Reclassification Risk: Government vs. Market Solutions

Based on work with:

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Outline of Talk

• Unfocused Blather

• Somewhat Focused Blather

• Does Guaranteed Renewable Insurance Solve the Problem of Reclassification Risk?
Unfocused Blather
Context: Policy Analysis

• What good are actuaries?

• What good are economists?

• Complementarities?
Actuaries (my take)

- Good at setting the table. (Borch, Bühlman)
- Excel at measuring and pricing risk.
- Excel at solvency analysis.
Economists (my take)

• Good at focusing on a specific aspect (or two) of a problem. (but toy models ....)

• Excel at examining strategic interaction. (e.g., Mimra and Wambach, 2014)

• If willing, can accommodate philosophical (normative) insights into social valuations. (Equilibrium and welfare analysis.)
Complementarities?

- Many policy issues require careful quantitative risk analysis (actuaries?) and an approach to social valuation (economists?). (... but see Guy Thomas – 2008)

- Example 1: Solvency Analysis – actuarial input arguably much more important. (+ Contagion?)

- Example 2: Regulating Risk Classification – both groups important with economics arguably better placed to compare distributional implications and aggregate effects on winners and losers. (... see subsequent slide)
Risk Classification (and bans)
Example: Genetic Tests

• Measuring price of risk with mixtures of risk groups. (e.g., MacDonald, 2011 and many more)

• Consumer welfare implications (Hoy and Durnin, 2012)

• See also Dionne and Rothschild – 2014, and Durnin, Hoy, Ruse - 2012)

• Does context matter? Why do people like bans?

• What is “fair pricing”? 
The Problem of Reclassification Risk
(A Toy Model – Classic Rothschild-Stiglitz Model)

• Consumers identical risk preferences and wealth \((W)\)
• Single possible loss (size \(d < W\))
• Two risk types – \(p_L < p_H\), average - \(p_A\)
• Ignore all costs except claim costs
• Perfectly competitive market and risk neutral firms
• Nonexclusive contracting \(\rightarrow\) pooling equilibrium
• Initially everyone thinks he/she is an average risk.
Risk-rating Allowed – Premium Risk

Ban on Risk-rating (pooling) – Partial Coverage Risk

\[ W_0 - p_H d \]

\[ W_0 - r^* p_A d - (1 - r^*) d \] (loss)

\[ W_0 - r^* p_A d \] (no loss)
Remarks

• Reclassification – ban can be efficient from ex ante perspective if risk type is not initially known

• If risk type is initially known, risk analysis turns into inequality/welfare analysis (Atkinson– 2000).

• If fraction of H-types is “small enough”, social welfare improves (à la Harsanyi – 1953, 1955) due to a ban (Hoy, 2006)
Risk and Inequality Measurement

Risk Measurement
Y ~ G more risky than X ~ F
Rothschild-Stiglitz (1970)

• All risk averters prefer X to Y.
• Y can be obtained from X through a series of mps’s.
• F SSD G.

Inequality Measurement
Y ~ G more unequal than X ~ F

• All (symmetric) concave swf’s “prefer” X to Y.
• Y can be obtained from X through a series of regressive transfers.
• F SSD G.
• X Lorenz dominates Y
More Remarks

• Suppose risk type not known at time of first purchase decision for life insurance

• Guaranteed renewable life insurance has potential to remove premium risk

• Using same R-S model, full coverage would be purchased via GR insurance (at price $p_A$)

• However, many complications arise and an explicit intertemporal choice model is required.
Spot Market Insurance – Premium Risk

Full coverage Guaranteed Renewable Insurance Purchased

\[ W_{0-p_{Ad}} \quad W_{0-p_{Ad}} \quad W_{0-p_{Ld}} \]
Alternatives to Bans

• Explicit taxes/subsidies across risk type contracts (Crocker and Snow, 1985)
• Basic level of social insurance + unregulated private supplementary insurance (Rothschild, 2011)
• Explicit insurance for genetic test outcomes (Tabarrok, 1994)
• Guaranteed Renewable Insurance?
Role of GR Insurance
Private Market Solution?

• **Obvious:** Allows individuals to insure against bad news in future periods (i.e., insure against reclassification or premium risk).

• **Not so much Recognized:** Allows individuals to insure against possible increased insurance needs (independent of risk type).
What we focus on:

• Assume two types of heterogeneity – demand type and risk type.

• An individual’s knowledge about his risk type and (future) demand type evolves over his lifetime.

• Symmetric information about risk type, but not demand type.
Related Literature:

• Aside from large literature on lapsation of GR (and related) insurance:


• Fei, Fluet, Schlesinger (2015)
Model

• Intertemporal choice with two dimensions of uncertainty – risk type and demand type

• Incomplete markets (due to demand type being unobserved by insurers)
$t = 1 \quad y_1; s, L^{1G}, L^1 \quad (1 - p) \quad C^{1D} \quad C^{1N}$
$t = 1 \quad y_1; s, L^{1G}, L^1 \quad (1 - p) \quad C^{1D} \quad p$  

$C^{1N} \quad y_2, \{i, j\}; L^{2G}_{ij}, L^2_{ij}$  

$\ldots$
end of $t = 2$
end of $t = 2$
end of $t = 2$
end of $t = 2$

- same as above except replace $l$ with $h$
Model (cont’d):

\[
EU = p \nu_1(C^{1D}) + (1 - p)u_1(C^{1N}) + \\
(1 - p) \left[ \sum_i \sum_j q_i r_j [p_i \theta_j \nu_2(C_{ij}^{2D}) + (1 - p_i)u_2(C_{ij}^{2N})] \right]
\]

insurance premium denoted by

\[
\pi_1, \pi_H, \pi_L, \pi^{1G}, \pi^{2G}
\]
Pricing of GR insurance – Zero Profit Constraint Implies (Formally): (with second line applying if $\pi^{2G} \geq \pi_L$)

\[
\pi^{1G} L^{1G} = p L^{1G} + \sum_{i,j} q_i r_j (p_i - \pi^{2G}) L_{ij}^{2G}
\]

\[
\pi^{1G} = p + q_H (p_H - \pi^{2G}) \sum_j r_j \frac{L_{ij}^{2G}}{L^{1G}}
\]
Prop 1: Characterization of Social Optimum

- MU equated for all $ij$ types across all time/state contingent scenarios.

- Consumption in life or death state independent of risk type (period 2).

- Period two consumption level for high demand type exceeds that for low demand type (but independent of risk type)
Characteristics of Optimal GR Contract

• First period GR purchase typically lies between that of what is desired ex post by high versus low demand types.

• If first period insurance needs are relatively low, then GR insurance less effective.

• Second period consumption of high risk types of either demand type is typically (but not always) less than that of low risk types.
Characteristics of Optimal GR Contract

• Lapsation not necessarily problematic.

• If only demand type uncertainty prevails, then renewal price of GR insurance will be less than loss probability.

• Even with both demand and risk type uncertainty, renewal price may be less than loss probability of lowest risk type.
Characteristics of Optimal GR Contract

• MU NOT equated for all \(ij\) types across all time/state contingent scenarios (unless only risk type differences prevail AND first period insurance needs are sufficiently high).

• A “different” type of adverse selection arises due to demand uncertainty. (Low demand - High risk types renew “too much insurance.”)

• Second period consumption of high risk types of either demand type lower than that of low risk types is what compromises welfare.
Conclusions

• Demand type uncertainty compromises value of GR insurance contracts.

• Regulatory bans may be welfare enhancing even in the presence of GR insurance contracts.

• In richer environments (e.g., healthcare) this insurance market becomes much more complex to model.

• Strategic issues among firms could prove an interesting direction for future research regarding all sorts of pricing issues, including regulatory bans.

• There are more policy instruments to consider (e.g., limits on insurance purchases that are subject to a ban on risk classification).
References


References (cont’d)

- Mirza, A. (2006),
Simulations

3.1 Period 1 Felicities

\[ u_1(C^{1N}) = \frac{1}{1-\beta} (C^{1N})^{1-\beta} \]
\[ v_1(C^{1D}) = \alpha^D u_1(C^{1D}) \]
3.2 Period 2 Felicities

\[ u_2(C_{ij}^{2N}) = \frac{1}{1-\beta}(C_{ij}^{2N})^{1-\beta} \]

\[ v_2(C_{ij}^{2D}) = \theta_j \frac{1}{1-\beta}(C_{ij}^{2D})^{1-\beta}, \quad \theta_h > \theta_l > 1 \]
3.3 Common Assumptions

$p = 0.08; \ y_1 = y_2 = 100$

CRRA utility with $\beta = 2$

$\alpha^D = 8$
Case 1: Demand Difference Only

\[ \theta_l = 1.2, \, \theta_h = 20.0; \, p_L = p_H = 0.10; \, r_l = r_h = 0.5 \]

Case 2: Demand and Risk Differences (A)

Same parameters are as above except \( p_L = 0.10 \) and \( p_H = 0.15 \)

\[ q_L = 0.80, q_H = 0.2 \]
Case 3: Risk Differences Only

$\theta_l = \theta_h = 20; \ p_l = 0.10, \ p_h = 0.50; \ q_L = 0.90; \ q_H = 0.1$
Case 4: Demand and Risk Differences (B)

\[ \theta_l = 1.2, \quad \theta_h = 20.0; \quad p_l = 0.10, \quad p_h = 0.50; \]
\[ r_l = r_h = 0.5; \quad q_L = 0.90, \quad q_H = 0.1. \]
## Social Optimum (Part 1)

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<tr>
<th></th>
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<th>$C^{1D}$</th>
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NOTE: DD/RD II has $p_H$ LARGE!
### Social Optimum (Part 2)

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**NOTE:** DD/RD II has $p_H$ LARGE!
## Social Optimum and Efficiency Loss under GR Insurance

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### Comparing Insurance Regime Efficiency (CV loss)

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**NOTE:** DD/RD II has $p_H$ LARGE!
Model:

- 2 periods; time indexed $t = 1, 2$
- first period uninformed
- probability of death, quite low, $p_1$
- buys spot insurance ($L$), buys GR ($L^{1G}$), saves ($s$) from income ($y_1$)
- second period risk type is realized
- observable to insurer
- $p_1 \ll p_L < p_H$; risk type indexed $i = L, H$; probability $q_i$
- demand type realized; affects death utility
- is $θ_ℓν_2(*)$ or $θ_hν_2(*)$; $θ_ℓ < θ_h$; indexed $j = ℓ, h$; probability $r_j$
- not observable to insurer
- buys spot insurance ($L_{ij}$), renews GR ($L^{2G}_{ij} \leq L^{1G}$) from income ($y_2$) and saving
Model (cont’d):

where:

\[ C^{1N} = y_1 - s - \pi^1 L^1 - \pi^{1G} L^{1G} \]
\[ C^{1D} = y_1 + (1 - \pi^1) L^1 + (1 - \pi^{1G}) L^{1G} \]
\[ C_{ij}^{2N} = y_2 + s - \pi_i^2 L_{ij}^2 - \pi^{2G} L_{ij}^{2G} \]
\[ C_{ij}^{2D} = y_2 + s + (1 - \pi_i^2) L_{ij}^2 + (1 - \pi^{2G}) L_{ij}^{2G} \]

with constraints

\[ 0 \leq L^1, \ 0 \leq L^{1G}, \ 0 \leq L_{ij}^{2G} \leq L^{1G}, \ 0 \leq L_{ij}^2 \]