Rationales for Social Insurance

1 Overview

4 weeks on...

- why have social insurance?
- failures in insurance markets and how to detect them
- optimal social insurance design (focus: unemployment insurance)
- targeting social insurance and redistribution (focus: disability insurance, social security)
- government intervention in health insurance markets and health care
- will consider both optimal design (theory) and measurement of behavioral effects of policies (empirics)

2 What is Social Insurance?

- social insurance: government transfer to provide insurance against adverse events (unemployment, disability, age)
- contrasts with means-tested redistribution based on “permanent” differences
- biggest and most rapidly growing part of govt expenditure today: 9% in 1953, 50% in 2012 (mainly at the expense of defense spending)
- key reasons: aging, health care
- social insurance takes many forms:
  - public provision of insurance (UI, Medicare, Social Security)
  - mandate that firms provide insurance (workers’ compensation)
  - mandate that individuals buy insurance (health insurance)
– subsidize, regulate private insurance markets

• little known about optimal choice of instrument

3 Rationales for Social Insurance

• reduce risk for risk-averse individuals (involuntary unemployment, disability, living long)

• but why not just private insurance markets?

• private market failures
  1. informational problems (adverse selection, not moral hazard)
  2. aggregate (macroeconomic) shocks that need to be diversified across generations
  3. commitment problems with long-term contracts, insuring premium (reclassification) risk

• paternalism, individual optimization failures (myopia, improper planning)

• redistribution (can be viewed as ex ante insurance behind the Rawlsian veil of ignorance)

• Samaritan’s dilemma (government cannot commit not to help out uninsured individuals), in fact a form of government failure

• consider adverse selection argument in some more detail today

4 Adverse Selection in Insurance Markets

• key question: is there a scope for welfare improving government interventions when insurance markets are affected by adverse selection?

• classic theoretical paper: Rothschild/Stiglitz (1976)

• adverse selection results from private information about risk type, no moral hazard

• in particular, there are high risk \(H\) and low risk \(L\) types, fraction of low risks is \(\lambda\)

• risk of (monetary) loss \(D\) with probability \(\pi_H, \pi_L, \pi_H > \pi_L\)
many competitive risk neutral insurance firms

each firm can offer one insurance contract, specifying coverage \( C \in [0, D] \) at premium \( P \)
zero profit condition for each type

\[
P = \pi_k C
\]

characterizes “fair” premium

individuals are risk averse with expected utility

\[
\mathbb{E}U_k = \pi_k u(W - D + C - P) + (1 - \pi_k) u(W - P), \quad k = H, L
\]

single crossing: higher risk individuals have higher marginal willingness to pay for insurance (steeper indifference curves in \((C, P)\)-space)

\[
\left. \frac{dP}{dC} \right|_{\mathbb{E}U_k} = \frac{\pi_k u'(W - D + C - P)}{\pi_k u'(W - D + C - P) + (1 - \pi_k) u'(W - P)}
\]
at any given contract \((C, P)\)

insurers offer one contract each, then (after observing set of offered contracts) individuals select their preferred contract

first best (symmetric information benchmark): each type gets full insurance at fair premium

\[
P_k = \pi_k D, \quad k = H, L
\]

what about equilibrium under asymmetric information? this would not be incentive compatible \((H\)-types would buy the \(L\)-types’ contract)

Definition: A set of contracts \( S \) is a Rothschild-Stiglitz (RS) equilibrium if

1. each contract in \( S \) makes non-negative profits and
2. there does not exist a contract \((C, P)\) outside of the equilibrium set \( S \) that earns strictly positive profits when offered in addition to \( S \)

idea: there is no profitable deviation for any insurance firm

Results (see graphs):
1. there does not exist a pooling equilibrium

2. a separating equilibrium exists if $\lambda$ is not too high

3. it is such that the high risks get their first best contract $(C_H = D, P_H = \pi_H D)$ and the low risks get their fair contract that just satisfies the high risks’ incentive constraint: $(C_L, P_L)$ such that $P_L = \pi_L C_L$ and

$$u(W - \pi_H D) = \pi_H u(W - D + C_L - P_L) + (1 - \pi_H)u(W - P_L)$$

4. for $\lambda \to 1$, no equilibrium exists (“RS non-existence problem”)

• argument for government intervention?

• Wilson (1977): let insurers “react” and withdraw unprofitable contracts

• **Definition:** A set of contracts $S$ is a Wilson equilibrium if

1. each contract in $S$ makes non-negative profits and

2. there does not exist a contract $(C, P)$ outside of the equilibrium set $S$ that earns strictly positive profits when offered in addition to $S$ and after all the unprofitable contracts in $S$ have been withdrawn

• when $\lambda$ is small enough for the RS equilibrium to exist, then the Wilson equilibrium is equal to the RS equilibrium

• otherwise, the Wilson equilibrium is a pooling equilibrium (see graph)

• an equilibrium always exists

• already shows that details of modelling interaction between insurers matter

5 **Equilibrium Efficiency**

• clearly, RS contracts are inefficient “if the RS equilibrium does not exist” (Pareto dominated by pooling contract)

• however, pooling contract is always constrained inefficient (i.e. there exists a Pareto improvement even when taking into account the informational constraints, namely that risk types are private information)
• idea: introduce incentive compatible partial separation starting from pooling contract

• the RS separating equilibrium may or may not be constrained efficient (even if it exists)

• key idea (see graph): $L$-types may benefit from cross-subsidizing the $H$-types, as this relaxes the $H$-types’ incentive constraint and therefore allows the $L$-types to obtain more insurance

• this could e.g. be implemented by mandating a pooling contract as a partial social insurance system, and then letting individuals buy additional private insurance starting from there

• this is Pareto improving if
  
  1. sufficiently high degree of risk aversion (low risks value additional insurance coverage more)
  2. $\lambda$ high enough (makes per capita cross-subsidy for the low risks cheaper)

• Eckstein/Eichenbaum/Peled (1985), Crocker and Snow (1985)

• however, does this really require government intervention?

• have ruled out cross-subsidization by assumption

• what if insurers can offer multiple contracts? Miyazaki (1977)

• **Definition:** A set of contracts $S$ is a Miyazaki-Wilson equilibrium if

  1. the contracts in set $S$ make non-negative profits together and
  2. there does not exist another set of contracts $S'$ outside of the equilibrium set $S$ that earns strictly positive profits when offered in addition to $S$ and after all the unprofitable contracts in $S$ have been withdrawn

• by the same argument as above, the Miyazaki-Wilson equilibrium contracts will involve cross-subsidization from low to high risks

• specifically, the high risks get a full insurance contract at a subsidized premium $(D, \pi_H D - y)$ whereas the low risks pay the cross-subsidy $z$ and get the contract
(C_L, \pi_L C_L + z) that makes the high risks just indifferent:

\[
u(W - \pi_H D + y) = \pi_H u(W - D + C_L - \pi_L C_L - z) + (1 - \pi_H) u(W - \pi_L C_L - z).
\]

(1)

• overall zero profits in equilibrium in addition require

\[
\lambda z = (1 - \lambda) y \Rightarrow z = \frac{1 - \lambda}{\lambda} y
\]

(2)

• substituting equation (2) in (1) implicitly defines a relationship \(y(C_L)\), i.e. the cross-subsidy from low to high risks \(y\) that allows the low risks to get coverage \(C_L\) (such that the high risks remain willing to self-select into their own contract)

• then the Miyazaki-Wilson equilibrium contracts solve

\[
\max_{C_L} \pi_L u \left( W - D + C_L - \pi_L C_L - \frac{1 - \lambda}{\lambda} y(C_L) \right) + (1 - \pi_L) u \left( W - \pi_L C_L - \frac{1 - \lambda}{\lambda} y(C_L) \right)
\]

s.t. \(y(C_L) \geq 0\).

• i.e. they involve the cross-subsidization that maximizes the expected utility of the low risks, subject to the constraint that cross-subsidization goes from low to high risks

• it is easy to see that cross-subsidization cannot go in the opposite direction. Suppose the contrary, i.e. insurers make profits with the high risks’ contract to cross-subsidize the low risks’ contract. Then a deviator could offer a slightly cheaper contract to the high risks that still makes profits with them. A fortiori, it makes profits if it were purchased by some low risks as well, so it is a profitable deviation even if the equilibrium contracts are withdrawn.

• if the constraint binds, we’re back to the standard RS equilibrium without cross-subsidization

• clearly this depends on \(\lambda\) by (2)

• equivalently, the Miyazaki-Wilson contracts solve the following problem:

\[
\max_{(C_H, P_H), (C_L, P_L)} \pi_L u(W - D + C_L - P_L) + (1 - \pi_L) u(W - P_L)
\]

(3)
\[ \pi_i u(W - D + C_i - P_i) + (1 - \pi_i) u(W - P_i) \geq \pi_i u(W - D + C_j - P_j) + (1 - \pi_i) u(W - P_j), \quad i, j \in \{H, L\} \quad (4) \]

\[ \lambda (P_L - \pi_L C_L) + (1 - \lambda) (P_H - \pi_H C_H) \geq 0 \quad (5) \]

\[ P_L - \pi_L C_L \geq 0 \quad (6) \]

• hence, they solve a Pareto problem: the best contract for the low risks subject to a standard set of incentive constraints (4), an overall zero profits (or equivalently, resource) constraint (5), and the constraint that cross-subsidization must go from low to high risks, so that firms cannot make losses with the low risks (equation (6))

• thus, this equilibrium is always constrained efficient. If this captures the interaction in competitive insurance markets with adverse selection, there is no scope for Pareto improving government intervention

• interventions may still be able to improve welfare through redistribution (make the high risks better off)

• can show that (6) binds whenever \( \lambda \) is low, then there is some critical value \( \tilde{\lambda} \) such that for all \( \lambda > \tilde{\lambda} \), there is positive and increasing cross-subsidization (under some regularity conditions on preferences). See Netzer/Scheuer (2014) for details. RS contracts are efficient for a small population share of low risks, otherwise cross-subsidization and convergence to pooling contract for \( \lambda \to 1 \) (see graph)

• such contracts can be formally derived as equilibrium starting from very different approaches to modelling insurance markets:

  1. as SPE in a dynamic game (Netzer/Scheuer 2014)
  2. as Walrasian equilibrium in a general equilibrium setting where individuals trade contingent consumption bundles taking prices as given subject to incentive constraints, and there are markets for consumption rights (Bisin/Gottardi 2006)
  3. in a directed search model with adverse selection (Guerrieri/Shimer/Wright 2010)

• still, sustaining cross-subsidization in competitive markets is conceptually not easy
in summary, whether adverse selection justifies government interventions in competitive insurance markets really depends on which stance one takes about how insurance companies interact

moreover, is there evidence that there is adverse selection?

how great would be the welfare gains from government intervention?

how would these compare to the cost of government intervention?
  - moral hazard
  - productive efficiency (is the govt more or less efficient at providing insurance than private firms?)
  - allocative efficiency (e.g. tradeoff between productive efficiency and choice, for instance)

only recent and little work on these latter questions

6 Detecting Asymmetric Information in Insurance Markets

how to test whether there is asymmetric information in an insurance market?

general implication of adverse selection models discussed so far: high risk individuals buy more insurance than low risks (as captured by coverage in the models, maximum payouts or deductibles/copayments in practice)

the same positive correlation between coverage and ex post risk occurrence would result from a moral hazard model (even though opposite direction of causality)

Chiappori et al. (2006) show that this is a very general property of insurance markets with asymmetric information

this has lead to the “positive correlation test” (Chiappori and Salanie, 2000)

the positive correlation test estimates the correlation between the amount of insurance an individual buys and his ex-post risk experience, conditional on the observable characteristics that are used in pricing insurance policies

essential to condition on all the information that is used to set insurance prices. Finding, for example, that smokers demand more life insurance than non-smokers,
and that they also have higher mortality risk, is uninformative, since the price of insurance for smokers is adjusted to reflect this differential. Results from the positive correlation test are always conditional on the risk classification that the insurance company assigns to the individual.

- idea: run two regressions

\[ C_i = X_i \beta + \epsilon_i \]
\[ L_i = X_i \gamma + \mu_i, \]

where \( C_i \) is the insurance coverage purchased by individual \( i \), \( L_i \) the risk of loss (ex post loss occurrence), \( X_i \) is the set of variables that the insurance company uses to place the buyer into a risk class (and to compute the premium)

- need to control for \( X_i \) very flexibly (premium may depend on observables nonlinearly)

- under the null hypothesis of symmetric information, the residuals in these two equations, \( \epsilon_i \) and \( \mu_i \), should be uncorrelated. A statistically significant positive correlation between the two implies rejection of the null hypothesis.

- data requirements: individual claims, individual insurance contract purchases, insurance company’s pricing schedule (ideal)

- evidence varies very much across insurance markets:
  - original Chiappori/Salanie paper looks at French auto insurance where \( C_i \) is a binary variable whether individual buys more insurance than the required minimum. Cannot reject null hypothesis of symmetric information.
  - many studies find positive correlation in health insurance (Cutler and Zeckhauser, 2000), but exceptions (e.g. Fang et al., 2008)
  - no positive correlation in life insurance markets (Cawley and Philipson, 1999, and McCarthy and Mitchell, 2006)
  - positive correlation (with caveats, see below) in annuity markets (Finkelstein and Poterba 2004)

- the contrast between life insurance and annuity markets is particularly surprising: life insurance insures against the risk of dying early, an annuity against the risk of dying late. Since these markets insure exactly opposite risks, if there is asymmetric information in one market, there also should be asymmetric information in the other
also remarkable: no evidence on insurance markets where there is a lot of government intervention (UI, DI, etc.)

Finkelstein and Poterba (2004) show that it is important to consider different dimensions of coverage. Specifically, they consider annuity contracts and 3 different features that make them more or less attractive to high risks:

- a direct measure of “coverage” would be the initial annual annuity payment.
- contracts also differ in their degree of backloading (nominally fixed annual annuity payments versus escalating annuities that increase at a fixed nominal rate versus annuities that provide a constant real annual payment through inflation indexing). High risk individual should value more backloaded annuities more as they are more likely alive at later years when the backloaded annuity pays out more than the flat one.
- “guaranteed” annuities continue to pay out for a fixed number of years to the annuitant’s estate even after death. “Capital protected” annuities make annuitant recover premium. Effectively reduces insurance, more valuable to a short-than long-lived individual.

find evidence for asymmetric information using the latter two characteristics of coverage, but not the first

problem: test cannot distinguish between asymmetric information from adverse selection or moral hazard, however very different policy implications (not a problem for annuity markets though)

how to distinguish?

not robust to allowing for private information about preferences as well as risk type

e.g. suppose low risk individuals are also more risk averse. Then they may not buy less insurance than high risk types, and positive correlation test fails (e.g. auto insurance)

will turn to these two issues in more detail

7 Adverse Selection versus Moral Hazard

positive correlation test = joint test (except in settings where moral hazard is likely to be a smaller problem, such as annuity markets)
• how to distinguish selection from moral hazard?

• randomized experiment (Karlan and Zinman 2006)
  – consumer credit market in South Africa
  – risk is risk of default on the credit
  – people first get random “offer rates”
  – once people have signed up based on this, randomly half of the people who got the high offer rate get their actual “contract rate” reduced as a surprise
  – comparing people with the same contract rate, but different offer rates identifies selection effects
  – comparing people with the same offer, but different contract rates identifies moral hazard effects
  – find strong evidence for moral hazard, but not for adverse selection

• use dynamic (panel) data rather than cross-sectional variation
  – to identify pure moral hazard effect, need to observe change in behavior of given individual under different contracts (with different coverage)
  – e.g. insurance firm changed contracts without allowing for additional selection (e.g. Abbring et al. 2003, change in co-pays and deductibles for the same individual due to experience rating)

8 Unobserved Preference Heterogeneity

• adverse selection models considered so far: individuals are identical except for their risk, get single-crossing, positive correlation property

• but suppose individuals differ in other unobserved dimensions as well, e.g. risk aversion

• then positive correlation is not a necessary nor sufficient condition for asymmetric information

• theoretical challenge: how to model insurance market equilibrium in such a setting? how to think about market efficiency?

• key issue: no longer get single crossing preferences
• DeMeza and Webb (2001) assume that individuals differ in their privately known risk aversion and there is an (ex ante) moral hazard problem
  – then, under some conditions, the risk averse type exerts more precautionary effort to reduce risk, and thus (endogenously) becomes a low risk type, and vice versa
  – in equilibrium, the risk-averse types may buy more insurance but have the lower ex post risk occurrence (advantageous selection)
• Netzer and Scheuer (2010) show that this also works without the additional moral hazard problem, but with multidimensional ex ante heterogeneity
  – idea: individuals differ in their ex ante risk but also their skill type (or patience/savings propensity)
  – individuals endogenously accumulate (unobserved) wealth
  – ceteris paribus, high risk types save (work) more and thus accumulate more wealth, which makes them less risk-averse if risk aversion is decreasing
  – can also generate advantageous selection based on this channel of “self-insurance” through wealth accumulation (i.e. high risks self-insure more and thus buy less insurance coverage on the market)
• empirical challenge: how to detect asymmetric information in such a setting, and (conditional on that) market inefficiency?
• suppose individuals have private information about their risk type $Z_1$ and risk aversion $Z_2$. Then we can decompose the error terms from the positive correlation test as follows
  \[ \varepsilon_i = Z_{1i}\pi_1 + Z_{2i}\pi_2 + \eta_i \]
  \[ \mu_i = Z_{1i}\rho_1 + Z_{2i}\rho_2 + \nu_i \]
• positive correlation test is based on the idea that private risk type $Z_1$ is positively correlated with both coverage $C$ and ex post risk occurrence $L$ ($\pi_1 > 0$ and $\rho_1 > 0$)
• suppose, however, that risk aversion $Z_2$ is also positively correlated with coverage but negatively with ex post risk occurrence (e.g. due to moral hazard effect as above): $\pi_2 > 0$ but $\rho_2 < 0$
• then the correlation between $\varepsilon_i$ and $\mu_i$ may be zero or negative despite asymmetric information
- Cohen and Einav (2007): heterogeneity in unobserved risk aversion is more important than heterogeneity in unobserved risk type in automobile insurance

- Finkelstein and McGarry (2007): similar in market for long-term care insurance (have direct evidence of private information about risk type, but find offsetting preference based selection, so zero correlation between ex post risk and coverage)

- Finkelstein and Poterba (2006): unused observables test
  - characteristics of individuals that are not used by insurance company for pricing, even though observable
  - formally, a variable $W_i$, which could either be related to $Z_1$ or $Z_2$
  - regress
    \[ C_i = X_i\beta + W_i\alpha + \varepsilon_i \]
    \[ L_i = X_i\gamma + W_i\delta + \mu_i \]
  - then rejecting the joint null hypothesis $\alpha = \delta = 0$ is equivalent to rejecting null hypothesis of symmetric information
  - apply this to UK annuity market, using geographic location as unused observable
  - puzzle: why unused?

9 Insurance Rejections

- Hendren (2013): why do we see, across a wide range of insurance markets, insurance companies rejecting applicants on the basis of observable (often high-risk) characteristics?

- surprising, since even though they have higher expected expenditures, there is still unrealized risk

- e.g. impossible to buy insurance for long term care if an individual has suffered a stroke. But there is only a 20% chance of needing LTC for this subgroup of households. Also, regulation does not prevent risk-adjusted pricing in these markets, so why not just offer a higher premium?

- key explanation: adverse selection can lead to market breakdown for these subgroups
• starts from basic Rothschild-Stiglitz setting, but generalizes it to arbitrary type distributions
• i.e. rather than $p \in \{p_L, p_H\}$, allows for $p \in \Psi \subset [0, 1)$ with distribution $F(p)$
• as before, consider binary loss event, where loss $D$ is incurred with probability $p$ for a type $p$
• expected utility
  \[ pu(c_L) + (1 - p)u(c_{NL}), \]
  where $c_L$ is the consumption in case of loss and $c_{NL}$ in case of no loss.
• abstracts from institutional structure such as game of competition between insurance companies and finding an equilibrium, instead considers entire set of implementable allocations
• Definition: An allocation $\{c_L(p), c_{NL}(p)\}_{p \in \Psi}$ is implementable if
  (i) it is resource feasible
  \[ \int_\Psi [W - pD - pc_L(p) - (1 - p)c_{NL}(p)] dF(p) \geq 0 \]
  (ii) it is incentive compatible
  \[ pu(c_L(p)) + (1 - p)u(c_{NL}(p)) \geq pu(c_L(p')) + (1 - p)u(c_{NL}(p')) \quad \forall p, p' \in \Psi \]
  (iii) it is individually rational
  \[ u(c_L(p)) + (1 - p)u(c_{NL}(p)) \geq pu(W - D) + (1 - p)u(W) \quad \forall p \in \Psi. \]
• Result: The endowment $\{(W - D, W)\}$ is the only implementable allocation if and only if
  \[ \frac{p}{1 - p} \frac{u'(W - D)}{u'(W)} \leq \frac{\mathbb{E}[P|P \geq p]}{1 - \mathbb{E}[P|P \geq p]} \quad \forall p \in \Psi. \]
• LHS: MRS between consumption in the event of no loss and in the event of loss, evaluated at endowment. It is a type $p$'s willingness to pay for a small amount of insurance.
• cost of providing this insurance to type $p$ would be $p/(1 - p)$. But RHS is the average cost if all higher types $P \geq p$ also obtained this insurance. If no other contract
was offered, then a contract that \( p \) prefers to autarky would also be bought by all higher types, so the cheapest way to give a small amount of insurance to \( p \) would be given by the RHS.

- if no agent is willing to pay this cost, the entire insurance market breaks down, in a similar way to the market unraveling in the Akerlof model (but without restrictions on the allowed set of contracts).

- can interpret this empirically as rejections to all individuals in a market segment where this no trade condition is satisfied. It is not possible for firms to offer weakly profitable insurance in such a market that anyone would be willing to buy.

- key: it is the thickness of the upper tail of high risks (as captured by the RHS) that matters for whether adverse selection leads to rejections

- can measure and estimate the barrier to trade from private information using measures inspired by this theory

- applies it to LTC, disability and life insurance markets

- empirical question: is the barrier to trade larger for those who are rejected relative to those who are served by the market and is the difference large enough to plausibly explain why one group is rejected and the other is not? I.e. has information about rejection rules of insurance companies.

- in all 3 settings, finds such a pattern. E.g. in LTC insurance, finds that private information imposes a barrier to trade equivalent to an implicit tax on insurance premiums of 65-70% for those who would be rejected, compared to only 10-20% for those who would not be rejected.

- provides alternative interpretation for the Finkelstein/McGarry result that there is direct evidence for private information in the LTC insurance market but no correlation between risk and coverage. Finkelstein/McGarry interpret it as evidence that there must be preference based selection that offsets risk based selection. Hendren interprets it as a result of rejections, so that those with lots of private information get rejected, whereas those who end up in the LTC insurance market do not have much private information, which is why the positive correlation test fails

- also offers an interesting solution to the puzzle why we find evidence for adverse selection in the annuity market, but not in the life insurance market (based on the positive correlation test), even though they are both about mortality risk.
finds rejections in life insurance but no rejections in annuity markets

what matters is the thickness of the upper tail of risks, and whereas some agents privately know that they have a relatively high mortality risk, there seem to be few agents who know that they have exceptionally low mortality risk

since annuity and life insurance markets are about opposite ends of the same (mortality) risk, the thickness of the upper tail of risks can thus be very different, and therefore also the implications for adverse selection

10 Measuring Efficiency Costs of Adverse Selection

suppose we find evidence for adverse selection in a given insurance market

to provide rationale for government intervention, need to quantify the efficiency costs of adverse selection

what would be the welfare gains from a government mandate?

consider RS model and suppose \( \pi_H \) and \( \pi_L \) are very close together → very little adverse selection and market equilibrium is very close to pooling contract with full insurance

coverage of low risks indicates degree of adverse selection

key real world challenge: multidimensional heterogeneity

need to recover the joint distribution of risk type and risk preferences to make efficiency inferences (structural approach)

Einav, Finkelstein, Schrimpf (2010)

- suppose observe offered insurance options, choices made, and claims incurred
- can estimate risk type from claims data (abstracting from moral hazard)
- conditional on risk type, persons choosing different contracts must do so because of different risk aversion, so can estimate risk aversion from data on who chose which contract
- to get moral hazard effect, also need data on changes in insurance contracts: change in ex post risk occurrence under two different contracts for a given individual identifies moral hazard effect
• given all structural parameters of the model estimated in this way, can compare welfare under the asymmetric information equilibrium to the first best or some government mandate (using CV or EV)

• issue: with preference heterogeneity, mandates may have additional costs by removing choice options