II_a: Asymmetric Information: Theory Overview

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Rationales for social insurance

1. Private market failures
   1.1 Imperfect competition [go take IO]
   1.2 **Asymmetric Information**
   1.3 Aggregate Shocks
   1.4 Externalities

2. Redistribution

3. Individual failures of rationality / optimization

4. Paternalism
Asymmetric Information

- Adverse selection (hidden types)
  - Individuals have private information about their costs to insurer
  - Can impair efficient operation of market and create scope for welfare improving public policy
- Moral hazard (hidden actions)
  - Individuals take hidden actions in response to insurance contract
  - Prevents attainment of first best insurance policy
  - In general not something the government has a comparative advantage in addressing.
  - Critical though for optimal design of insurance (public or private)
    - Tradeoff between insurance (risk spreading) and incentives (moral hazard)
Lecture outline

- Present simple theoretical frameworks for
  - Adverse selection
  - Moral hazard
- Goals
  - Conceptual clarity
  - Framework for empirical work (coming next)
Recall “free lunch” appeal of insurance:
- By pooling idiosyncratic risk, can make everyone better off
- Prefer to pay $10 for sure than face a one in ten thousand risk of having to pay $100,000

But this pooling mechanism may not work if individuals have private information about risk type:
- Risk type: chance become sick, lose job, die etc
- High risk come into the market and drive up prices for low risk
- Possible result: no one buys insurance even, even though each person’s benefit from insurance exceeds cost of providing it to that person
- Suggests possible welfare-improving role for mandates
• Key points
  • Welfare gain to risk averse individuals from being able to buy actuarially fair insurance
  • Market failure: because private information about risk type, may not be able to buy actuarially fair insurance
  • Potential scope for welfare improving government intervention

• Classic theory: Akerlof (1970); Rothschild and Stiglitz (1976)
  • Rothschild and Stiglitz (1976) covered in section
  • Framework we (and others) use for empirical work follows Akerlof (1970)
Simplified graphical theoretical framework

- Sketch a simplified graphical theoretical framework
  - To illustrate under-insurance and welfare loss that can arise with private information about risk type
  - To illustrate tradeoffs involved with potential government interventions (e.g. mandates)
- Up next: Take framework to data to:
  - Test for existence of adverse selection
  - Quantify resultant welfare loss
  - Assess welfare consequences of alternative policy interventions
- Overview follows Einav and Finkelstein (JEP 2011)
A comment on applications

- Model is abstract but often helpful to discuss by way of a specific application
- Will use (intentionally and sometimes unintentionally!) health insurance to fix ideas
- Many recent empirical applications to other insurance markets including
  - flood insurance (Wagner 2020)
  - worker’s compensation insurance (Cabral et al. 2019)
  - unemployment insurance (Landais et al. 2020)
- Applications to credit markets too (mortgages, student loans, personal loans etc).
  - Stiglitz and Weiss (1981) is theoretical analog of Akerlof
Setup - Textbook case

- Perfectly competitive, risk neutral firms offer a single health insurance product that covers you if you get sick
  - Consumer choice: buy or not buy the contract
  - Important assumption: insurance product taken as given (standard demand / supply of a "good")
    - "fixing contract space"
    - Akerlof (fixed) vs. Rothschild and Stiglitz (not fixed)
- Risk averse individuals identical except for their (privately known) probability of getting sick
  - NB: Growing empirical evidence on importance of heterogeneity in preferences (as well as risk).
  - Will relax....
- No additional frictions (e.g. administrative costs)
  - so firms’ (and social) costs of providing insurance are expected insurance claims, that is expected payouts on policies
  - Will relax later in lecture...
• Marginal cost: expected insurance claim of the marginal (at that price) buyer
• Given this setup, what drives demand?
  • {Note: unit demand. so "quantity" is share of population who purchases}
  • Because individuals identical except for probability of getting sick, individuals with higher probability of getting sick have higher demand (wtp) for insurance
• Key Implication: downward sloping marginal cost curve
  • Individuals with highest willingness to pay have highest expected costs
  • Link between demand and cost curve is distinguishing feature of selection markets: production costs depend on which consumers purchase your product
Adverse selection: under-insurance

Demand curve

Price

Quantity

$Q_{max}=1$
Adverse selection: under-insurance

$Q_{max} = Q_{eff}$

(sickest individuals have highest willingness to pay)

Risk premium
Adverse selection: under-insurance
Adverse selection: under-insurance
Can get complete unraveling

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity</th>
</tr>
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<tbody>
<tr>
<td>Q_{max} = Q_{eff} = 1</td>
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AC curve

Demand curve

MC curve
Mandates as possible solution

![Graph showing demand, AC, and MC curves]

- **Demand curve**
- **AC curve**
- **MC curve**

- **Price**
- **Quantity**

- **$P_{eqm}$**
- **$Q_{eqm}$**
- **$Q_{eff}$**
Mandates as possible solution

Note: everyone not better off
(some value at $< P_{\text{mandate}}$)

Demand curve

AC curve

MC curve

Price

Quantity

$P_{\text{eqm}}$

$P_{\text{mandate}}$

$Q_{\text{eqm}}$

$Q_{\text{eff}}$
Potential public policy solutions

- Assume government has no better information than firm
- Comparative advantage of government is to manipulate price (tax/subsidies) or manipulate quantity (mandate)
- Subsidize insurance
  - Unambiguous welfare gain (until you consider the cost of public funds or as we will discuss it the "fiscal externalities" of the policy (Hendren 2016))
- Mandate coverage
  - Can achieve efficient outcome (mandate $Q_{mandate} = Q_{max} = Q_{eff}$)
  - Unambiguous welfare gain; magnitude uncertain
  - Note: *No Pareto Improvement* - some will be made worse off by mandate
    - Useful in understanding '08 Obama-Clinton primary debates...
    - But also model specific (e.g. potential Pareto improving policies in Rothschild-Stiglitz)
• Common policies: restrictions on price differentiation
  • e.g. no pricing on age and gender
  • extreme: "community rating"

• Tradeoff
  • Adverse Selection vs. Reclassification Risk (Handel, Hendel, Whinston EMA 2015)
    • "Reclassification risk" (aka "premium risk") = risk of becoming a bad risk and therefore paying a lot more in premiums
    • Insurance behind the veil of ignorance (Hendren 2021: Measuring Ex-Ante Welfare)
Comment: pricing on Xs

- Note: Pricing on X’s does not necessarily reduce welfare cost of adverse selection
- Imagine segment market (price on) gender
  - Now have two distinct insurance markets to analyze / two graphs (one for each market)
- If pricing on gender removes all residual private information (i.e. gender-specific MC curves are flat) then unambiguously welfare improving
- Otherwise ambiguous
  - is sum of area two welfare loss triangles (for men and women) bigger or smaller than area of triangle in gender-pooled market?
Comment: pricing on Xs (con’t)

- Example with three types:
  - Type 1 (10% of population) has expected cost of 20 and wtp 30
  - Type 2 (60% of population) has expected cost of 5 and wtp 20
  - Type 3 (30% of population) has expected cost of 4 and wtp 7.5

- Competitive (zero-profit price): is 6.2 and everyone buys insurance (efficient)

- If type 2 individuals are all female and type 1 and 3 are all male and price on gender
  - women are all insured (price of 5) - efficient
  - men: pooled competitive price is 8 at which point type 3 would inefficiently not buy insurance
Comment: pricing on Xs (con’t)

- Real world application: Medicare Advantage introduced finer risk adjustment (i.e. pricing insurance on more Xs)
  - From just demographics to also using health conditions
  - Not clear that reduced advantageous selection ("cream skimming") into this market (Brown et al. 2014 "vs." McWilliams et al. 2012)
- Key conceptual point: reducing but not eliminating a friction is not always welfare improving
  - Creates important opportunities for empirical work!
Departure from textbook case I: Loads

- Why might it not be efficient to insure everyone (i.e. why might MC be above WTP for some individuals?) Assuming everyone is risk averse...
  - Loading factors on insurance (administrative costs)
  - [Profits – not yet introduced in model]
  - Horizontal product differentiation (HMO vs PPO trades off lower oop costs but with more restrictions on doctor’s choice)
  - [Moral hazard - not yet introduced in model]
- With these, everyone may not value insurance at $> \text{MC}$ of providing it to them
- What if it is not efficient for everyone to buy insurance?
  - No longer unambiguous welfare gain from mandate
  - Tradeoff between two allocative inefficiencies: under-insurance from adverse selection vs. over-insurance from mandate
    - And this is still without allowing for preference heterogeneity! That introduces further sources of ambiguity...
Adverse selection with loads

Demand curve

AC curve

MC curve

$P_{eqm}$

$P_{eff}$

$Q_{eqm}$

$Q_{eff}$

$Q_{max}$

Price

Quantity
• Individuals may differ not only in their risk type but also their preferences (e.g. risk aversion / willingness to bear risk)
  • WTP increasing in risk aversion and in risk
• Creates potential for advantageous selection (opposite results of adverse selection)
• If high-risk individuals are less risk averse and heterogeneity in risk aversion is large, can get upward sloping marginal (and therefore average) cost curve
  • Individuals with highest WTP are the most risk averse and lowest (vs. highest) expected cost
Advantageous selection

Upward sloping, the AC curve will lie everywhere below it. If there were no insurance loads (as in the textbook situation), advantageous selection would not lead to any inefficiency; the MC and AC curves would always lie below the demand curve, and in equilibrium all individuals in the market would be covered, which would be efficient.

With insurance loads, however, advantageous selection generates the mirror image of the adverse selection case, also leading to inefficiency, but this time due to over-insurance rather than under-insurance. Figure 4 depicts this case. The efficient allocation calls for providing insurance to all individuals whose expected cost is lower than their willingness to pay—that is, all those who are to the left of point \( E \) (where the MC curve intersects the demand curve) in Figure 4. Competitive equilibrium, as before, is determined by the intersection of the AC curve and the demand curve (point \( C \) in Figure 4). But since the AC curve now lies below the MC curve, equilibrium implies that too many individuals are provided insurance, leading to over-insurance: there are \( Q_{\text{eqm}} - Q_{\text{eff}} \) individuals who are inefficiently provided insurance in equilibrium. These individuals value the insurance at less than their expected costs, but competitive forces make firms reduce the price, thus attracting these individuals together with more profitable inframarginal individuals. Again, the area of the deadweight loss triangle \( EDC \) quantifies the extent of the welfare loss from this over-insurance.

Advantageous selection

• Over-insurance
  • Opposite problem from adverse selection

• Opposite policy solutions
  • e.g. tax (vs. subsidize) insurance
Ultimately these are empirical questions (to be covered in next few lectures)

- Does adverse selection exist?
  - i.e. is marginal cost curve downward sloping? As you raise the price, is the marginal guy who drops out lower risk than the average guy who remains?
- How large is the welfare loss from adverse selection?
- What are the net welfare effects of various government interventions
Lecture outline

- Present simple theoretical frameworks for
  - Adverse selection [done]
  - Moral hazard
Moral hazard

- Unobserved effort taken by agent in response to insurance contract that affects expected claims
- For example, in response to more (vs less) comprehensive...
  - automobile insurance - drive more or less safely
  - unemployment insurance - exert less effort searching for a job, set higher reservation wage
  - health insurance - eat more cheeseburgers, don’t search for cheaper doctor
- Drives wedge between private and social cost
- Classic tradeoff of insurance vs. incentives
- Cost of insurance (not of social insurance / govt intervention)
Simple model of moral hazard

• Application: unemployment insurance
  • Pays out when you become unemployed
  • highly simplified, static model (see Chetty (2006) for richer model(s))

• The model
  • utility from consumption: additively separable and risk averse: \( u(c) \)
  • immediately: probability \( p \) of becoming unemployed
  • regains employment with probability \( q \) at cost \( h(q) \)
  • income while employed: \( w - \tau \)
  • income when unemployed: \( b \)
  • \{simplify: assumed taxes paid only by employed, not by reemployed\}

• government \{or insurer\} budget constraint requires:

\[
p(1 - q)b = (1 - p)\tau
\]
First best

- Suppose can control $q$ (e.g. monitor search effort perfectly).
- Set benefits ($b$), taxes ($\tau$) and remployment probability (i.e. effort) $q$ to maximize utility subject to the government break even constraint (benefits financed by tax).
- Solve:

$$\max_{q,b,t}\{(1 - p)u(w - \tau) + p[(1 - q)u(b) + qu(w) - h(q)]\}$$

subject to

$$p(1 - q)b \leq (1 - p)\tau$$
First best (con't)

- Solve:

\[
\max_{q,b,t}\{(1 - p)u(w - \tau) + p[(1 - q)u(b) + qu(w) - h(q)]\}
\]

subject to

\[
p(1 - q)b \leq (1 - p)\tau
\]

- First order conditions:

\{\tau\}: \quad (1 - p)u'(w - \tau) = \lambda(1 - p)

\{b\}: \quad p(1 - q)u'(b) = \lambda p(1 - q)

\{q\}: \quad h'(q) = u(w) - u(b) + \lambda(b)
First best (con't)

- Interpretation
  - FOC for $q$: $h'(q) = u(w) - u(b) + \lambda(b)$
    - internalizes fiscal cost of benefit $b$. i.e. equates marginal cost of $q$ with marginal benefit which is the private benefit (difference in utility between re-employment and unemployment) and the public benefit (the fiscal cost of the benefit)
  - We get "full insurance": marginal utility of consumption equated across states ("consumption smoothing"): 

$$u'(w - \tau) = u'(b) \quad (1)$$

(note: here we can't do anything about the fact that consumption is not equalized with the reemployment state, due to our simplifying assumption)
Worker private optimization problem

- Key: social planner can’t choose $q, b, \tau$. Can set parameters of social insurance $(b, t)$ but then worker privately optimizes / chooses $q$

Worker optimization:

$$V(b, \tau) = \max_q \{(1 - p)u(w - \tau) + p(1 - q)u(b) + pqu(w) - ph(q)\}$$

- optimum yields $q^*(b)$ with first order condition

$$h'(q) = u(w) - u(b)$$

Interpretation

- Worker equates marginal cost of $q$ with private marginal benefit (difference in utility between re-employment and unemployment). Unlike in the social optimum, he does not take account of the public benefit (fiscal cost of the benefit)
- Note: if reemployed paid taxes we would have $q^*(b, \tau)$ [this is what we are buying in simplicity]
Because of insurance, private marginal benefit from re-employment is less than social marginal benefit
  - Therefore insurance distorts private behavior (here: search effort)
Consequence: cannot achieve first best (equalizing marginal utility of consumption across states)
  - If consumption were same whether unemployed or not, would exert no search effort
Holmstrom (1979): presence of moral hazard leads optimal insurance contracts to be incomplete, striking a balance between reducing risk and maintaining incentives
Welfare loss from moral hazard: graphical illustration

**Patient-side Moral Hazard**

With no insurance, at a cost of $100 per visit, individuals would consume $Q_1$ doctor’s office visits, where marginal costs and benefits are equal. With only a $10 copayment, however, individuals consume $Q_2$ worth of visits, where private marginal costs equal social marginal benefit; this overconsumption of health care leads to a deadweight loss of ABC.

Source: Gruber textbook
Moral hazard reduces willingness to pay for insurance

- The extra insurance claims due to moral hazard raise actuarially fair premiums, but are not valued by individuals at their cost
- Imagine
  - an insurance policy with a 20% coinsurance (individual pays 20 cents per dollar of claims; insurance pays 80 cents)
  - Insurance increases expected claims by $100 (from say $500 without insurance to $600).
  - Therefore expected insurance costs (hence premiums) increase by $80
  - What is individual’s WTP for (how much does individual value) that extra $100 of healthcare use?
Moral hazard is therefore one reason not everyone “should” be insured.
Potential design responses (markets or government)

- Provide only partial insurance
  - High deductibles (Arrow 1963)
    - Concavity of utility function suggests value of insurance is higher for larger losses
    - Optimal trade off between combatting moral hazard through higher consumer cost-sharing with the goal of providing risk protection through lower consumer cost sharing
  - Exclusions (e.g. life insurance policies don’t cover suicide or sky diving accidents)
  - Partial experience rating (e.g. automobile insurance) - see discussion of reclassification risk
- Lump sum (indemnity) insurance
  - Observability? Residual Risk?
Recap

- Moral hazard (hidden action)
  - Introduces fundamental tension / tradeoff in design of optimal insurance (private or public)
- Adverse selection (hidden types)
  - Can impair efficient operation of market and create scope for welfare improving public policy
• Are moral hazard and adverse selection really distinct?
• ”Ex post adverse selection” (Cabral Restud 2017)
  • Strategically delay healthcare treatment to minimize out of pocket costs (moral hazard)
  • Can generate subsequent adverse selection
  • Helps explain why market for dental insurance has largely unravelled
  • Implications for e.g. open enrollment period or annual caps (less effective as opportunity for intertemporal substitution rises)
• Selection on moral hazard (Einav et al. AER 2013)
  • Choice of high deductible vs no deductible health insurance plan can depend on anticipated behavioral response (moral hazard) to the deductible
    • analogy: all you can eat restaurants
  • Implications for e.g. policies to combat selection
    • eg better monitoring may not only reduce moral hazard but also selection
  • Related to broader idea of Selection on Gains / Roy Model
• Existence: how do we empirically detect selection
• Welfare cost of asymmetric information
• Welfare consequences of government intervention