An Equilibrium Analysis of Long-Term Care Insurance

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*These are our personal views and not necessarily the views of the Federal Reserve System.

Motivation: Facts about Long-Term Care for the Aged.

- In 2010 the annual cost of a nursing home stay was $75,000 for a semi-private room and $84,000 for a private room (longtermcare.gov).
- Life-time probability of a long stay (over 100 days) is 0.375 for females and 0.211 for male. (Hurd et al., 2014)
- 40% will spend more than one year, 20% more than 3 years and 11% more than 5 years (Kopecky and Koreshkova, 2014).

Motivation: Who pays for Long-Term Care Expenses?

- Medicare, 18% of total NH expenditures Medicare only covers rehabilitation stays ≤ 100 days. Only partial coverage for stays beyond 30 days.
- Medicaid, 37% of total NH expenditures Medicaid is means-tested.
  - Asset test threshold about \$2000.
  - Medicaid is a secondary payer. \$90 per month of personal income is exempt.
- Private insurance 2%-4% of total NH expenditures.
- Out-of-pocket 37% of total NH expenditures.
- Most long-term nursing home stays (over 100 days) are paid for out-of-pocket, except for the very poor.

Recent Research

- Recent research finds that Means-Tested Social Insurance (MTSI) is highly valued.
  1. Partial equilibrium DeNardi, French and Jones (2014) find that both rich and poor individuals value MTSI more than the actuarially fair cost of providing it.
  2. General equilibrium Braun, Kopecky and Koreshkova (2014) show that MTSI is welfare enhancing for all households as indexed by permanent life-time earnings quintile.
- These results suggest that the demand for LTC insurance is large.
- Is there a special role for the government to provide this insurance?

Puzzling features of private U.S. LTCI market.

- Market is small Only 10% of those over 65 have private LTCI. (Brown and Finkelstein, 2009).
- Residual Risk Insurance contracts offered do not fully insure against LTC expenses. Lifetime benefit periods and 10-year benefit periods are disappearing.
- Pricing Premia are much higher than actuarially fair insurance and have been particularly high for males. (Average expected benefits range between $0.49 and $.82 for each $ 1 of premium.)

More puzzling features of the U.S. private LTCI market

- Rejections In 2013, 27.8 percent of private LTCI applications were declined, withdrawn or suspended. (2014 Broker World Long Term Care Survey)
- Concentration: 2 issuers accounted for 60 percent of all new policies issued in 2012. (2014 Broker World Long Term Care Survey

Why is private LTC market so small? Demand for private LTCI is crowded out by Medicaid

- Brown and Finkelstein (2008) emphasize the crowding out effects of Medicaid on the demand for private LTCI.
- For many individuals private LTCI is redundant given that Medicaid is available.
  1. Medicaid is the secondary payer.
  2. Biggest risk is ending up poor, sick and alone. Medicaid insures against this risk.
  3. Purchase of LTCI reduces the probability of qualifying for Medicaid.

High rejection rates suggest frictions in supply of private LTCI

- Average issue age has ranged from 56 to 58 years old.
- We estimate that rejection rates for LTCI could be as high as 38% for those aged 55-66 years old.
- Our estimate is based on applying underwriting standards to HRS data.
- Underwriting has two rounds.
  1. Pre-screening (rejection rates are 18-23 percent).
  2. Formal application (rejection rates are about 20 percent).

Round 1: Pre-screening

Common questions include:

1. Do you require human assistance to perform any of your activities of daily living?
2. Are you currently receiving home health care or have you recently been in a nursing home?
3. Have you ever been diagnosed with or consulted a medical professional for the following: a long list of diseases that includes diabetes, memory loss, cancer, mental illness, heart disease?
4. Do you currently use or need any of the following: wheelchair, walker, cane, oxygen, etc.?
5. Do you currently receive disability benefits, social security disability benefits, or Medicaid?

Source: 2010 Report on the Actuarial Marketing and Legal Analyses of the Class Program

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The HRS contains enough information to more or less answer each of these questions for HRS respondents.

Round 1: Pre-screening

Percentage Answering "Yes" to at Least One Question

	Age		
	55–56	60–61	65–66
All	40.2	43.7	49.5
Singles	48.7	51.1	55.0
Top Half of Wealth Distribution Only			
All	30.8	33.6	39.4
Singles	33.5	35.4	40.4

- The percentage answering "Yes" to at least one question is large even for the youngest age group and the top half of the wealth distribution.

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- Q3 was answered "Yes" with highest frequency.
- If Q3's yes's are not counted $\Rightarrow$ Round 1 declination rates range from 18–23% for all and 25–29% for singles.

Round 2: Formal application

- Conditional on passing round 1, individuals are invited to make a formal application.
- One in five formal applicants are denied coverage. (Source: American Association for Long-Term Care Insurance)
- Assuming the declination rate is 20% in each round $\Rightarrow$ roughly 38% of 55–66 year-old HRS respondents would be unable to obtain LTCI.

Is adverse selection the source of these rejections?

- Some good reasons to be skeptical about this conjecture.
- Standard setup (see e.g. Stiglitz (1977), Chade and Schlee (2012))
  - Highest risk agents get full insurance.
  - Separating equilibrium (no rejections).
- Still, recent research by Hendren (2012) and Chade and Schlee (2014) suggests that adverse selection might be important.
  - Hendren (2012) shows that pooling and thus rejections arise in an adverse selection setup if some agents know that they will experience a NH event w.p. 1.
  - Chade and Schlee (2014) show that marginal cost loads on a single monopolistic insurer can also produce pooling and rejections.

Our Objective

- Jointly model private and social insurance for long-term care risk.
  1. Demand Medicaid crowds out private insurance. But provides insurance against LTC and lifetime earnings risk.
  2. Supply How important are adverse selection distortions in LTCI market?
  3. General Equilibrium Want to recognize the costs of financing Medicaid and conduct a welfare analysis.
- Empirical Can the model reproduce observations on rejections, pricing, benefit levels and size of U.S. market for LTCI and also MTSI recipiency rates?
- Determine the optimal mix of private and social insurance for retirees.

Today I will report the results of our first tentative steps in this research agenda.

Two-period general equilibrium model

- Young observe health status h, a noisy indicator of their LTC risk exposure, receive an endowment w_y and make a consumption (c_y) – savings (a) decision.
- Old receive w_o, observe their true exposure to LTC, $\theta = \{\theta_g, \theta_b\}$. Decide whether to purchase private LTCI: premium is π and indemnity is ι .
- Single issuer of private insurance. Insurer observes h, a and w but does not observe θ.
- MTSI social insurance (secondary payer). It guarantees a consumption floor of $\underline{c}$ to those with wealth and low levels of insurance.

Individual's problem

$$U(\{\pi^i_{h,\mathbf{w}}(\cdot), \iota^i_{h,\mathbf{w}}(\cdot)\}_{i\in\{g,b\}}, \mathbf{w}, h) =$$
$$\max_{a\geq 0} u(c_y) + \beta E_\theta[\theta u(c_{NH}) + (1-\theta)u(c_o)]$$
$$c_y = (1-\tau)w_y - a$$
$$c_{NH} = a + TR(a,\pi,\iota) - \pi - m + \iota + (1-\tau)(ra + w_o + d)$$
$$c_o = a - \pi + (1-\tau)(ra + w_o + d)$$
$$TR(a,\pi,\iota) = max\{0, \underline{c} - [a - m + \iota - \pi + (1-\tau)(r + w_o + d)]\}$$
$$u_2(\theta, a, \pi, \iota) \equiv \theta u(c_{NH}) + (1-\theta)u(c_o)$$

where m are nursing home expenditures, τ is a tax on the endowment and d is a dividend.

Insurer's problem (Monopolist)

$$\max_{\{\pi^i_{h,\mathbf{w}}(a),\iota^i_{h,\mathbf{w}}(a)\}_{i\in\{g,b\}}} \sum_{\mathbf{w}}\sum_{h}\sum_{a} \Big\{\psi_{h,\mathbf{w}}[\pi^g_{h,\mathbf{w}}(a) - \theta_g(\lambda\iota^g_{h,\mathbf{w}}(a))] + (1-\psi_{h,\mathbf{w}})[\pi^b_{h,\mathbf{w}}(a) - \theta_b(\lambda\iota^b_{s,\mathbf{w}}(a))]\Big\} f(h,\mathbf{w},a)$$

subject to

$$(IC_i) \quad u_2(\theta_i, a, \pi^i_{h,\mathbf{w}}(a), \iota^i_{h,\mathbf{w}}(a)) \geq u_2(\theta_i, a, \pi^j_{h,\mathbf{w}}(a), \iota^j_{h,\mathbf{w}}(a)) \quad \forall h, \mathbf{w}, a \quad i,j \in \{g,b\}, i \neq j$$

$$(PC_i) \quad u_2(\theta_i, a, \pi^i_{h,\mathbf{w}}(a), \iota^i_{h,\mathbf{w}}(a)) \geq u_2(\theta_i, a, 0, 0) \quad \forall h, \mathbf{w}, a, \quad i \in \{g,b\}$$

where $\lambda \geq 1$ is a load to the *insurer* and profits are non-negative.

Equilibrium

- Small open economy (real interest rate is exogenous).
- Taxes fund social LTC insurance.
- Profits from the firm are paid out to individuals.

Settings of model parameters

- Isoelastic preferences with risk aversion coefficient of 2.
- No endowment when old and interest rate is zero.
- Uniform joint distribution over h and w_y.
- LTC costs $m = 0.8$
- Risk Exposure $\theta_g = 0.2$ $\theta_b = \{0.8, 0.9, 1\}$
- MTSI consumption floor $\underline{c} = 0.2$ (When MTSI is present)
- 10 income classes.
- 5 health classes lowest class $h = 1$ is poor health.
- Monopolists inferences about θ_g, (ψ_h).

h	1	2	3	4	5
ψ_h	0.4	0.525	0.65	0.775	0.9

First Step: investigate the empirical relevance of alternative adverse selection models of the private LTCI market.

Criteria

- Market is small Only 10 percent of those over 65 have private LTCI.
- Residual Risk Insurance contracts offered do not fully insure against LTC expenses.
- Pricing Premia are much higher than actuarially fair insurance. (Average expected benefits range between \$0.49 and \$.82 for each \$ 1 of premium.)
- Rejections Rejection rates are high (38%).

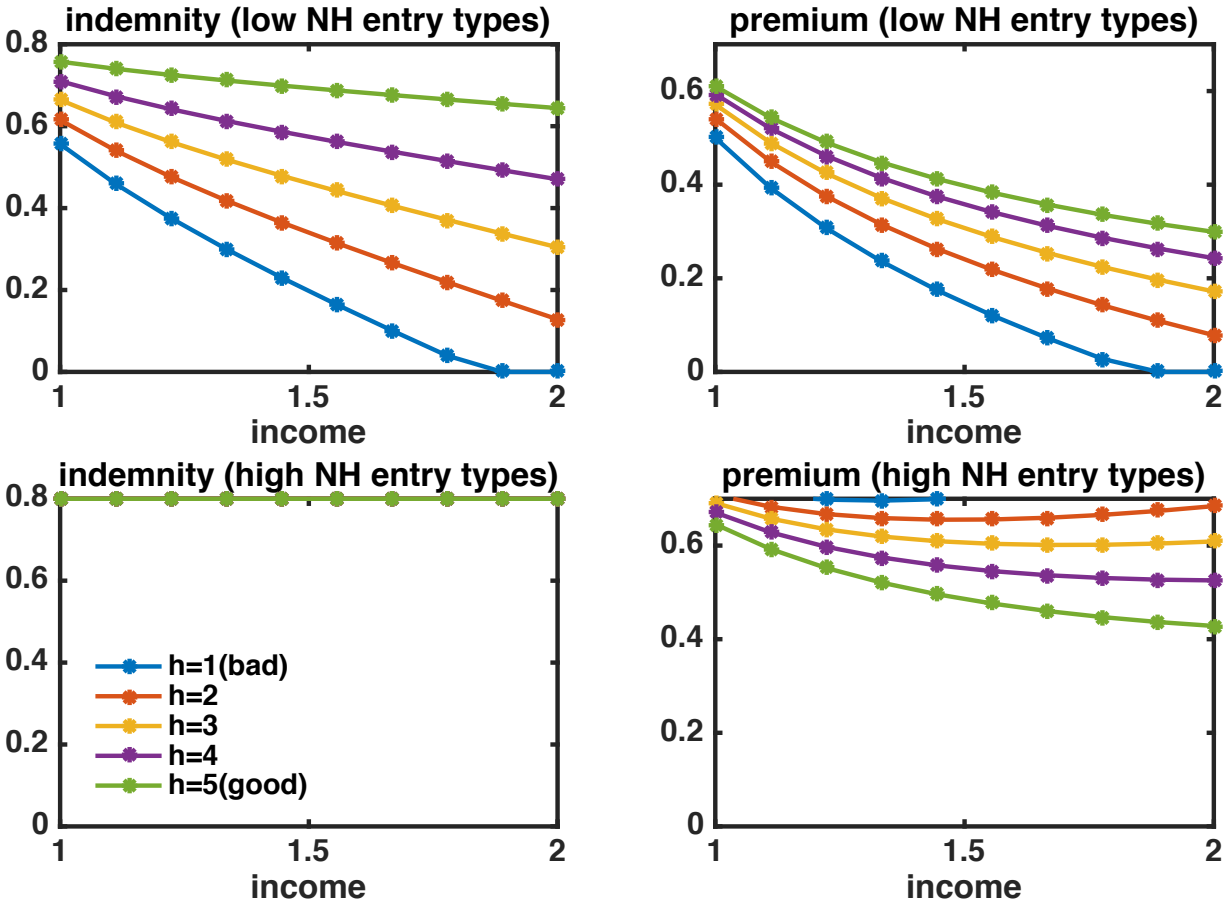
Properties of our model with no social insurance under standard assumptions

Classic result due to Stiglitz (1977), Hellwig (2010) and Chade and Schlee (2012).
When $\theta_b < 1$:

1. *Separating equilibrium* Agents are offered two contracts. Type θ_b prefer one of the contracts and type θ_g prefer the other contract.
2. *No distortion at the top* Type θ_b agents get an efficient contract.
3. *Distortion for good risks.* The contract for type θ_g agents is distorted down.

- Our model has these properties which we now illustrate using a partial equilibrium (P.E.) version of our model.

Simulation results "classic" setup ($\theta_b = 0.8$, P.E.)



Top panel is type θ_g, bottom panel is type θ_b.

Summary of the "classic" setup

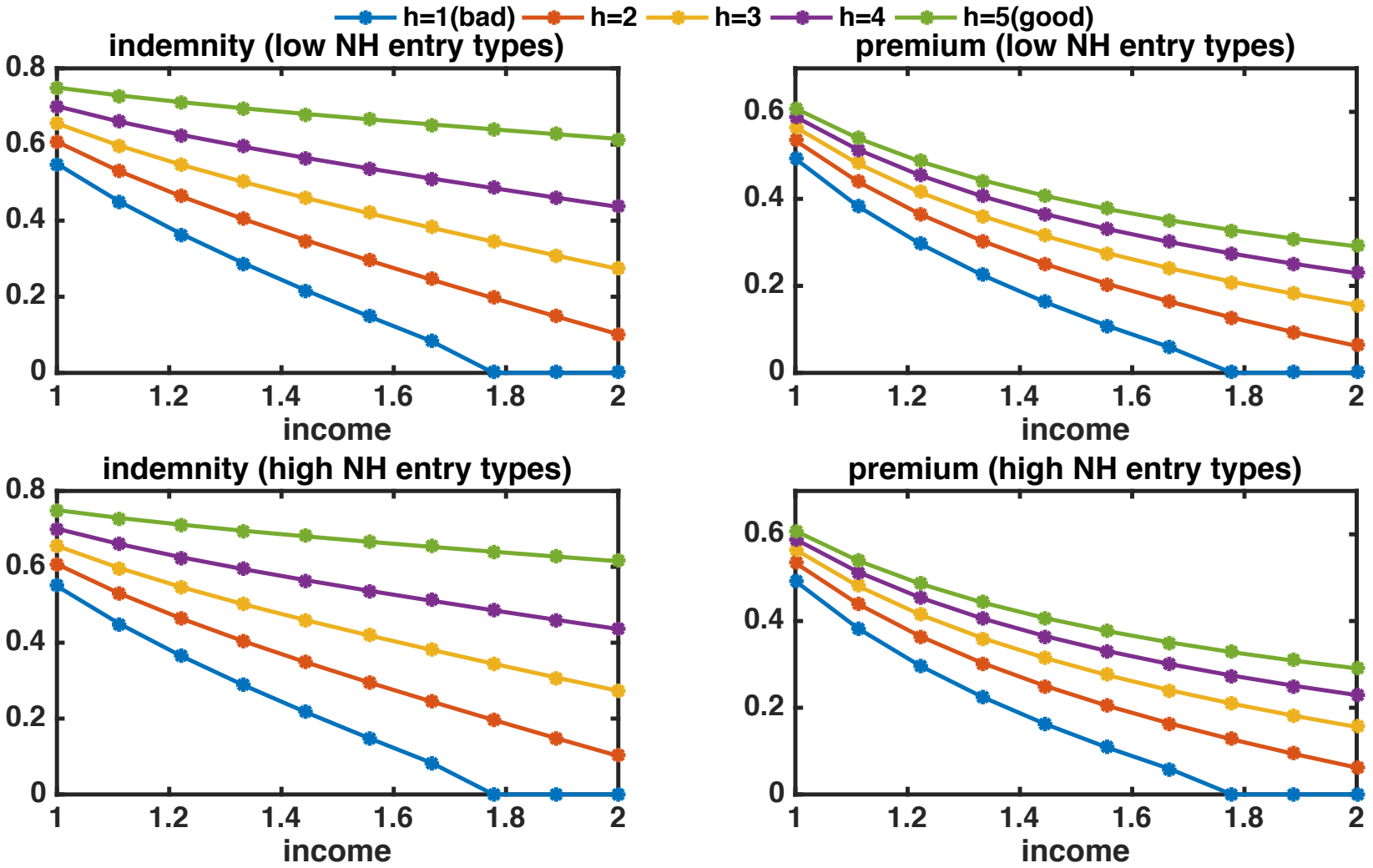
- *Insurance is not actuarily fair*. Individuals receive on average $ 0.55 of expected benefits for each $1 of premium paid.
- *No rejections*. Those with poor health status and high income *prefer* not to purchase insurance.
- *Size of the LTCI market is large*. 98% of agents are insured.
- This setup cannot account for the pattern of incomplete insurance results. Highest risk individuals are fully insured.

Hendren's (2012) strategy for producing rejections is to set ($\theta_b = 1$, P.E.)

Previous results assume $\theta_b < 1$. Properties of the model are quite different when $\theta_b = 1$.

- Pooling.
- Incomplete insurance.
- If the fraction of $\theta_b = 1$ types in the pool is large enough, the pool is rejected.
- How does Hendren's strategy work in our model?

Simulation results ($\theta_b = 1$, P.E.)

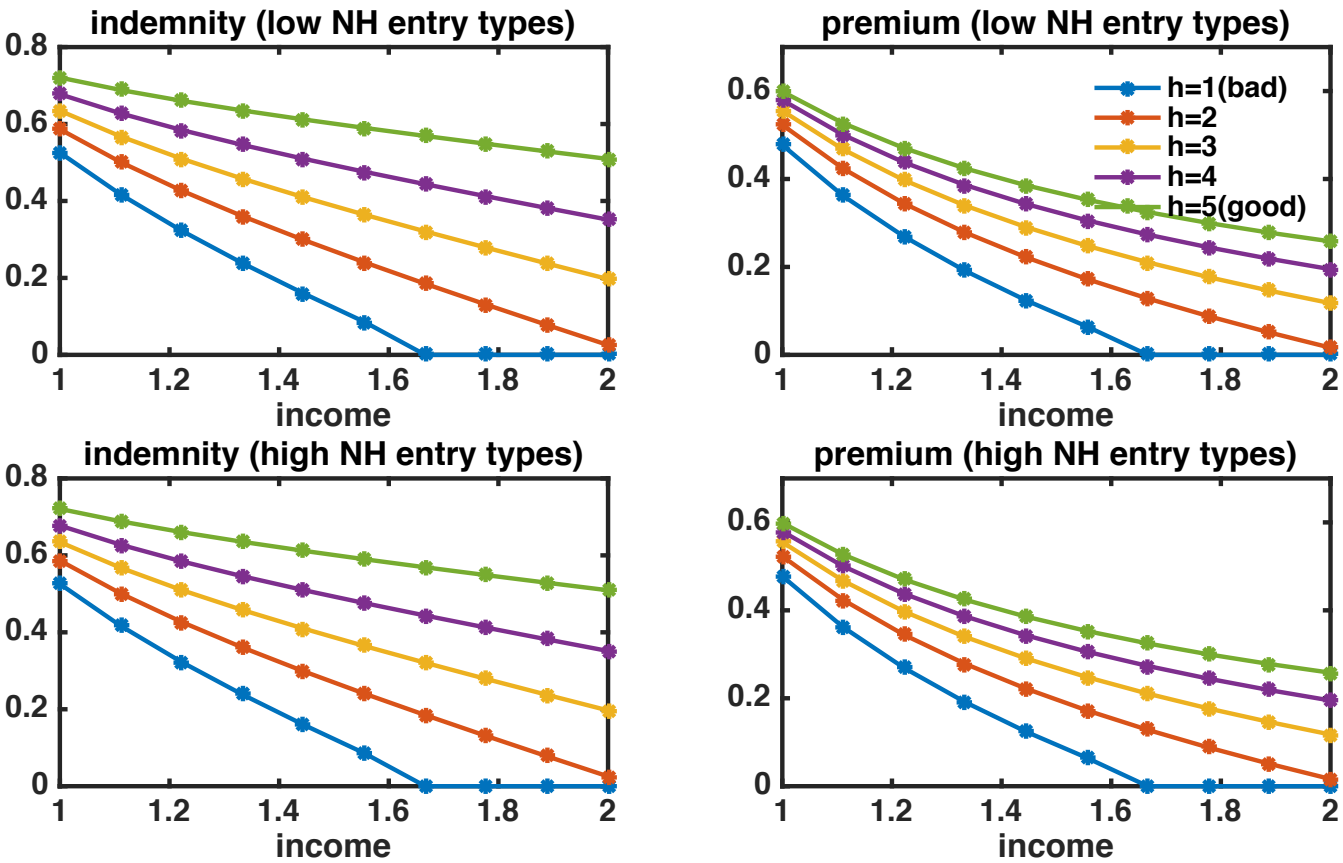


Top panel is type θ_g, bottom panel is type θ_b.

Summary: Hendren's mechanism ($\theta_b = 1$, P.E.)

- This mechanism can account for the incomplete insurance results: nobody is fully insured.
- Rejections. Poor health status, high income types are offered no insurance (pooling contract).
- Size of the LTCI market is smaller but still very large (94% of agents).
- Individuals receive on average $ 0.68 of expected benefits for each $1 of premium paid.

Chade and Schlee (2014) propose marginal cost loads ($\lambda = 1.3, \theta_b = 0.8$, P.E.)



Top panel is type θ_g, bottom panel is type θ_b.

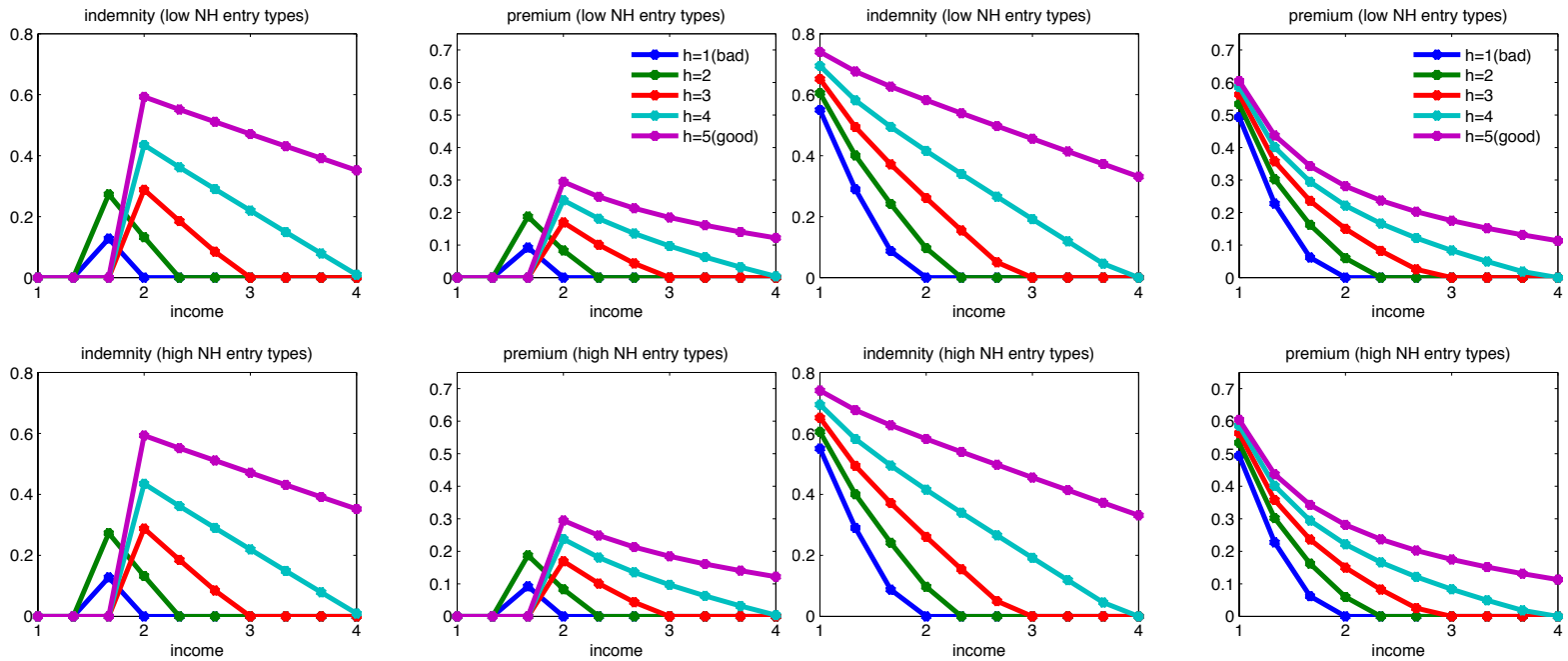
Summary of Marginal Cost Loads

- Pooling for all h This mechanism can also account for the incomplete insurance results.
- Rejections: type $h = 1$ higher income individuals are offered no contract.
- Size of the LTCI market is smaller than with no loads (92% of agents are insured).
- Individuals receive \$0.56 of expected benefits for each \$1 of premium.
- These expected benefits are a bit higher than the example with no loads. Monopolist has lower profits when $\lambda > 1$.

Private and social LTC insurance (Medicaid)

- We have a setup that can account for the qualitative properties of private insurance markets.
  - Rejections
  - Those with high risk exposures are rejected.
- We now consider how Medicaid affects the market for private LTC insurance.
- General equilibrium (GE): the government budget constraint is satisfied and profits equal dividends.
- Parameterization $\theta_b = 0.9$, $\lambda = 1.1$, $\underline{c} = 0.2$.

Premia and indemnities with Medicaid and No Medicaid ($\theta_b = 0.9, \lambda = 1.1, \underline{c} = 0.2$, G.E.).

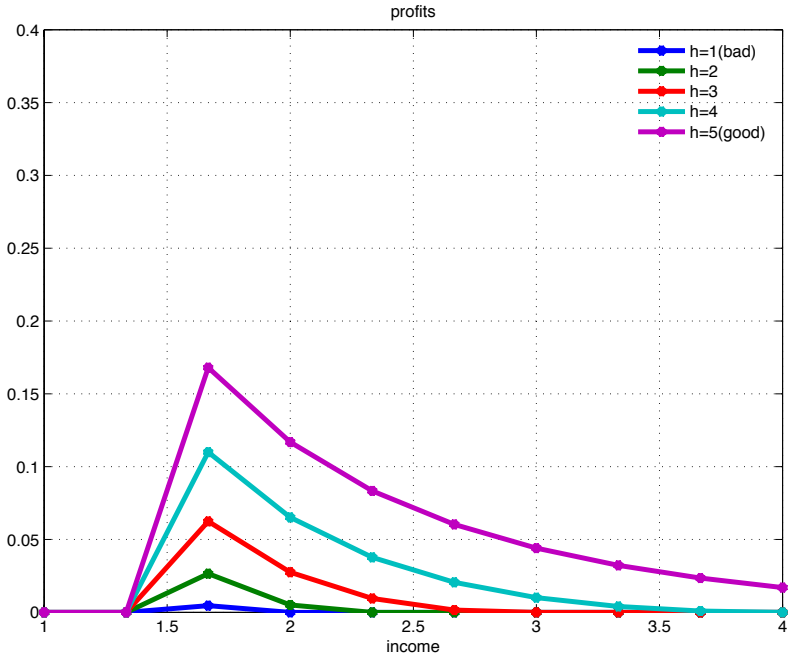


Right Panel is No Medicaid. Top panel is type θ_g, bottom panel is type θ_b.

Demand-side distortions due to Medicaid ($\theta_b = 0.9, \lambda = 1.1, \underline{c} = 0.2$, G.E.).

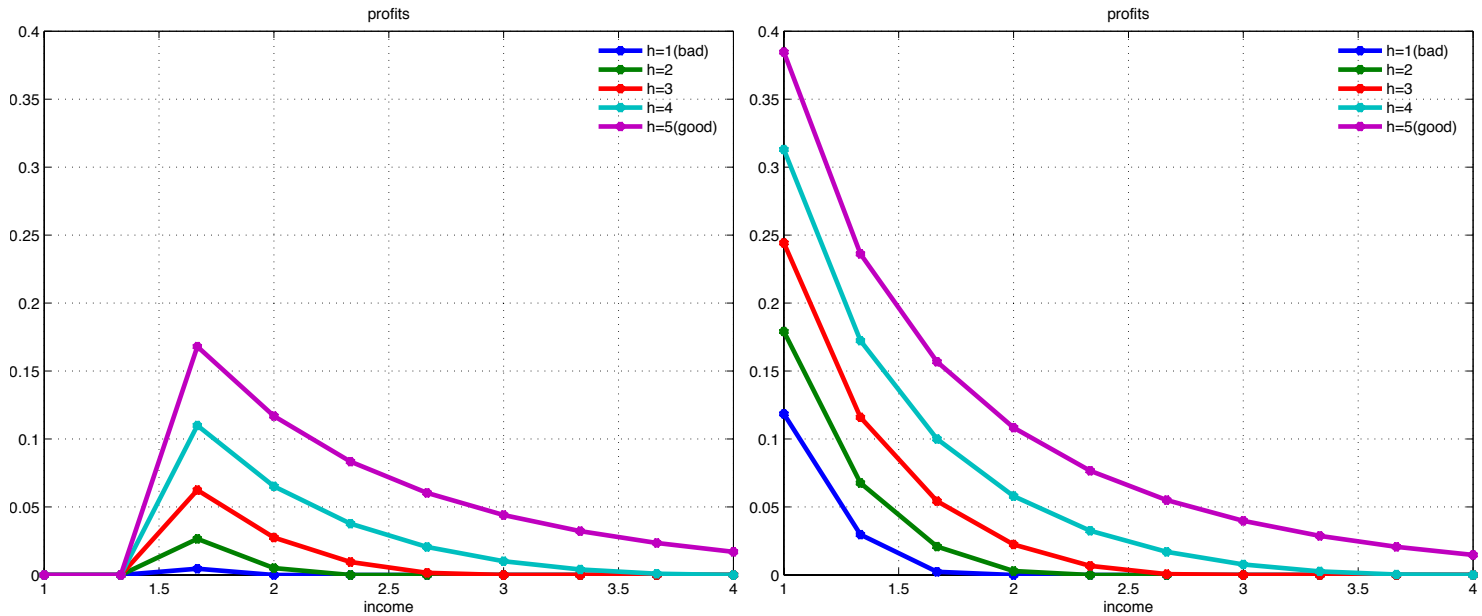
- Significant crowding out for those with poor health and low assets.
- Crowding out occurs via rejections and not pricing.
- Those who purchase private LTCI pay about the same premia and receive about the level of coverage as when Medicaid is absent.
- Medicaid depresses profits for the monopolist.

Profits with Medicaid



- Monopolist gets most profits from types with good health and medium income levels.
- For those with lower income levels outside option is MTSI.
- For those with highest income levels outside option is self-insurance.

Profits: Medicaid and No Medicaid Scenarios.



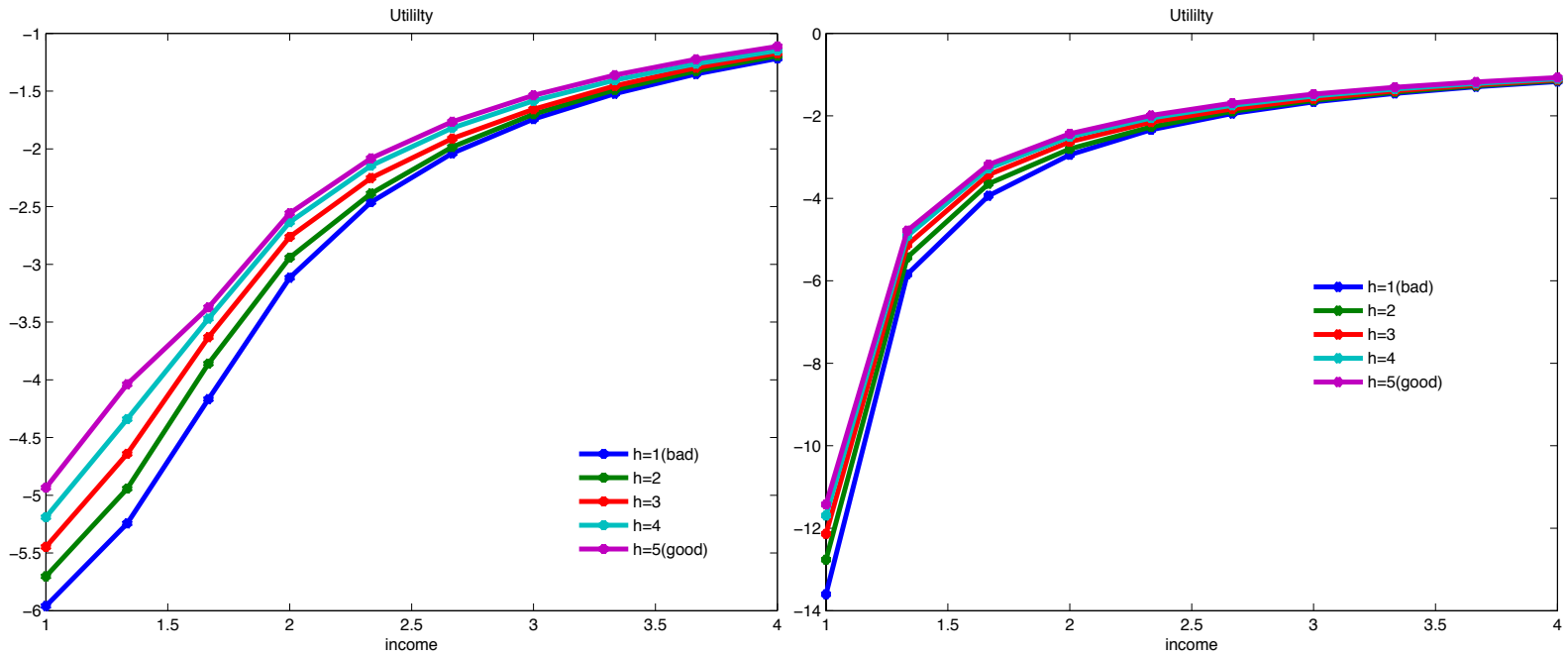
No Medicaid scenario is the right panel.

- If size of Medicaid consumption floor is increased from 0.2. Those with poor health status are not offered private insurance at any income level.

How well does the model account for puzzling features of private LTCI market?

- Data: Market is small Only 10 percent of those over 65 have private LTCI.
- Model 44% have private LTCI in the model with Medicaid.
- Data: Residual Risk Insurance contracts offered do not fully insure against LTC expenses.
- Model All types have less than complete insurance.
- Data: Pricing Premia are much higher than actuarially fair insurance. Average expected benefits range between \$0.49 and \$.82.
- Model Average expected individual benefits with Medicaid are \$0.73 for each \$1 of premium.
- Data: Rejections Total rejections are about 38%.
- Model 56% of applications are rejected.

Utility with Medicaid and no Medicaid.



Left panel is with Medicaid. Note the scale difference!

Welfare

- Big welfare gains from having even a very small Medicaid program.
- Ex ante welfare increases as the scale is increased to 0.3.
- Pooling is providing insurance to some individuals who would not receive insurance if their realization of θ was observed.
- The means-test distorts savings decision but also insures against life-time earnings risk (low endowment).

Conclusion

- Results highly preliminary but promising.
- Things to do.
  - Calibration of the model.
  - Social insurance reform.
  - Private market reform.
- Thank You!

Insurance in different settings.

	Perfect Comp.		Monopoly	
Risk	Complete Info.	Priv. Info.	Complete Info.	Priv. Info.
θ_b	Complete insurance, actuarially fair	Complete Insurance, actuarially fair	Insurer extracts entire surplus	Complete insurance, not actuarially fair
θ_g	Complete Insurance, Actuarially Fair	Partial Insurance, Actuarially fair	Insurer extracts entire surplus	Partial or no insurance, not actuarially fair