Dynamic Pricing Regulation and Welfare in Insurance Markets

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August 19, 2022
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Introduction

- The primary role of insurance is to insure idiosyncratic risks.
- Insurers also face uncertainties about future claims.
  - New markets, long-term contracts, aggregate risks etc.
- Insurers might pass through risk by adjusting premiums ex-post.
- The government has increasingly adopted regulations that limit insurers' ability to revise rates (rate stability regulation).
- How should we design dynamic pricing regulation?
  - Benefit: reduced uncertainty about future rate increases.
  - Cost: insurer exit or higher markup.

Overview of the Paper

We study the welfare impact of dynamic pricing regulation in the context of the U.S. private long-term care insurance (LTCI) market.

- Provide descriptive evidence for the effect of dynamic pricing regulation.
  - Premium stability improved at the cost of reduced insurer and product variety.
- Develop and estimate an equilibrium model of insurer entry/exit, dynamic pricing, and consumer insurance choice.
  - Tradeoff: premium stability vs. insurer availability and/or markup
- Conduct counterfactual policy experiments to examine the welfare impact of supply-side regulations.
  - The current rate stability regulation is too strict; relaxing it would increase the overall social welfare.

Outline

Outline

U.S. LTCI market

- LTCI pays for formal LTC services such as nursing homes.
- Difficulty in predicting future claims costs
  - Long-term contracts: avg purchase age is 60, while avg age of nursing home entry is 83.
  - LTC utilization risk depends not only on health and mortality risk, but also on the availability of family care, preference for different types of care etc.
  - Relatively young market.
- Small and highly concentrated market.
  - About 10% of elderly Americans own LTCI (cf. Medicaid is the biggest payer for LTC costs).
  - On average, 4 insurers account for 70% of market share.

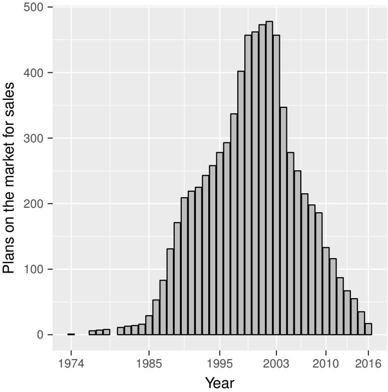
Pricing in LTCI

- Insurers commit to certain contract characteristics.
  - Guaranteed renewable.
  - No individual reclassification risk: rates cannot change based on individual circumstances.

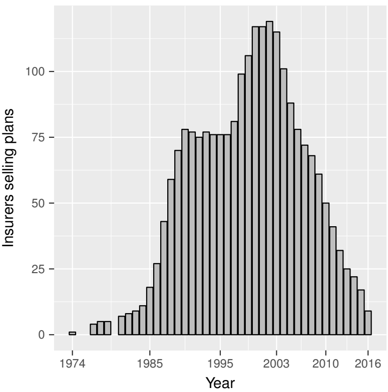
- Insurers do not commit to a certain premium schedule.
  - If the state regulator approves, insurers can increase rates at the buyer cohort level.

- Frequent rate increases
  - About one half of plans had a rate increase.
  - Cumulative increase was more than 60% relative to the initial price.

Decreasing Product Availability and Insurer Competition



Panel A: Active plans



Panel B: Active Insurers

- Sharp decline in product variety and insurer participation since 2003.

Changes in Supply Regulations

- Oversight of LTCI industry is largely the responsibility of states.
- States regulate their LTCI market based on national standards established by NAIC (LTCI Model Regulation, enacted in 1987).
- In 2000, major revisions were implemented to the Model to improve rate stability (Rate Stability Regulation of 2000).
  - Stricter requirements for rate increase approvals.
- Between 2001-2012, 41 states adopted the new standards.
  - # of states adopting the regulation reached its peak in 2003.

Outline

Empirical Strategy

- We utilize variations in adoption of rate stability regulation across states to examine its effect on market outcomes.

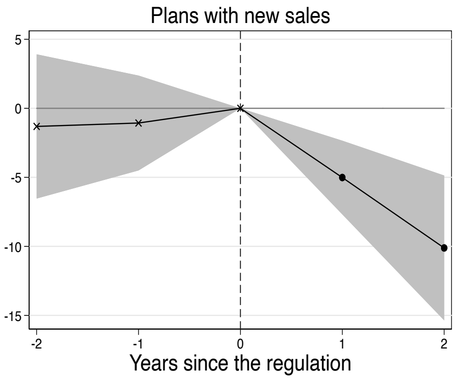
- Event study framework

$$y_{st} = \alpha + \sum_{k=-2}^{2} \beta_k I_{stk} + \tau_t + \eta_s + \varepsilon_{st}. \tag{1}$$

  I_{stk}: indicator for year t being k years since state s adopted rate stability regulation.

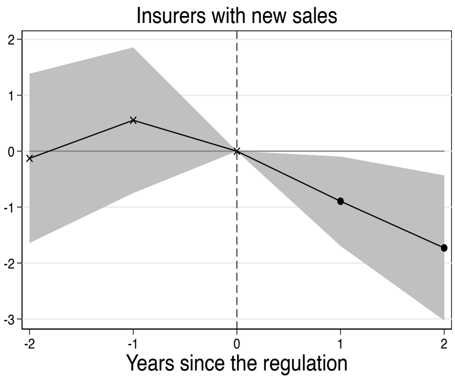
- Data: LTCI Experience Reports submitted to the NAIC by all insurers operating in the LTCI industry (2000-2007)

Reduced Product Availability



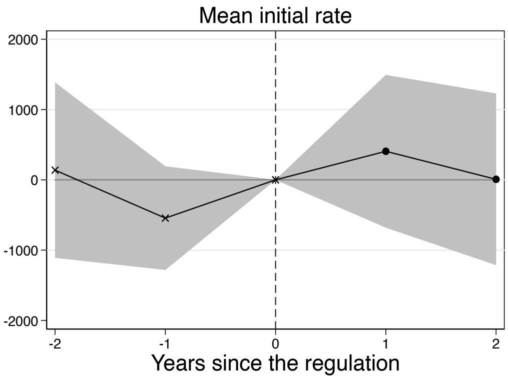
- In two years since the adoption of the regulation, the number of active plans in a given state is reduced by 10 (mean=65).

Reduced Insurer Participation



- In two years since the adoption of the regulation, the number of active insurers in a given state is reduced by 2 (mean=31).
- Mostly driven by fringe firms' exits.

Unchanged Initial Rates

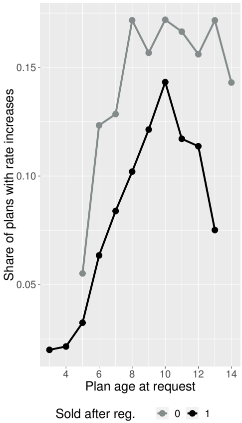


- Adoption of the regulation is not correlated with initial rates in a statistically significant manner.
- Initial rate regulation might play a role here.

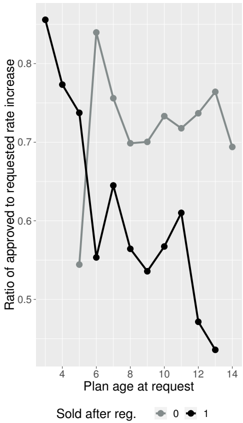
Effect on Premium Stability

- Evidence presented so far suggests that the regulation might have adversely affected consumers.
  - Reduced product offerings and insurer participation.
- We now examine how the regulation might have affected rate increases over the lifetime of a contract.
- Data: rate increase data from CA Dept of Insurance (2007-2017).

Improved Premium Stability



Extensive margin



Intensive margin

For plans sold after the regulation,

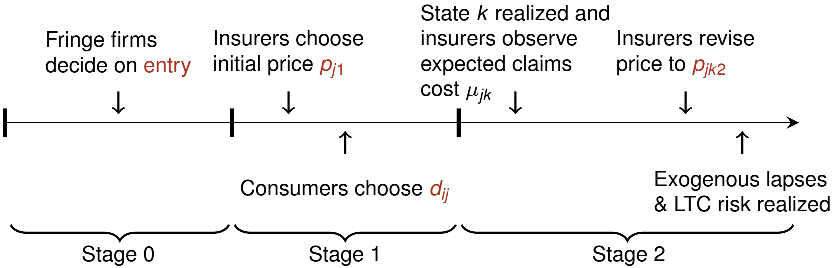
- Approval rate is lower.
- Ratio of approved to requested rate increase is lower.

Outline

Model Overview

- Three stage model
  - Stage 0: Firms' entry decision.
  - Stage 1: Firms' initial pricing & consumers' choice.
  - Stage 2: Firms' rate increase decision.
- Two types of firms: major vs. fringe.
  - Only fringe firms make entry decisions.
  - After entry, a representative fringe firm ($j = J$) decides on a single price schedule.
    - The premium dispersion among fringe firms in the data is much lower than that of major firms.
  - Consumers' value for J depends on # of fringe entrants.
- Policy environments
  - Supply: regulations on initial rate & subsequent increases.
  - Demand: means-tested public insurance for LTC (Medicaid).

Timeline



- In stage 1, consumers believe prices will remain constant.
  - Less than 20% of LTCI buyers knew that their insurer had raised rates on other policyholders (LifePlans 2017).
- In stage 2, no switching by consumers.
  - Almost all firms deny coverage to consumers over the age of 75.
  - Lapses are small and driven by behavioral reasons (Gottlieb and Smetters 2021; Friedberg et al 2021).

Stage 1: Payoffs

Consumers

- 1st period utility from contracting with insurer $j \in \{1, ..., J\}$

$$\tilde{u}_{ij1} \quad = \quad \alpha \underbrace{u(y_i - p_{j1})}_{\text{concave}} + \gamma(j = J)n_J + \xi_j + \varepsilon_{ij}$$

Insurers

- 1st period profit

$$\Pi_{j1} = p_{j1}s_{j1} - C_j^I(p_{j1} - \tilde{\mu}_j)$$

  - C_j^I = regulatory cost associated with initial price setting.
  - $\tilde{\mu}_j$ = target price set by the regulator.

Stage 2: State-Contingent Payoffs

Consumers

- 2nd period utility from contracting with insurer j:

$$\tilde{u}_{ijk} = \delta_k \tilde{u}_{ik,lapse} + (1 - \delta_k)\tilde{u}_{ijk,stay}$$

- δ_k = exogenously given lapse probability.
- $\tilde{u}_{ijk,stay} = \alpha u(y_i - p_{jk2}) + \gamma(j = J)n_J + \xi_j + \tilde{\varepsilon}_{i1}$
- In stage 1, consumers believe $p_{jk2} = p_{j1}$.
- $\tilde{u}_{ik,lapse} = \int_\lambda \alpha u(y_i - oop(\lambda, y_i))f_k(\lambda)d\lambda + \tilde{\varepsilon}_{i2}$.
- *oop* incorporates Medicaid payments for eligible individuals.

Insurers

- 2nd period profit:

$$\Pi_{jk2} = (p_{jk2} - \mu_{jk})s_{jk2} - C^{rs}_{jk}(p_{jk2} - p_{j1})$$

  - C^{rs}_{jk} = regulatory & reputation cost associated with revising the rate from p_{j1} to p_{jk2}.

Equilibrium

- We characterize the Nash equilibrium in each market where

  1. Consumers solve
  $$\max_{d_{ij}}\{\tilde{u}_{ij1} + \beta_c \sum_k \pi_k E_{\tilde{\varepsilon}_i}\left[\tilde{u}_{ijk}\right]\}$$
  2. Insurer $j \in \{1, ..., J\}$ solves
  $$\Pi_{jk} = \underset{p_{jk2} \leq \bar{p}_k}{\text{Max}} (p_{jk2} - \mu_{jk})s_{jk2} - C^{rs}_{jk}(p_{jk2} - p_{j1})$$
  $$\Pi_j = \underset{p_{j1}}{\text{Max}}\, p_{j1}s_{j1} - C^{l}_{j}(p_{j1} - \tilde{\mu}_j) + \beta_f \sum_k \pi_k \Pi_{jk}$$
  3. Fringe firm with entry cost c^e enters if $c^e \leq \frac{1}{n_J}\Pi_J$.

- Rate stability regulation (C^{rs}_{jk}) will impact not just p_{jk2} but also p_{j1} and n_J.
  - Improved premium stability vs. higher initial rate or reduced insurer variety.

Outline

Estimation Overview

- Calibrate/estimate certain parameters outside the model
  - LTC risk and out-of-pocket expenditure.
  - Target initial price set by the regulator ($\tilde{\mu}_j$).
  - State-contingent premiums (p_{jk2}) and claims (μ_{jk}) in stage 2.
    Details
- Estimate demand parameters by following Berry (1994) and Berry et al. (1995). Details
- Estimate cost parameters using the optimality conditions. Details

Preliminary Demand Estimates

Parameter	Notation	Estimate	S.E.
Consumption utility scale	α	0.08	(0.03)
Fringe variety utility scale	γ	0.003	(0.0003)
Demand elasticity			
With respect to initial premium	$\frac{\partial \ln s_{j1}}{\partial p_{j1}}$	-0.10	
With respect to fringe variety	$\frac{\partial \ln s_{j1}}{\partial n_j}$	0.47	

- Relatively small price elasticity. Implies premium subsidies may not be effective in increasing the demand.
- Without regulatory constraints, insurers can exercise significant market power.

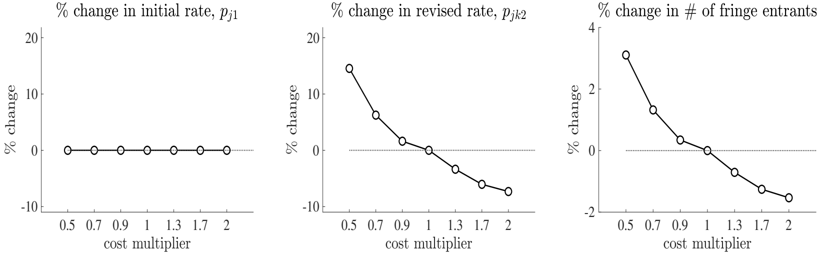
Outline

Counterfactual Experiments

1. Examine the effect of changing the strictness of the rate stability regulation.
2. Examine the effect of the initial rate setting regulation.
3. Examine the interaction between supply regulations and Medicaid.

- Today's presentation focuses on the 1st experiment.
- We change the cost associated with revising rates from 50% to 200% of the baseline.

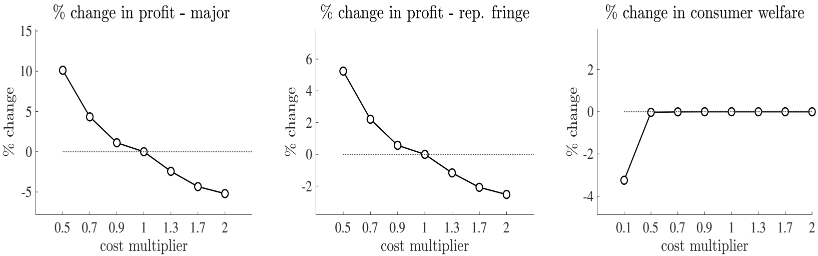
Counterfactual Rate Stability Regulation : Impact on Prices and Fringe Variety



Panel A　　Panel B　　Panel C

- Almost no impact on initial rate (consistent with descriptives).
- The regulation improves premium stability: doubling the regulatory cost decreases the stage 2 price by 7%.
- The regulation reduces fringe variety: doubling the regulatory cost reduces fringe entrants by 2%.
- Panel B vs. Panel C: trade-off to consumers.

Counterfactual Rate Stability Regulation : Impact on Welfare



Panel A

Panel B

Panel C

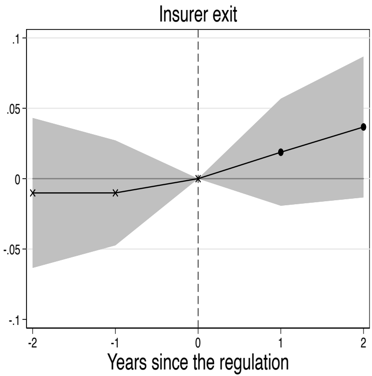
- The regulation reduces insurer profits.
  - Doubling the regulatory cost decreases major firms' profits by 5% and rep. fringe firm's profits by 2.5%.
- Consumer welfare remains almost unaffected (for reasonable costs).
  - Benefit from improved rate stability $\approx$ cost from reduced fringe variety (for regulatory costs not too far from the baseline).

Conclusion

- In this paper, we took a first attempt in understanding the welfare impact of pricing regulations in the LTCI market.
- A clear trade-off surrounding the regulation: enhanced premium stability vs. reduced insurer/product availability.
- Relaxing the current pricing regulations would increase social welfare and insurer participation.

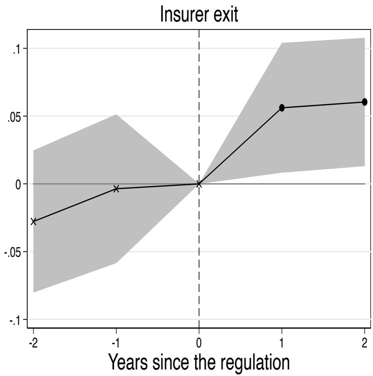
Additional Slides

Exit by Insurer Type



Major firms (share $\geq$ 5%)

Mean exit rate = 3%

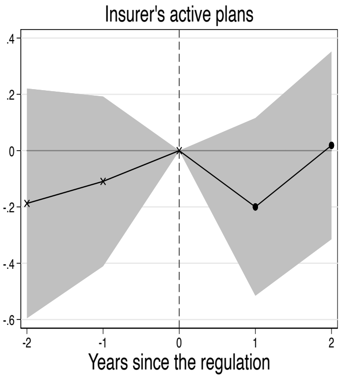


Fringe firms (share $<$ 5%)

Mean exit rate = 21%

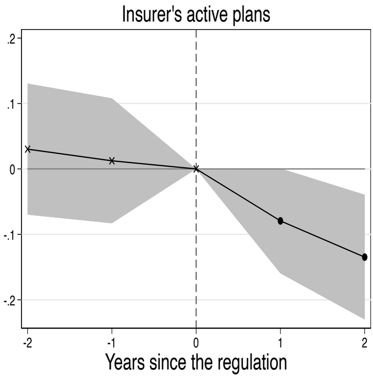
- The regulation increased fringe firms' exit, while it did not impact major firms' exit.

Plans Offered by Insurer Type



Major firms

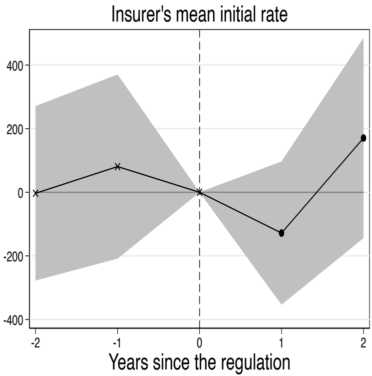
Mean plans offered = 2.6



Fringe firms

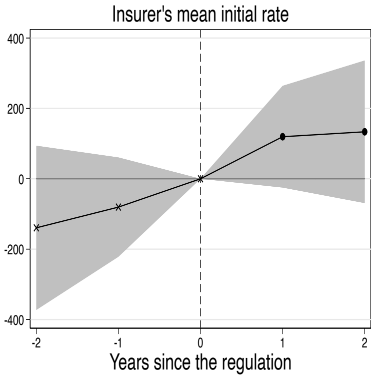
Mean plans offered = 1.5

Initial Rates by Insurer Type



Major firms

Mean initial rate = $2212



Fringe firms

Mean initial rate = $2125

Model: Commitment

- Standard dynamic contracting models assume one-sided commitment where firms can commit, while consumers cannot.
  - They predict long-term contracts with front-loading.
- Our data
  - Substantial rate increases make LTCI contracts back-loaded.
  - LTC insurers do not commit to a certain price schedule.
- We impose the following assumptions:
  1. No switching by consumers in stage 2 $\rightarrow$ locking consumers is less of a concern.
     - Almost all firms deny coverage to consumers over the age of 75.
     - Lapses are small and driven by behavioral reasons (Gottlieb and Smetters 2021; Friedberg et al 2021).
  2. Consumers believe prices will remain constant. $\rightarrow$ committing to a smooth price schedule is no longer optimal.
     - Less than 20% of LTCI buyers knew that their insurer had raised rates on other policyholders (LifePlans 2017).
- Other explanations (e.g., insurer's bankruptcy constraints) are less plausible in our data period.

State-contingent premiums (p_{jk2}) and claims (μ_{jk})

- We observe only the realized rate increases and claims.

- Assume that the distribution of rate increases follows a finite mixture model ($G = 2$).

$$f(y_{ijs}) = \sum_{g=1}^{G} \pi_{gs} f_g(y_{ijs}|x'_{ij}\beta_g)$$

  - $y_{ijs} = \ln(r_{ijs} + 1)$ where r_{ijs} is the cumulative rate increase.
  - For $g = 1$, the price increase is degenerate and is equal to zero with probability one.
  - For $g = 2$, the price increase follows a normal distribution.

- Estimate (π_{gs}, β_g) by a maximum likelihood estimator.

- Predict p_{jk2} as the quantile values of the estimated distribution.

- Use a similar approach to estimate the state-contingent claims.

Return

Demand Estimation

- We estimate the scales of utility from consumption (α) & insurer availability (γ):

  $$\tilde{u}_{ij} = \alpha u(y_i - p_j) + \gamma I(j = J) n_J + \xi_j + \varepsilon_{ij}$$

- Potential endogeneity issue: unobserved insurer quality ξ_j could be correlated with p_j and insurer availability n_J.
- We use the following IVs.
  - Insurers' own prices in other markets (Hausman-Nevo IVs).
  - Change in # of fringe entrants due to the adoption of the Rate Stability Regulation.

Return

Supply Estimation

- Specify functional forms for cost functions

$$
\begin{aligned}
C_{jk}^{rs}(p_{jk2} - p_{j1}) &= \begin{cases} c^0 + \frac{c_{jk}^1}{2}(p_{jk2} - p_{j1})^2 & \text{if } p_{jk2} - p_{j1} > 0 \\ 0 & \text{if } p_{jk2} - p_{j1} = 0 \end{cases} \\
C_j^l(p_{j1} - \tilde{\mu}_j) &= \frac{c_j^l}{2}(p_{j1} - \tilde{\mu}_j)^2 \\
c^e &\sim \ln N(\mu_e, \sigma_e)
\end{aligned}
$$

- Estimate C_{jk}^{rs} by MLE.
- Estimate C_j^l using the 1st stage FOC.
- Estimate distribution of c^e using the entry condition.

Return