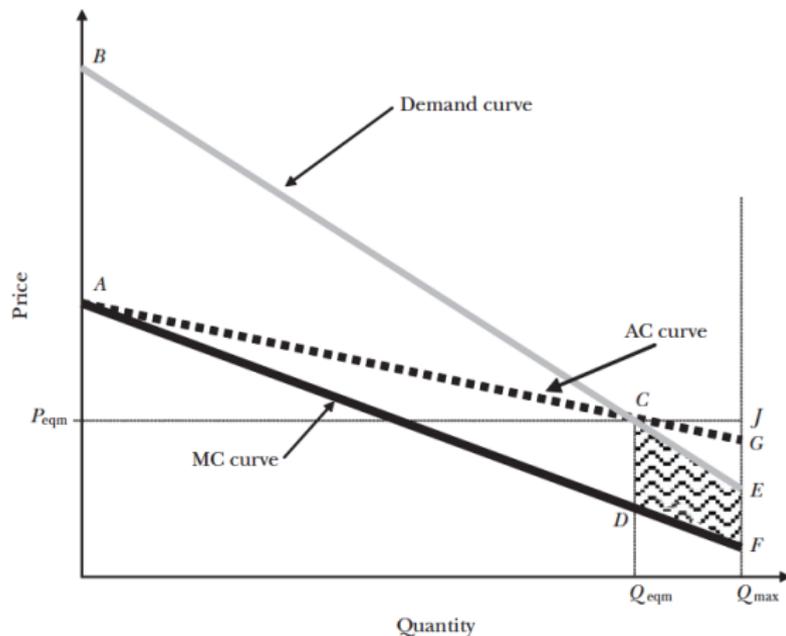
- Not clear that competitive equilibrium involves any insurance
  - Market can "unravel"
  - Market unravels if no one is willing to pay the pooled cost of those with higher demand (and thus likely to be higher risk)

Figure 2 (continued)

B: Adverse Selection with Complete Unraveling
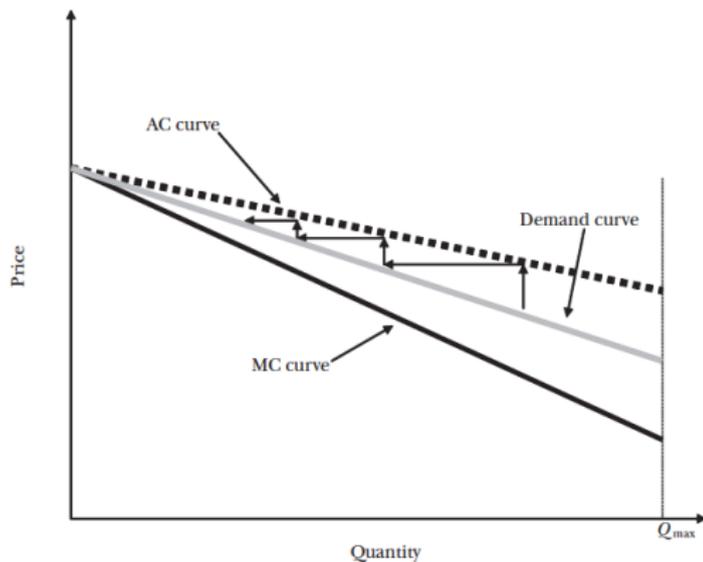
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Criticism of Akerlof (1970) as model of insurance

- Akerlof (1970): readily applied to market for cars
  - Explains why cars lose value the day after they're sold?
    - Also argued that market for health insurance above age 65 does not exist because of adverse selection
    - Market unraveled because of adverse selection "death spiral"
- But problem with model: single contract traded, so competition only on price
  - Rothschild and Stiglitz (1976)
    - Compete on more than 1 dimension of the contract
    - Can "screen" different risks into different contracts
  - Key problem: Unclear how to model equilibrium
    - Standard game-theoretic notions of (pure strategy) equilibria may not exist -> "Market unraveling"

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- Agents vNM preferences

$$pu(c_L) + (1-p) u(c_{NL})$$

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Insurers / timing

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- First, insurers simultaneously offer a menu of consumption bundles
- Given the set of available consumption bundles,

$$A = \cup_j A_j$$

individuals choose the bundle that maximizes their utility

Equilibrium

Definition

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

1. A is incentive compatible

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

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3. A has no profitable deviations [Next Slide]

No Profitable Deviations

For any other menu, $\hat{A} = \left\{ \hat{c}_L \left(p \right), \hat{c}_{NL} \left(p \right) \right\}_{p \in \Psi}$, it must be that

$$\int_{p \in D\left(\hat{A}\right)} \left[p \left(w - I - c_L \left(p \right) \right) + \left(1 - p \right) \left(w - c_{NL} \left(p \right) \right) \right] dF \left(p \right) \leq 0$$

where

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- Require that the profits earned from these people are non-positive

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- **Rothschild and Stiglitz unraveling**
  - Realize a Competitive Nash Equilibrium may not exist
  - Market unravels a la Rothschild and Stiglitz when there does not exist a Competitive Nash Equilibrium

Akerlof Unraveling

Theorem

(Hendren 2013) The endowment, $\{(w - l, w)\}$, is a competitive equilibrium if and only if

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

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  - No gains to trade -> no profitable deviations by insurance companies

Akerlof Unraveling
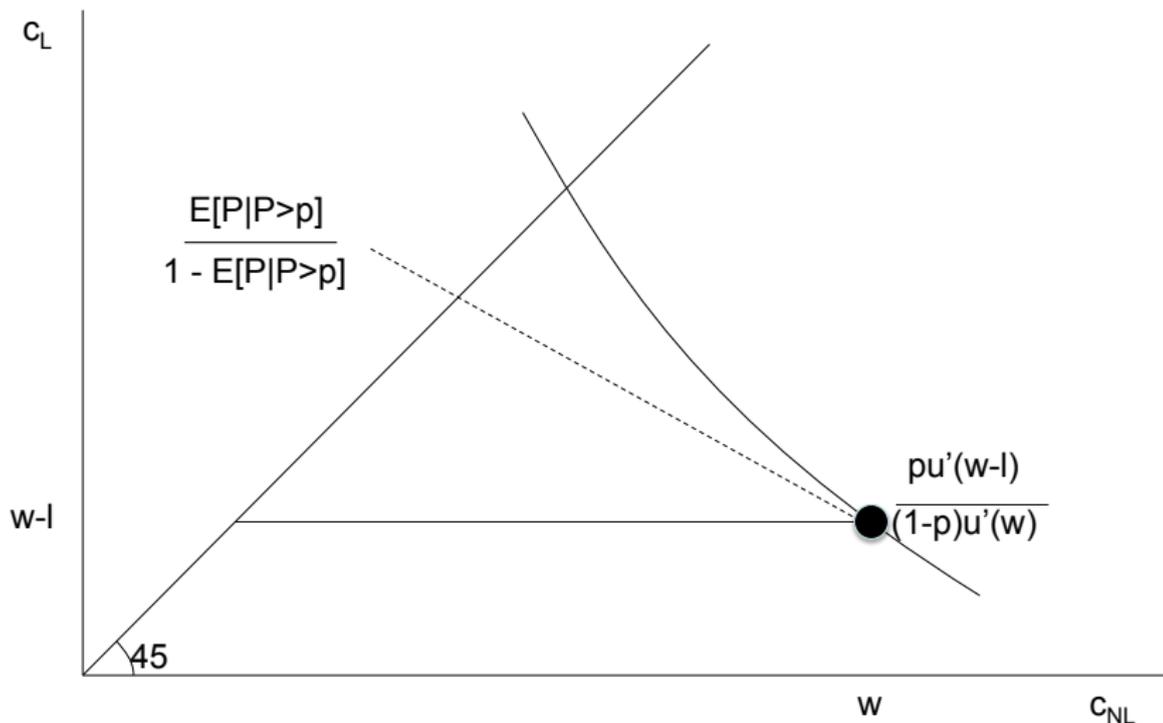
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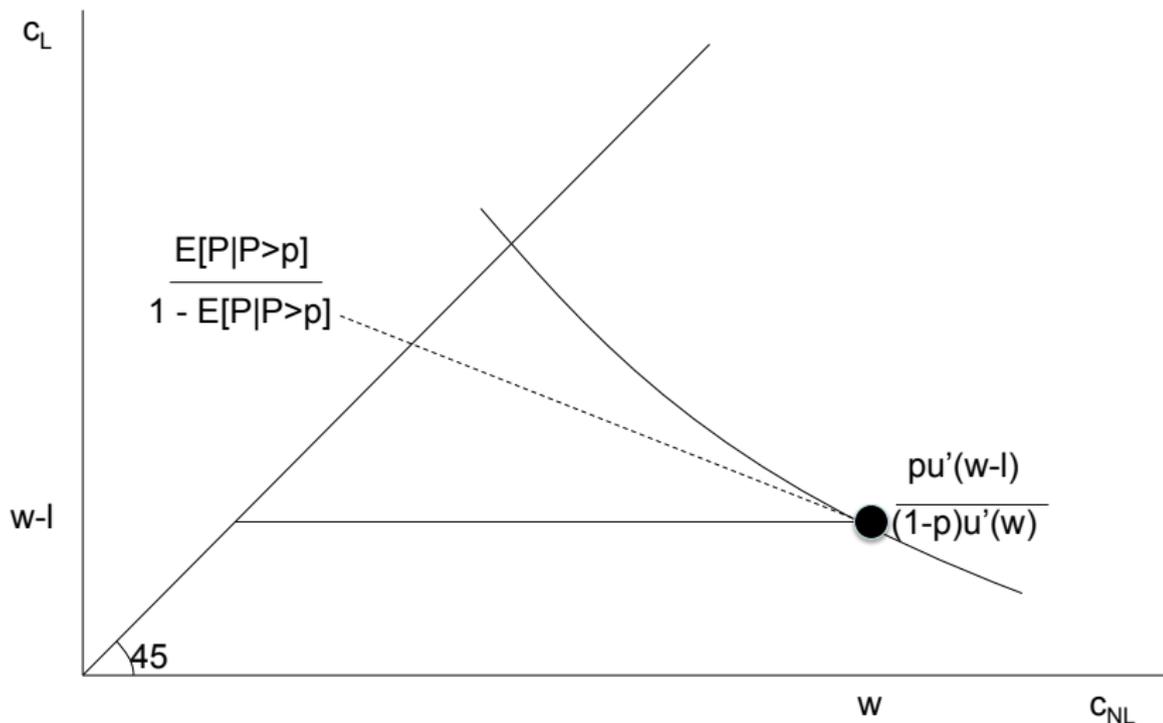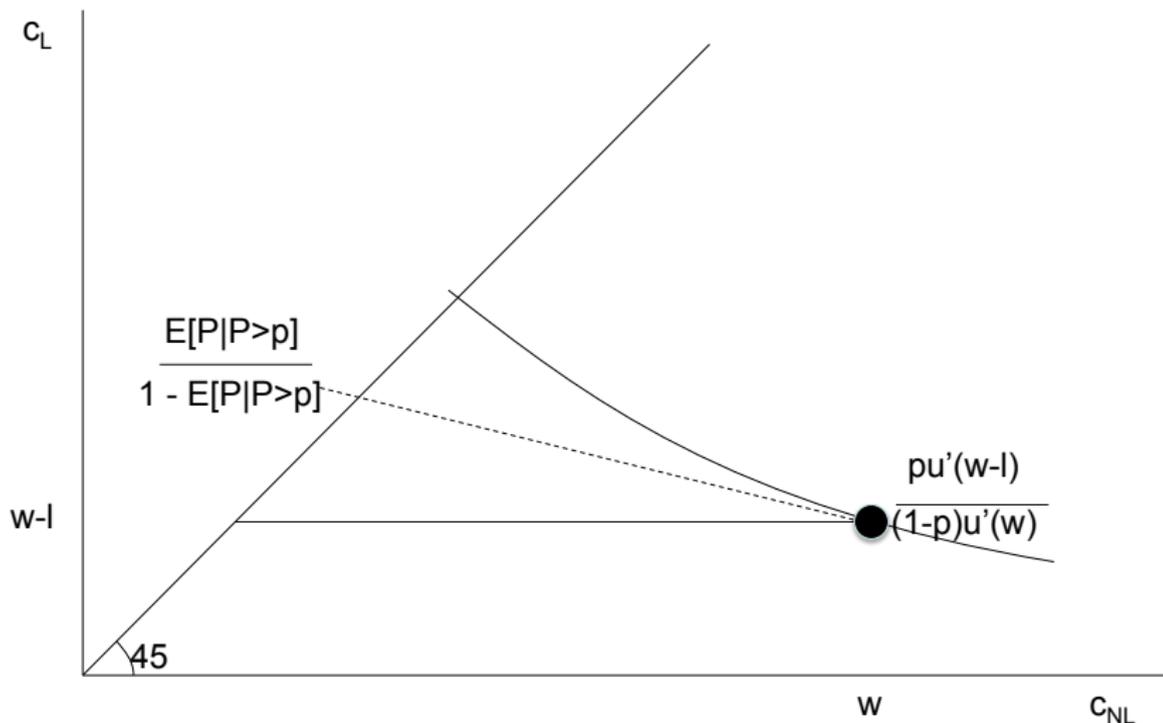
c_L

c_{NL}

$\dfrac{E[P|P>p]}{1 - E[P|P>p]}$

$\dfrac{pu'(w-l)}{(1-p)u'(w)}$

$w-l$

45

w

Akerlof Unraveling (3)

Aside: High Risks

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  - Can be relaxed with some transactions costs (see Chade and Schlee, 2013)

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- Key insight of Rothschild and Stiglitz (1976): Nash equilibriums can't sustain pooling of types

Rothschild and Stiglitz: No Pooling

Rothschild and Stiglitz: No Pooling (2)
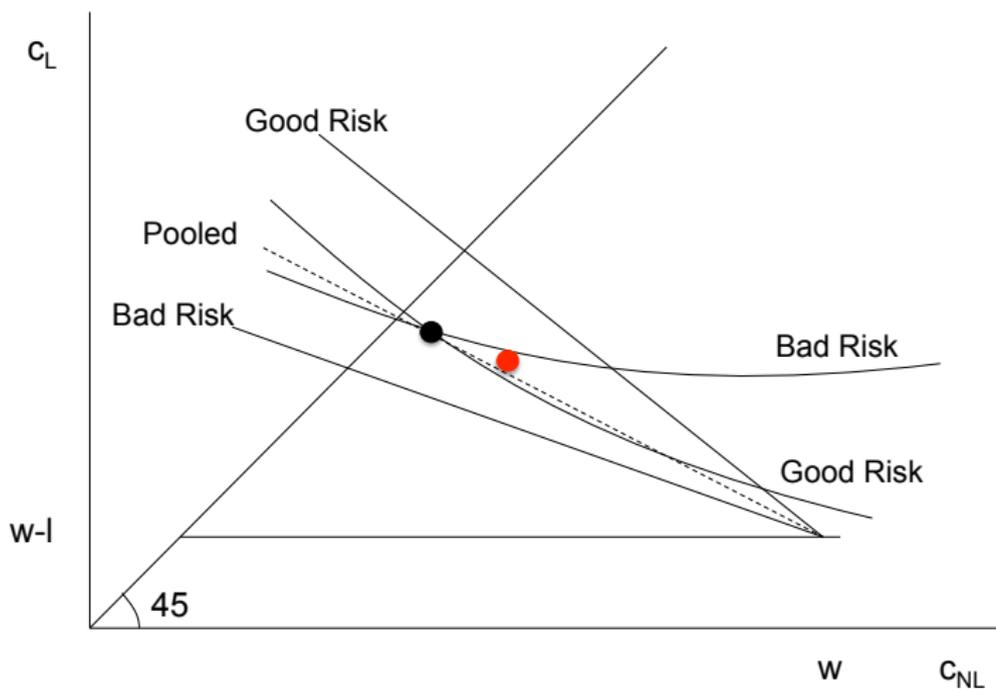
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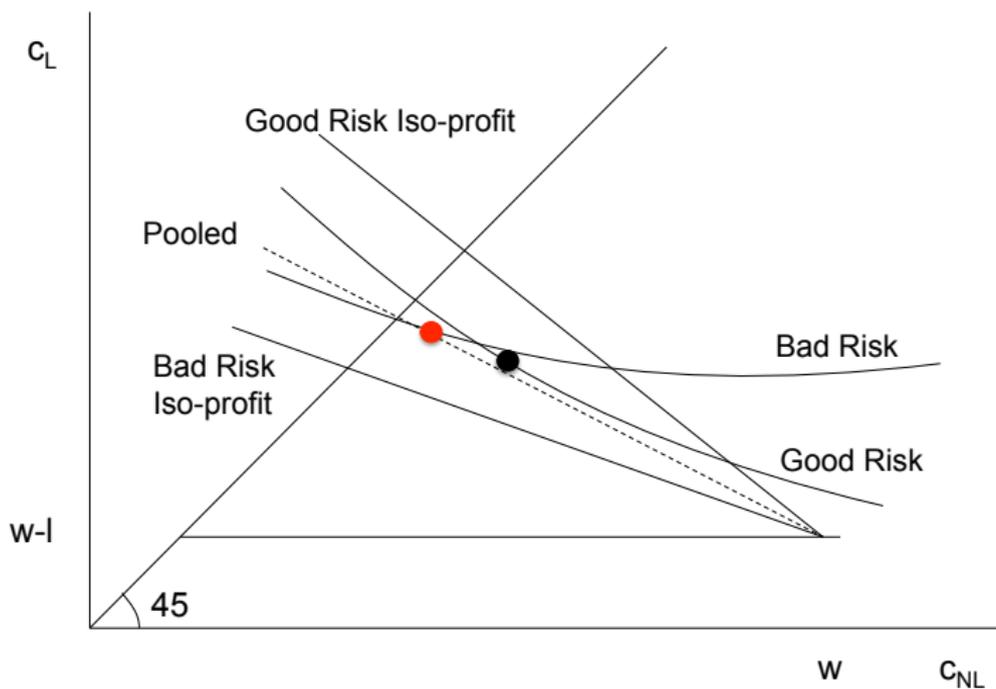
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- Can approximate any distribution with distributions satisfying the regularity condition

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Result #2: Exhaustive of Possible Occurrences

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        - We know Akerlof unraveling condition cannot hold
        - Follow Riley (1979) – shows there's an incentive to pool types -$>$ breaks potential for Nash equilibrium existence

Generic No Equilibrium (Riley)
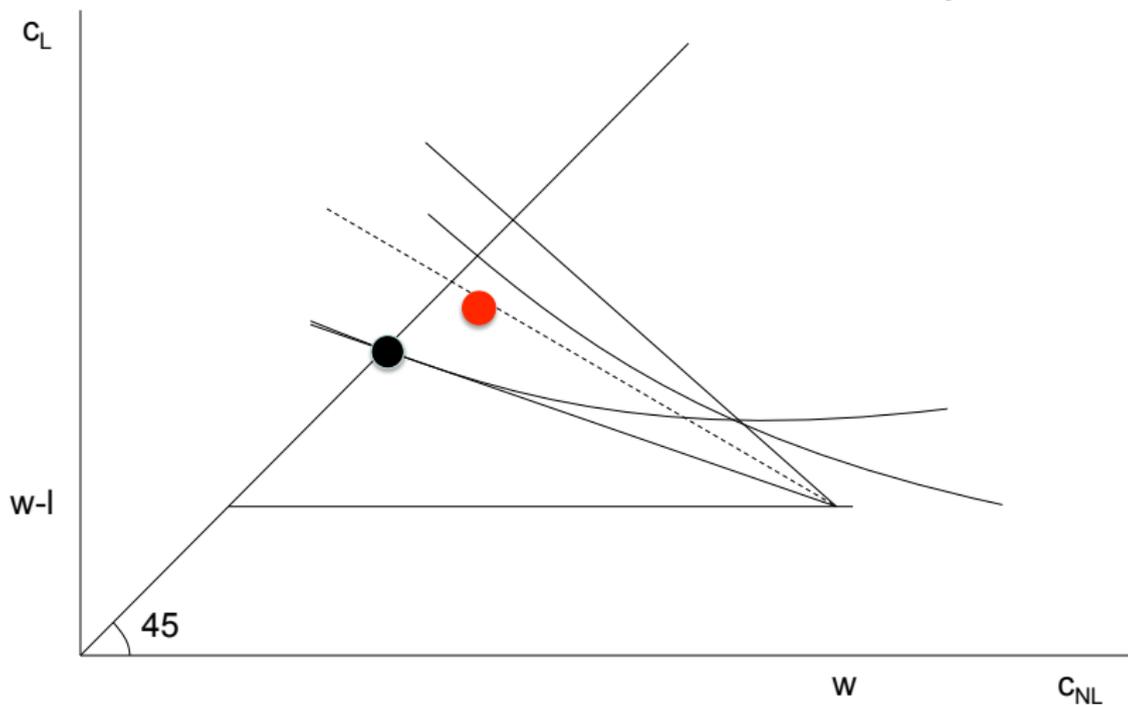
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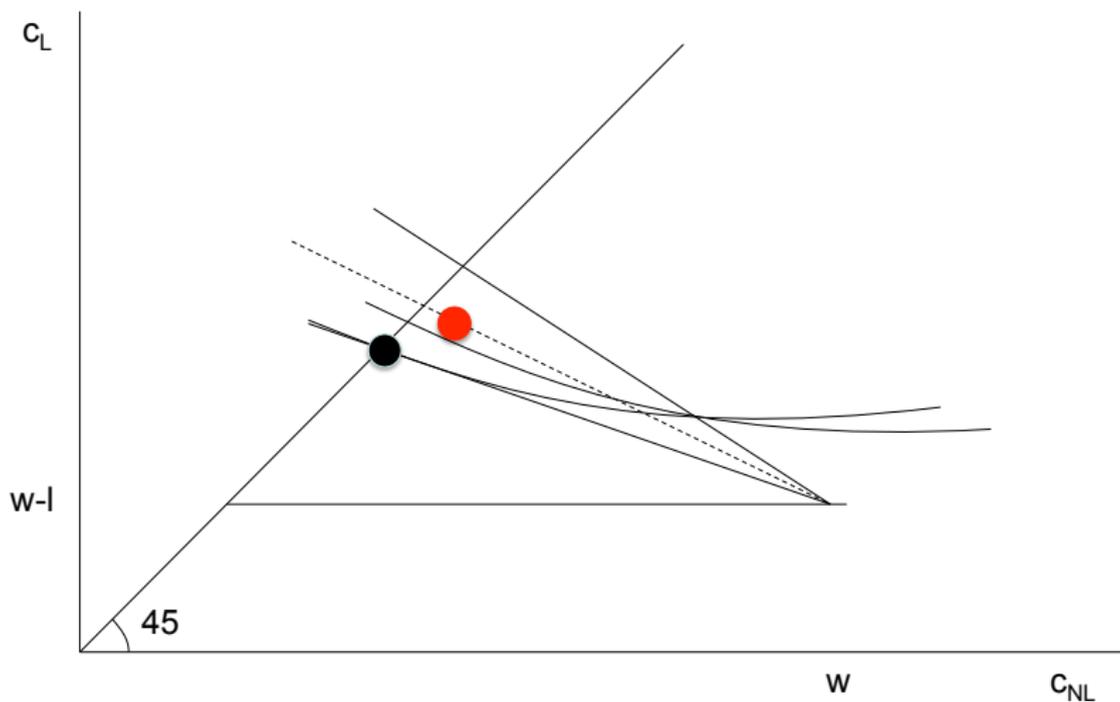
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  - But there are profitable deviations
  - Generically, no Competitive Equilibrium (unravels a la Rothschild and Stiglitz)
- We don't have a model of insurance markets!
  - Generically, the standard Nash model generically fails to make predictions precisely when there are theoretical gains to trade

Solutions to the Non-Existence Problem

- Two classes of models in response to non-existence
- Consider 2-stage games:
- Stage 1: firms post menu of contracts
- Stage 2: Assumption depends on equilibrium notion:
  - Miyazaki-Wilson-Spence: Firms can drop unprofitable contracts
    - Formalized as dynamic game in Netzer and Scheuer (2013)
  - Riley: Firms can add contracts
    - Formalized as dynamic game in Mimra and Wambach (2011)
- Then, individuals choose insurance contracts

MWS

- Miyazaki (1979); Wilson (1977); Spence (1978)
- Two Stage Game:
  - Firms choose contracts
    - Menus (Miyazaki)
    - Single contracts (Wilson / Spence)
  - Firms observe other contracts and can drop (but not add) contracts/menus
    - In Miyazaki, firms have to drop the entire menu
  - Individuals choose insurance from remaining set of contracts

MWS

- Reaching the Pareto frontier requires allowing some contracts to run deficits/surplus
  - Individuals generically are willing to "buy off" worse risks' incentive constraints
- Miyazaki Wilson Spence allows for this if the good types want to subsidize the bad types
  - If you try to steal my profitable contract, I drop the corresponding negative profit contract and you get dumped on!
- MWS equilibrium maximizes welfare of best risk type by making suitable compensations to all other risk types to relax IC constrint
  - Fully separating solution in Miyazaki
  - Can be pooling in Wilson / Spence

Riley (1979)

- Predicts "fully separating" contracts with no cross-subsidization across types
  - IC constraint + zero profit constraints determine equilibrium
- Why no cross-subsidization?
  - If cross-subsidization, then firms can add contracts.
  - But, firms forecast this response and therefore no one offers these subsidizing contracts
- Predicts no trade if full support type distribution

Other non-game-theoretic approaches

- Walrasian:
  - Bisin and Gotardi (2006)
    - Allow for trading of choice externalities -> reach efficient frontier/MWS equilibrium (pretty unrealistic setup...)
  - Azevedo and Gottlieb (2016) -> reach inefficient Riley equilibria
- Search / limited capacity / limited liability / cooperative solutions / etc.
  - Guerrieri and Shimer (2010) -> reach inefficient Riley equilibria

Empirical Question?

- Need theory of a mapping from type distributions to outcomes
  - Standard model works if prediction is no trade
    - This happens for those with "pre-existing conditions" in LTC, life, and disability insurance (Hendren 2013)
  - But, standard model fails when market desires cross-subsidization
    - Key debate: can competition deliver cross-subsidization?
    - Should be empirical question!?
- In short, insurance markets are fun because no one agrees about how to model them!
- In practice, just take contract space as given and ignore potential non-existence issues

Empirical Literature

- Positive correlation test (Chiappori and Salanie, 2000)

- Random variation in prices (Einav, Finkelstein, and Cullen, 2010)

- Subjective probability elicitations (Hendren, 2013)

Empirical Test: Positive Correlation Test

- Chiappori and Salanie (2000)
  - Asymmetric information -> positive correlation between claims and coverage
    - Holds in both Wilson (1977) and Riley (1979)
  - Is there a positive correlation between insurance purchase and insurance claims?
- Specification:

$$INS = \beta X + \epsilon$$

$$COST = \Gamma X + \eta$$

- Test: $cov\left(\epsilon, \eta\right) \neq 0$

Empirical Test: Positive Correlation Test

- Chiappori and Salanie (2000)
    - Data: French auto insurance company
    - Key: control flexibly for Xs
    - Find no evidence of adverse selection
    - Can't reject $cov\,(\epsilon, \eta) = 0$

- Finkelstein and Poterba study annuities in the UK
- Specification

$$Cost = \gamma INS + \beta X + \epsilon$$

- Consider two measures of INS
  - Size of annuity
  - Size of gaurantee (paid if die early)
- Find no evidence of INS quantity; but evidence on guarantee amount

Limitations of Positive Correlation Test: Preference Heterogeneity

- Standard theory: people differ only in their risk type
  - Different expected costs to the insurer
- Reality: People are different in many other ways too
  - Cost to the insurer may not be only driver of demand
- Preference heterogeneity may not be independent of risk type
  - The "worried well" may help sustain insurance markets
  - Could lead to "advantageous selection" instead of adverse selection

Finkelstein and McGarry (2006 AER)

- Many papers find evidence that preferences other than risk type affect demand
- Finkelstein and McGarry (2006, AER) document that seat-belt use and income are correlated with LTC insurance purchase
  - Suggest this could explain why we see no adverse selection in LTC

Table 1

Table 1

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

Notes: Reported coefficients are marginal effects from probit estimation of equation (1). Dependent variable is an indicator for any nursing home use from 1995 through 2000 (mean is 0.16). Both individual and insurance company predictions are measured in 1995. Heteroskedacticity-adjusted robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively. Column 4—which includes controls for "application information"—includes controls for age (in single year dummies), sex, marital status, age of spouse, over-35 health indicators, and a complete set of two-way and three-way interactions for all of the variables used in the insurance company prediction (age dummies, sex, limitations to activities of daily living, limitations to instrumental activities of daily living, and cognitive impairment); see text for more details.

Table 2

TABLE 2—RELATIONSHIP BETWEEN INDIVIDUAL BELIEFS AND INSURANCE COVERAGE

| | No controls (1) | Control for insurance company prediction | | Control for application information (4) |
		(2)	(3)	
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

Notes: Reported coefficients are marginal effects from probit estimation of equation (2). Dependent variable is an indicator for whether individual has long-term care insurance coverage in 1995 (mean is 0.11). Both individual and insurance company predictions are measured in 1995. Heteroskedacticity-adjusted robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively. Column 4—which includes controls for "application information"—includes controls for age (in single year dummies), sex, marital status, age of spouse, over-35 health indicators, and a complete set of two-way and three-way interactions for all of the variables used in the insurance company prediction (age dummies, sex, limitations to activities of daily living, limitations to instrumental activities of daily living, and cognitive impairment); see text for more details.

Table 3

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

Notes: Top row reports the correlation of the residual from estimation of a bivariate probit of any nursing home use (1995–2000) and long-term care insurance coverage (1995); p values are given in parentheses. Bottom row reports marginal effect on indicator variable for long-term care insurance in 1995 from probit estimation of equation (3). The dependent variable is an indicator variable for any nursing home use from 1995 through 2000; heteroskedacticity-adjusted robust standard errors are in parentheses. For all rows, control variables are described in column headings; see text for more information. ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively. Means of CARE and LTCINS are 0.16 and 0.11, respectively.

Table 4

Table 4

TABLE 4—RELATIONSHIP BETWEEN LTCINS AND CARE
(*Sample restricted to individuals with same choice set*)

	No controls (1)	Controls for insurance company prediction (2)	Controls for application information (3)
Correlation coefficient from bivariate probit of LTCINS and CARE	−0.123* ($p = 0.08$)	−0.122* ($p = 0.10$)	−0.191** ($p = 0.017$)
Coefficient from regression of CARE on LTCINS	−0.032* (0.018)	−0.028* (0.015)	−0.033** (0.012)
N	1,504	1,504	1,438

Notes: Sample is limited to individuals in the top quartile of the wealth and income distribution and who have none of the health characteristics that might make them ineligible for private insurance. Top row reports the correlation of the residual from estimation of a bivariate probit of any nursing home use (1995–2000) and long-term care insurance coverage (1995); p values are given in parentheses. Bottom row reports marginal effect on indicator variable for long-term care insurance in 1995 from probit estimation in equation (3). The dependent variable is an indicator variable for any nursing home use from 1995 through 2000; heteroskedacticity-adjusted robust standard errors are in parentheses. For all rows, control variables are described in column headings; see text for more information. ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively. Means of CARE and LTCINS are 0.09 and 0.17, respectively.

Table 5

Table 5

TABLE 5—PREFERENCE-BASED SELECTION

	No controls		Control for insurance company prediction		Control for application information	
	NH Entry (1)	LTC Insurance (2)	NH Entry (3)	LTC Insurance (4)	NH Entry (5)	LTC Insurance (6)
Panel A: Wealth						
Top wealth quartile	−0.095***	0.150***	−0.038**	0.131***	−0.018	0.139***
	(0.013)	(0.020)	(0.014)	(0.020)	(0.015)	(0.022)
Wealth quartile 2	−0.073***	0.104***	−0.025*	0.089***	−0.013	0.092***
	(0.013)	(0.020)	(0.014)	(0.020)	(0.014)	(0.020)
Wealth quartile 3	−0.030**	0.062***	0.0004	0.052***	0.006	0.057***
	(0.015)	(0.020)	(0.016)	(0.019)	(0.015)	(0.020)
Bottom wealth quartile (omitted)	—	—	—	—	—	—
Individual prediction	0.086***	0.089***	0.042**	0.098***	0.035*	0.086***
	(0.021)	(0.017)	(0.020)	(0.017)	(0.019)	(0.017)
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)

Notes: Table reports marginal effects from probit estimation of equations (1) and (2). Additional controls are given in column headings; see text for more information. In panel A, omitted wealth category is quartile 4. For panel A, income controls are omitted from the "application information" controls since they are highly multi-collinear with assets. In panel B, "preventive activity" measures the proportion of gender-appropriate preventive health behaviors undertaken; all estimates in panel B include an additional control for gender. Heteroskedacticity-adjusted robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively.

Fang, Keane, and Silverman (2008, JPE)

- Fan et al (2008, JPE) document advantageous selection in MediGap
- Use HRS and MCBS
- MCBS contains detailed cost information

TABLE 2

ORDINARY LEAST SQUARES REGRESSION RESULTS OF TOTAL MEDICAL EXPENDITURE ON "MEDIGAP" COVERAGE IN THE MCBS

	A. WITHOUT HEALTH CONTROLS			B. WITH DIRECT HEALTH CONTROLS		
	All	Female	Male	All	Female	Male
VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Medigap	−4,392.7***	−6,037.4***	−1,863.4***	1,937.0***	1,677.3***	2,420.9***
	(346.5)	(455.5)	(538.8)	(257.2)	(348.0)	(395.8)
Female	270.0	. . .	. . .	−751.6***	. . .	. . .
	(356.2)			(283.3)		
Age − 65	387.5***	460.6***	292.9	394.5***	417.5***	355.4*
	(138.0)	(175.5)	(228.5)	(117.2)	(144.6)	(196.8)
$(Age - 65)^2$	1.9	−1.8	5.6	−27.5***	−32.0***	−22.8
	(10.6)	(13.2)	(18.8)	(9.2)	(11.4)	(16.2)
$(Age - 65)^3$	.12	.17	.07	.47**	.55**	.47
	(.22)	(.27)	(.43)	(.21)	(.25)	(.38)
State dummy	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,945	9,725	6,220	14,129	8,371	5,758
Adjusted R^2	.073	.092	.060	.211	.196	.252

NOTE.—The dependent variable is total medical expenditure. All regressions are weighted by the cross-section sample weights. Health controls included in panel B are described in detail in the Data Appendix under the category Health. A total of 71 health indicators are included. Robust standard errors clustered at the individual level are in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

- Key concern: underwriting? Adverse selection vs. underwriting?
  - Why advantageous selection on observables but adverse selection (or moral hazard) on unobservables?
    - Makes very little sense...
  - Underwriting of firms?
  - Later: role of crowd-out of uncompensated care for low-income populations
    - Depresses demand for low-income populations that have more medical expenditures

Estimating adverse selection using variation in prices

- Key problem with positive correlation test: can't separate moral hazard vs. adverse selection
- Einav, Finkelstein, and Cullen (2010) propose a new method for identifying adverse selection using random variation in prices
- Suppose there are two (fixed) insurance contracts:
  - High coverage (H) and low coverage (L)
- Agents choose H or L
  - P is relative price of H versus L
  - $D(p)$ is the demand curve
    - Fraction of people who purchase H instead of L
  - $AC(p)$ is the average cost curve
  - $MC(p)$ is the marginal cost curve

Modeling Welfare Impact of Adverse Selection

- Key insight: can estimate demand and cost curves using random variation in prices
- Demand is the % willing to pay a given price
- Average cost is the cost experienced by the policy at different prices
- Marginal cost is the derivative of average cost
    - Measures how costs change in response to prices
    - If average costs go up in response to price increases -> Adverse selection
        - Why not moral hazard?
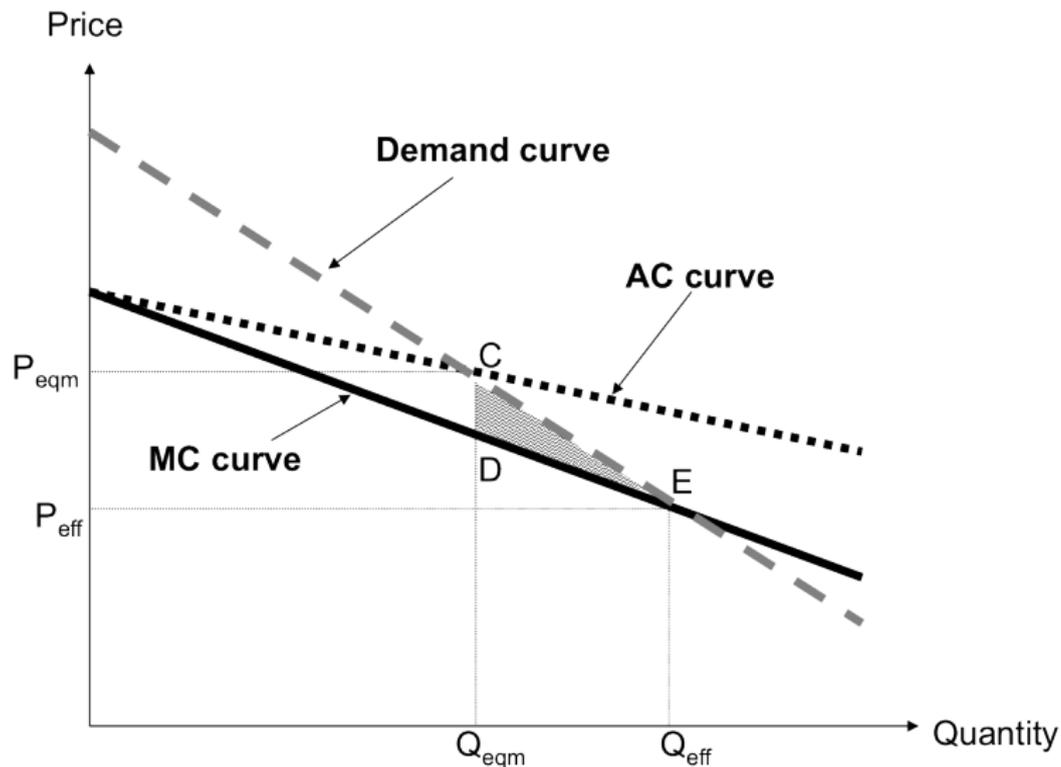
Source: Einav, Finkelstein, and Cullen (2010)

Empirical Implementation: Einav, Finkelstein, and Cullen (2010 QJE)

- Need random variation in prices
- Use data from Alcoa (they make aluminum)
  - Business unit heads choose price charged for high versus low coverage plans
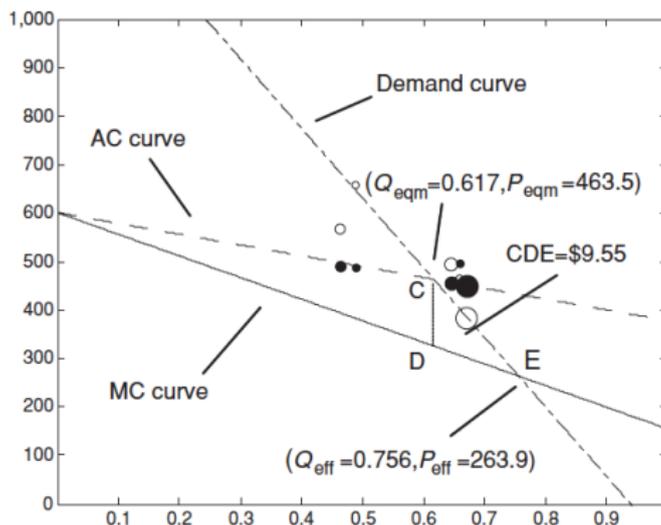
FIGURE V
Efficiency Cost of Adverse Selection—Empirical Analog

Source: Einav, Finkelstein, and Cullen (2010)

- Cost curve slopes downward
    - Suggests adverse selection
- Next lecture: Welfare implications
- Concerns:
    - If this was a big problem, can't the firms simply price based on more observables?

Cutler and Reber (1998, QJE)

- Fun case of unraveling: health insurance at Harvard!
- Harvard offers PPO and HMO
- Traditionally, subsidizes the more expensive PPO plan
- In 1995, switches to voucher system that provides equal payment to PPO and HMO
  - Individuals bore full average cost of PPO relative to HMO
  - Induced significant adverse selection
  - PPO unraveled

Adverse Selection vs. Market Non-Existence

- General impression suggests adverse selection is not a big issue with insurance markets
  - Adverse selection tends to occur when can't price based on observables
- But, is adverse selection the right thing to look for?
  - Akerlof (1970) suggests private info can completely unravel the market
  - Would not observe positive correlation between insurance purchase and claims if people with private information aren't offered any contracts
- Recent work suggests private information prevents the existence of insurance markets
  - Rejections for those with pre-existing conditions in LTC, Life, and Disability Insurance (Hendren, 2013)
  - Private market for unemployment insurance (Hendren, 2016)

Subjective Probability Elicitations

- Hendren (2013) characterizes when private information leads to adverse selection

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

where

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

- Depends on two numbers:
  - Markup people are willing to pay for insurance, $\frac{u'(w-l)}{u'(w)}$
  - Smallest markup imposed by worse risks adversely selecting the insurance contract
    - "Pooled price ratio", $T(p)$

Insurance Rejections

- 1 in 7 applicants rejected in individual health insurance
- Rejections common in individual life, LTC, disability insurance too
- Lots of policy interest...
    - Even Romney wanted to ban rejections for pre-existing conditions
- Idea: Rejections are market segments (defined by observable characteristics) for which private information has led to market unraveling
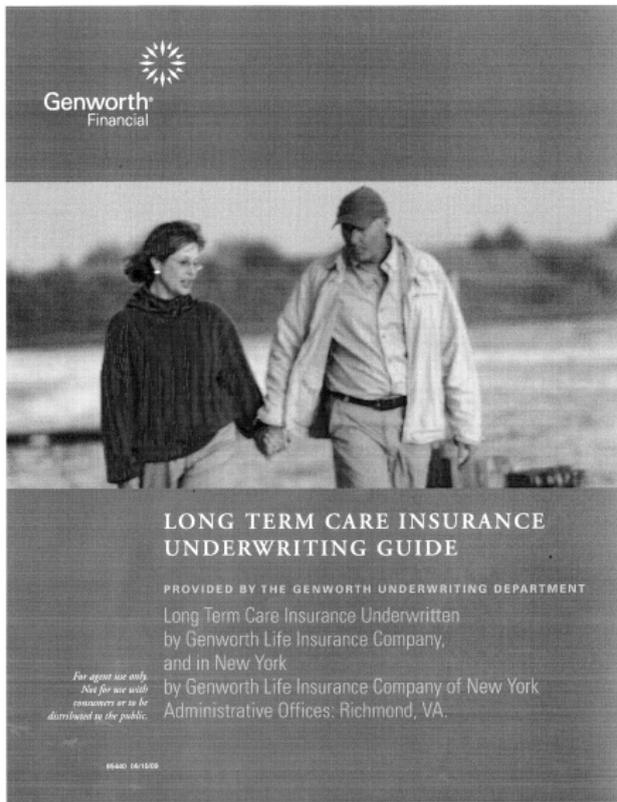
Genworth
Financial

LONG TERM CARE INSURANCE UNDERWRITING GUIDE

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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

Estimating Private Information

- Does private information cause rejections?
- Need to estimate private information for rejectees and non-rejectees.
  - Positive correlation test fails
  - Difficult to estimate demand curves for contracts that don't exist
- Solution: Use subjective probability elicitations in the Health and Retirement Study
  - "What's the chance (0-100%) that you will go to a nursing home in the next 5 years?"

Elicitation Error

- Do people report their true beliefs?
    - Hendren (2013) argues probably not
        - See Manski (ECMA 2004) for a rosier assessment
        - Evidence from psychology shows question framing affects response
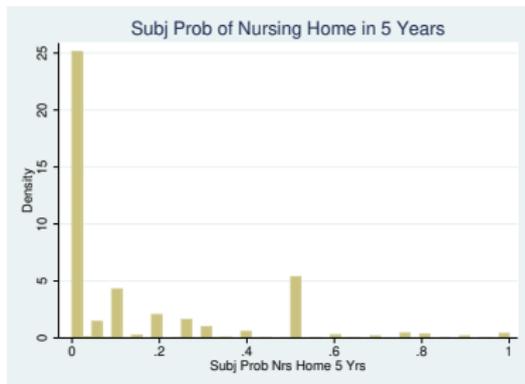
- Zero is pretty optimistic for 75 year olds...

Solution: Elicitations as "Noisy" measures of beliefs

- Hendren (2013) imposes increasing sets of assumptions
    - Minimal assumptions allow for testing for presence of private information
    - Stronger assumptions allow for quantification of price of market existence
- General tradeoff between quality of question vs. quality of assumptions

Assumptions on Beliefs (I)

- General idea: Agents behave as if they have beliefs P about the loss L, but may not be able to express these beliefs on surveys
    - Savage (1954) axioms; see Blackwell (1951, 1953) for sufficient statistics work too...
- **Assumption 1:** Elicitations contain no more information about L than do true beliefs
    - If Z contains information about L conditional on X, then so does P.
    - "P is sufficient statistic for Z about L".
- **Test for Private Information:** Is Z predictive of L, conditional on X?
- Context: Tests for private information in hypothetical insurance market that pays \$1 in the event L occurs.

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)

Magnitude of Private Info (Lower Bound)

- Evidence of private information
  - Is it sufficient to explain absence of trade for the rejected?
    - Small enough to explain presence of trade for those not rejected
- Need additional assumptions...
  - Unbiased beliefs
  - Model of the elicitation error

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

Plausible Values of WTP

What is a plausible willingness to pay?

- Existing estimates/calibrations of $\frac{u'(w-l)}{u'(w)}$:
  - LTC: 26-62% (Brown and Finkelstein, 2008)
  - Disability: 46-109% (Bound et al., 2004)
- Direct Calibration: Assume $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$ and $l = \gamma w$
 - If $\gamma = 10\%$ and $\sigma = 3$, then $\frac{u'(w-l)}{u'(w)} - 1 = 0.372$

Comparison to Positive Correlation Test

- Existing literature has conducted versions of the positive correlation test in LTC and Life
  - Finkelstein and McGarry (AER 2006) find no evidence of adverse selection in LTC
    - But were first to use subj prob to show people know about their future nursing home use
    - Suggest inversely correlated unobserved preference heterogeneity as explanation for why private info does not manifest in adverse selection (see also Cutler et al 2008 AER P&P, Fang et al (2008))
  - Cawley and Philipson (JPE 1999) find no evidence of adverse selection in Life
    - Suggest insurance company knows more than applicants
    - He (2008 JPubEc) revisits Life and finds some evidence of adverse selection
- Results suggest practice of rejections limits the extent of adverse selection in these markets
  - Positive correlation test only tests for adverse selection, not private information

Private UI Markets

- Evidence private information shuts down segments of health-related insurance markets
    - What about other settings?
- Job loss is one of most salient risks faced by working-age adults
- Why is there not a robust private market for unemployment/job loss insurance?
- Hendren (2016): Private information is the reason the private market doesn't exist
    - If a third-party insurer were to try to sell a UI policy, it would be too heavily adversely selected to deliver a positive profit – at any price
- Landais et al. (2021, AER)
    - Exploit variation in public subsidies in Sweden to document adverse selection
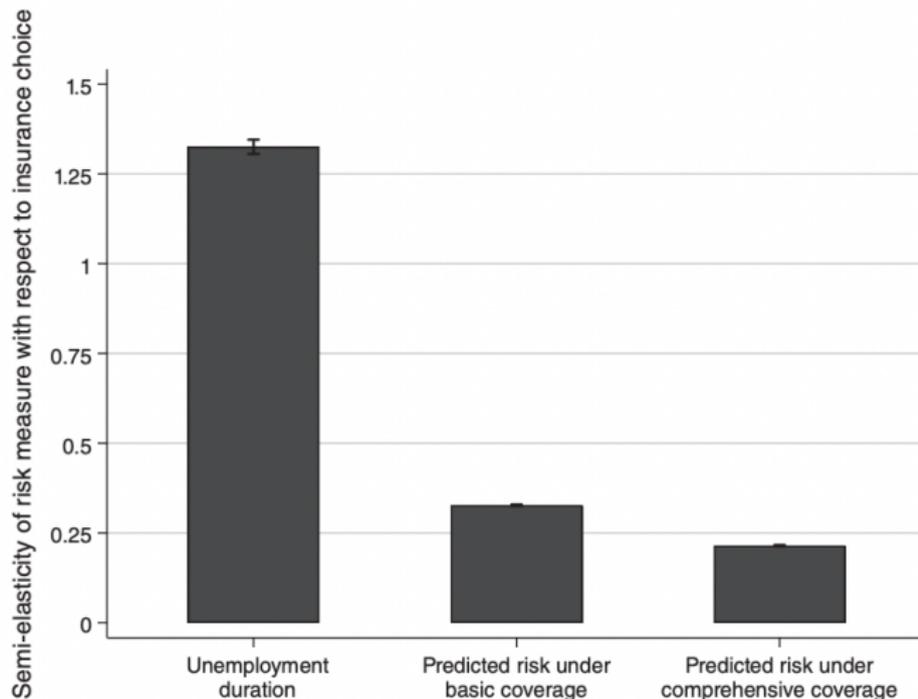
FIGURE 2. POSITIVE CORRELATION TESTS: RESULTS
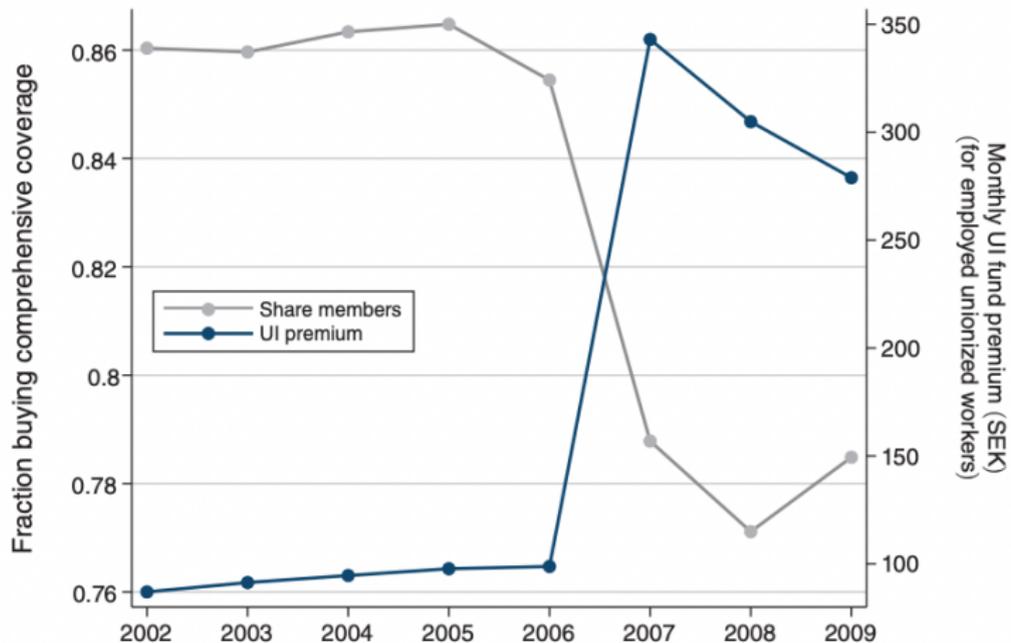
FIGURE 4. PRICE VARIATION: EVOLUTION OF PREMIA **p** AND OF THE FRACTION OF WORKERS
BUYING THE COMPREHENSIVE COVERAGE AROUND THE 2007 REFORM

Notes: The figure reports the evolution of monthly premium for the supplemental UI coverage over time. As explained in Section IA, there are no sources of premium differentiation up to 2008, apart from small rebates for union members and for unemployed individuals. Here, we report the value of the premium for employed union

Panel A. Total unemployment duration in 2008

FIGURE 7. BENEFIT VARIATION: REGRESSION KINK DESIGN ANALYSIS OF DEMAND RESPONSES AND RISK-BASED SELECTION

- Hendren 2016 argues private information prevents the existence of a private UI market in the US
- Document 3 pieces of evidence:
  1. Subjective probability elicitations
 2. Spousal labor supply responses
  3. Consumption responses

- Use data from Health and Retirement Study (1993-2013)

- Use data from Health and Retirement Study (1993-2013)
  - Survey asks subjective probability elicitations, Z

- Use data from Health and Retirement Study (1993-2013)
    - Survey asks subjective probability elicitations, Z
        - *"What is percent chance (0-100) that you will lose your job in the next 12 months?"*

Approach #1: Subjective Probability Elicitations

- Use data from Health and Retirement Study (1993-2013)
  - Survey asks subjective probability elicitations, Z
    - *"What is percent chance (0-100) that you will lose your job in the next 12 months?"*
- Do the elicitations predict future job loss conditional on observables?

Elicitations versus Future Unemployment
Coefficients on Z categories in Pr{UIZ,X}
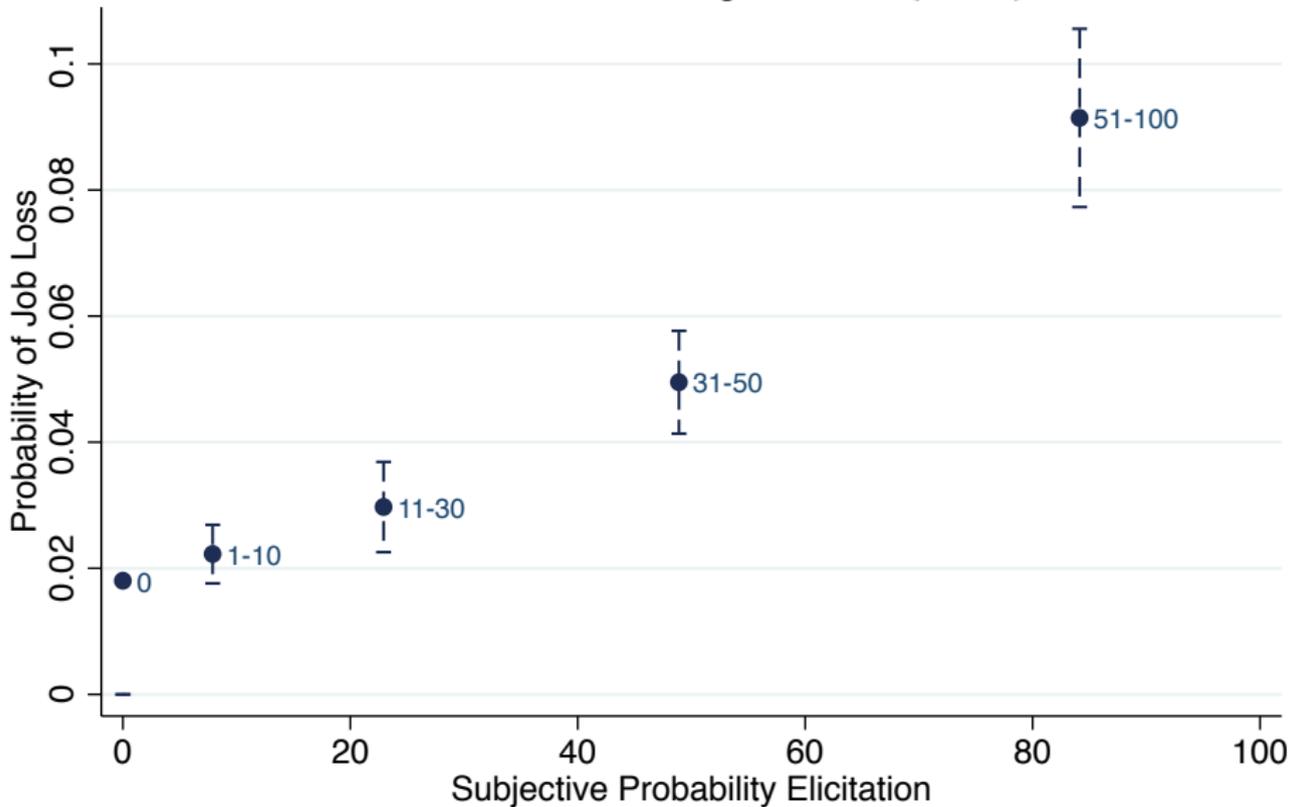
Regression of Job Loss on Elicitation

Specification	Baseline	Demo Only	Demo, Job, Health	Ind FE
Elicitation	**0.0836*****	**0.0956*****	**0.0822*****	**0.0715*****
s.e.	**(0.00675)**	**(0.00685)**	**(0.00736)**	**(0.0107)**
Controls				
Year Dummies	X	X	X	X
Demographics	X	X	X	X
Job Characteristics	X		X	X
Health Characteristics			X	
Individual FE				X
Num of Obs.	26640	26640	22831	26640
Num of HHs	3467	3467	3180	3467

Approach #2: Spousal Labor Supply

- Large literature on "added worker" effect studies impact of unemployment on spousal labor supply
  - If individuals learn ex-ante about future job loss, then should expect spouses to respond when individuals learn

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  - If individuals learn ex-ante about future job loss, then should expect spouses to respond when individuals learn
- Focus on labor market entry for sample of married households in HRS
  - Define an indicator for a spouse not in labor force last period and in labor force this period

Potential Job Loss and Spousal Labor Supply

Pr{Spouse Enters Workforce} vs. Subjective Probability Elicitation, with data points labeled 0, 1-10, 11-30, 31-50, and 51-100.
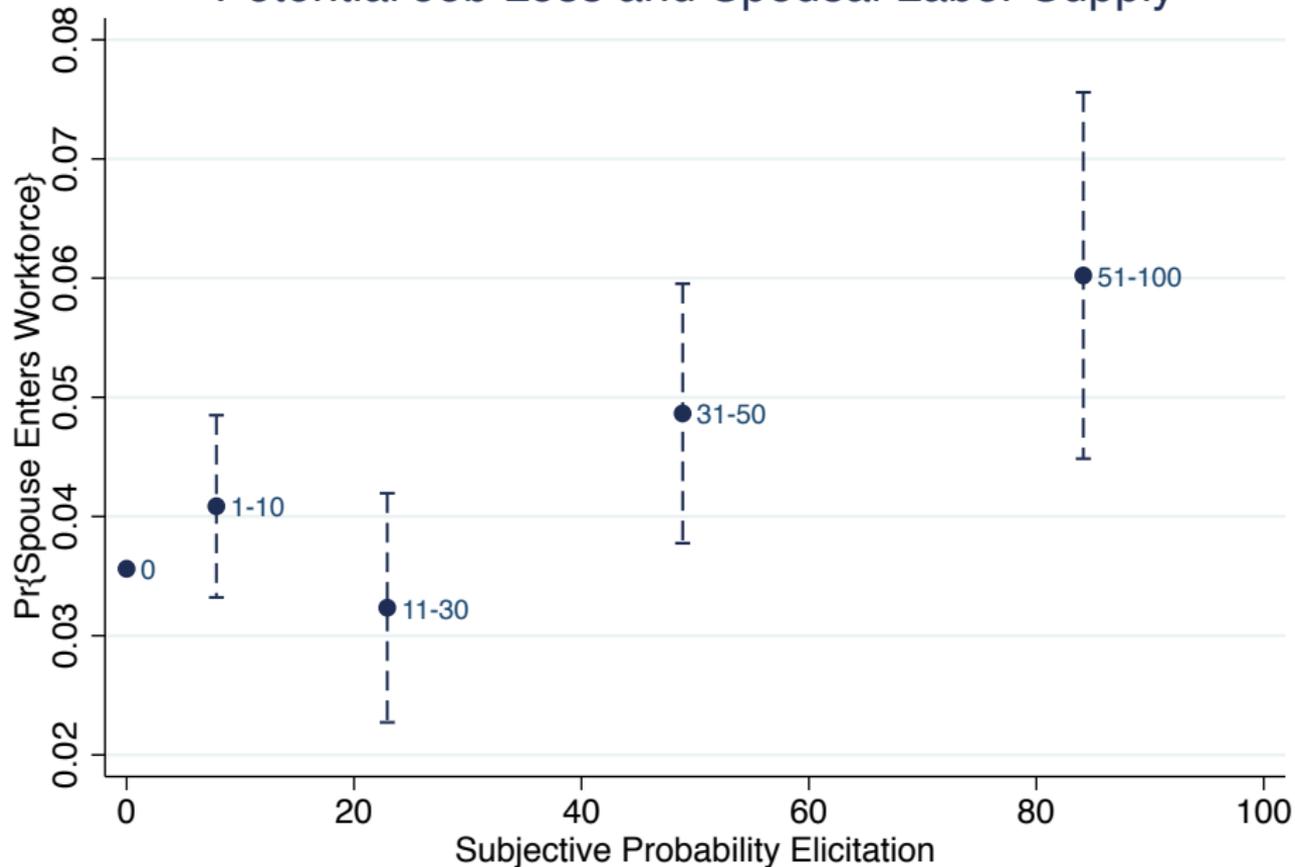
Spousal Labor Supply Response

Specification:	Baseline	HH FE	Ind FE	2yr Lagged Entry ("Placebo")
Estimation of dL/dZ				
Elicitation (Z)	0.0258***	0.0243**	0.0312*	0.00122
s.e.	(0.00868)	(0.0114)	(0.0180)	(0.00800)
Mean Dep Var	0.04	0.04	0.04	0.0394
Num of Obs.	11049	11049	11049	11049
Num of HHs	2214	2214	2214	2214

- Large literature documenting unemployment/job loss impact on consumption
  - Common to study impact of unemployment on 1-year consumption growth
  - If individuals learn ex-ante, consumption might respond

Approach #3: Impact on Consumption

- Large literature documenting unemployment/job loss impact on consumption
  - Common to study impact of unemployment on 1-year consumption growth
  - If individuals learn ex-ante, consumption might respond
- Use food expenditure in PSID
 - Following Gruber (1997)

Approach #3: Impact on Consumption

- Large literature documenting unemployment/job loss impact on consumption
  - Common to study impact of unemployment on 1-year consumption growth
  - If individuals learn ex-ante, consumption might respond
- Use food expenditure in PSID
  - Following Gruber (1997)
- Event study using leads/lags:
  - Regress $g_t = log(c_t) - log(c_{t-1})$ on U_{t+j}
    - Control for age cubic and year dummies
  - Restrict to sample employed in $t-2$ and $t-1$

Impact of Unemployment on Consumption Growth

Employed in t-2 and t-1 Sample

Coefficient on Unemployment Indicator (y-axis)

Lead/Lag Relative to Unemployment Measurement (x-axis)

● Coeff   ├─────┤ 5%/95% CI

▸ Inc
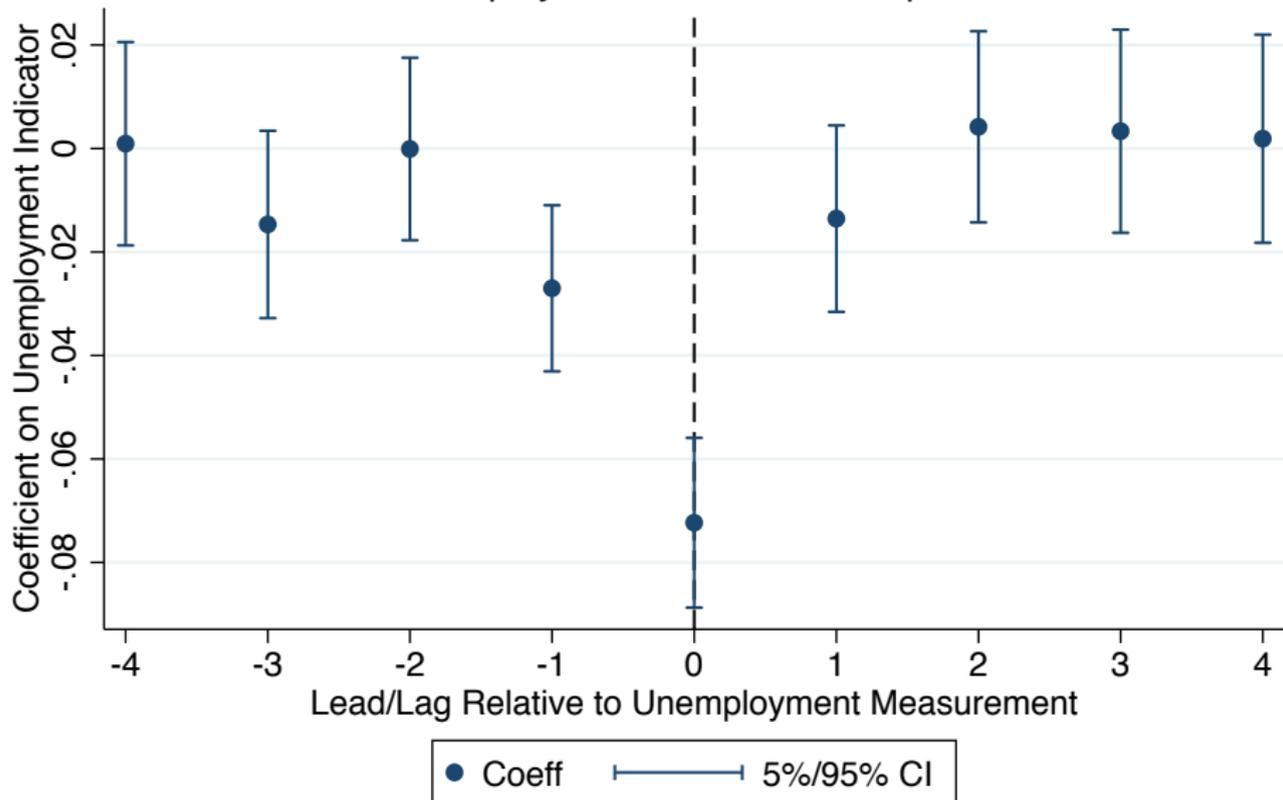
Impact of Future Job Loss on Consumption

Specification:	Unemployment	Income Controls	Involuntary Job Loss
Impact of Unemployment on log(c_{t-2})-log(c_{t-1})			
Unemp	-0.0271***	-0.0272***	-0.0260***
s.e.	(0.00975)	(0.00969)	(0.00824)
Num of Obs.	65483	65399	65556
Num of HHs	9557	9547	9560

- Implications:
  - People have private information about future job loss
  - They act upon this information -> private policies would be adversely selected...
  - **Can this explain the absence of a private market?**

Minimum Pooled Price Ratio

| *Specification* | Baseline | Alternative Controls | |
		Demo	Health
	(1)	(2)	(3)
Inf T(p) - 1	**3.360**	**5.301**	**3.228**
s.e.	**(0.203)**	**(0.655)**	**(0.268)**
Controls			
Demographics	X	X	X
Job Characteristics	X		X
Health Characteristics			X
Num of Obs.	26,640	26,640	22,831
Num of HHs	3,467	3,467	3,180

Minimum Pooled Price Ratio

| | Sub-Samples | | | | | |
Specification	Age <= 55	Age > 55	Below Median Wage	Above Median Wage	Tenure > 5 yrs	Tenure <= 5 yrs
Inf T(p) - 1	**3.325**	**3.442**	**4.217**	**3.223**	**4.736**	**3.739**
s.e.	**(0.306)**	**(0.279)**	**(0.417)**	**(0.268)**	**(0.392)**	**(0.336)**
Controls						
Demographics	X	X	X	X	X	X
Job Characteristics	X	X	X	X	X	X
Num of Obs.	11,134	15,506	13,320	13,320	17,850	8,790
Num of HHs	2,255	3,231	2,916	2,259	2,952	2,437

Summary

- Hendren (2017) also estimates WTP – will discuss next class.
- Private information provides micro-foundation for absence of market:

$$
\begin{aligned}
\text{WTP} &\leq \text{Pooled Price Ratio} \\
[15\%, 60\%] &\leq 300\%
\end{aligned}
$$

- Private information explains absence of private UI market
- Growing evidence that private information shapes the existence of insurance markets

Comparison of inf T(p) to Other Markets
Life, Disability, and LTC Estimates from Hendren (2013)
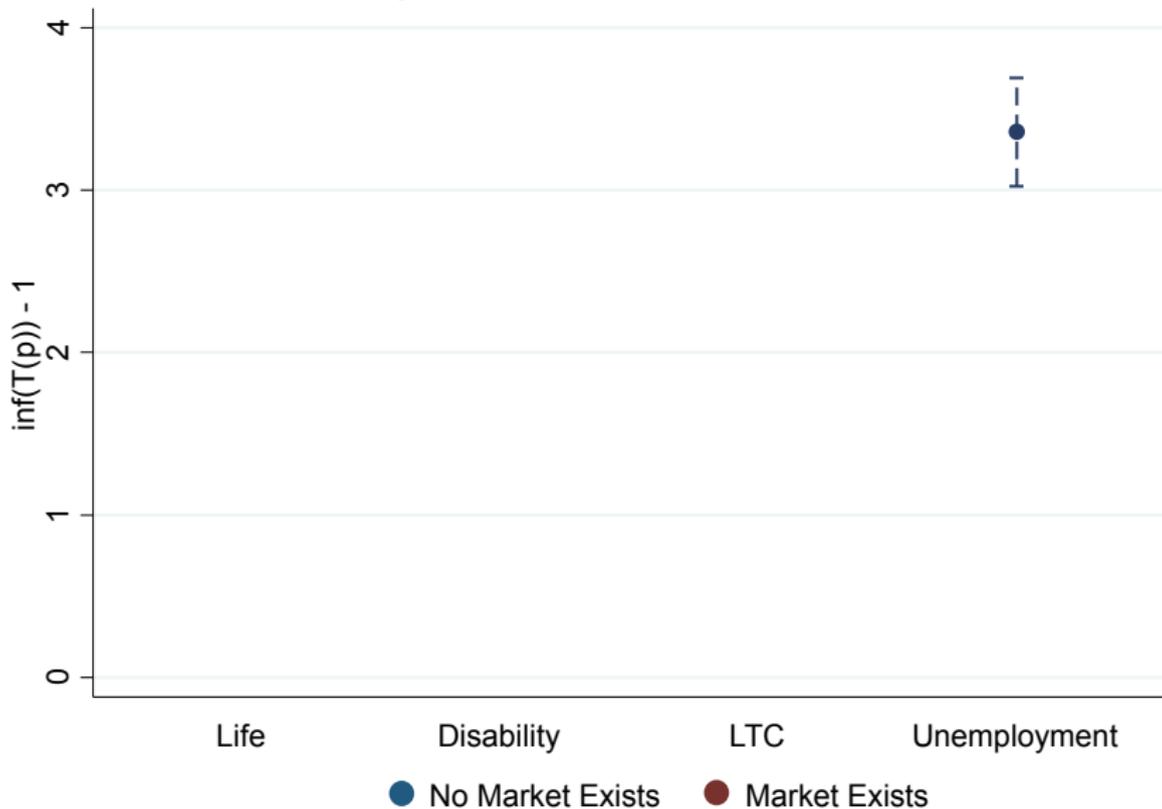
Comparison of inf T(p) to Other Markets
Life, Disability, and LTC Estimates from Hendren (2013)

Markets Exclude "Pre-existing Conditions"

No Market Exists

Market Exists

$\inf(T(p)) - 1$

Life   Disability   LTC   Unemployment

● No Market Exists   ● Market Exists
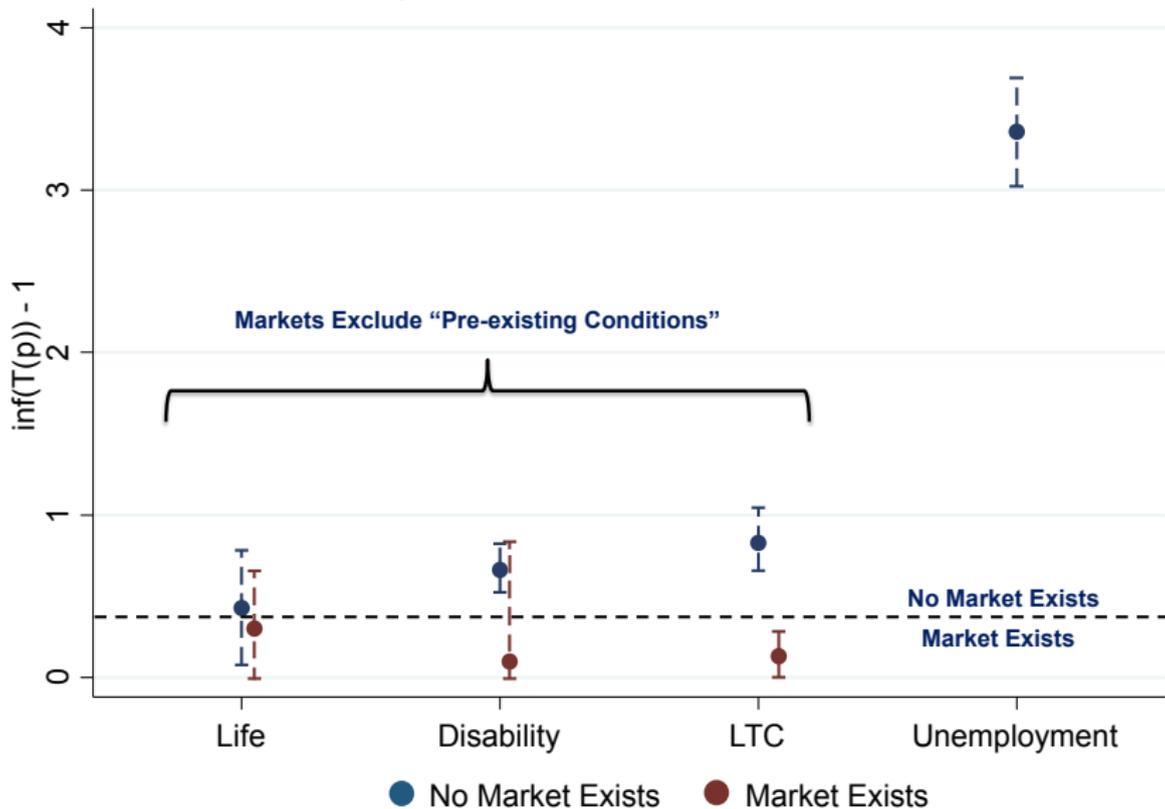
Why No Rejections in Annuities?

- Does private information always lead to rejection? No!
- Robust evidence of private information in annuity markets
  - Those who purchase annuities have longer life expectancy
    - Finkelstein and Poterba (2004)
- Why does life insurance have rejections but annuities have a thriving market with adverse selection?
  - Shape of incentive constraints:
    - Only one way to be healthy but many ways to be sick (Hendren, 2013)
    - Can sell annuities to the healthy without even healthier risks adversely selecting the annuity
    - But the sick don't get discounts!
- Akerlof unraveling does not occur
  - Rothschild and Stiglitz intuition: Can insure the "worst risk" type of healthy people

Broad Lessons

- Private information / adverse selection forms the boundary to the existence of insurance markets
  - Makes testing for observed adverse selection hard
- Existing evidence of "advantageous selection" in insurance are problematic
  - Likely reflects underwriting of firms, not selection of individuals
    - It's not that the sick don't want insurance, but rather the firms don't want the sick
- Open questions about how best to model insurance markets
  - In particular, how does contract design respond to asymmetric information?