

Equilibrium effects of price updating: evidence from a centralized marketplace for annuities

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October 13, 2025

¹Yale University

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- ▶ In several markets consumers receive initial offers, then they can request revised offers.
Examples:
 - Loans: consumers get a loan estimate (LE) and showing a LE to another lender could lead to a revised offer. [1]
 - Auto dealerships: buyers can shop around and dealers are willing to revise their initial offers [2]
- ▶ What are the impacts of allowing consumers to request revised offers?
- ▶ Economic forces at play:
 - Learning: firms learn competitors' prices and can best respond.
 - Discrimination: if search cost are correlated with preferences. [not today]

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└ Motivation

- I am going to study the effects of being able to request revised offers in a centralized marketplace for annuities in Chile.

Motivation

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Examples:
 - Loans: consumers get a loan estimate (LE) and showing a LE to another lender could lead to a revised offer. [1]
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- ▶ Economic forces at play:
 - Learning: firms learn competitors' prices and can best respond.
 - Discrimination: if search cost are correlated with preferences. [not today]

This research

- ▶ Studies a centralized marketplace for annuities in Chile (SCOMP)
- ▶ A recent law eliminated the possibility of requesting revised offers.
 - Before: consumers receive initial offers, then can request revised offers from one firm.
 - After: consumers can only accept/reject initial offers.
 - Rationale for elimination: "firms will not make their best efforts in the initial phase"
- ▶ Also provides evidence on asymmetries in information precision in selection markets.

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- ▶ Aftermarkets: **allen_search_2019**
- ▶ Competition in selection markets: **mahoney_imperfect_2017**; **cuesta_price_2018**; **cosconati_competing_2025**
- ▶ Selection in multiple dimensions: **finkelstein_adverse_2004** and Finkelstein and McGarry (2006).

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└ Literature

Literature

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Setting and Data

Empirical Evidence

Model

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└─ Setting and Data

└─ Outline

Setting and Data

Empirical Evidence

Model

Setting: annuities

- ▶ Profits of firm j :

$$\pi_{ji}(F) = S_i - \mathbb{E}_T^j \left[\sum_{t=1}^T \frac{F}{(1 + r_j)^t} | x_i \right]$$

S : stock of savings, F : per period annuity payment, x_i : individual mortality factors

- ▶ Firm heterogeneity: algorithm (mortality tables), financing costs (r_j) and risk ratings.

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- └ Setting and Data

- └ Setting: annuities

- Explicitly not link the annuities market with pensions because generates confusion
- Explain what annuities are.

Setting: annuities

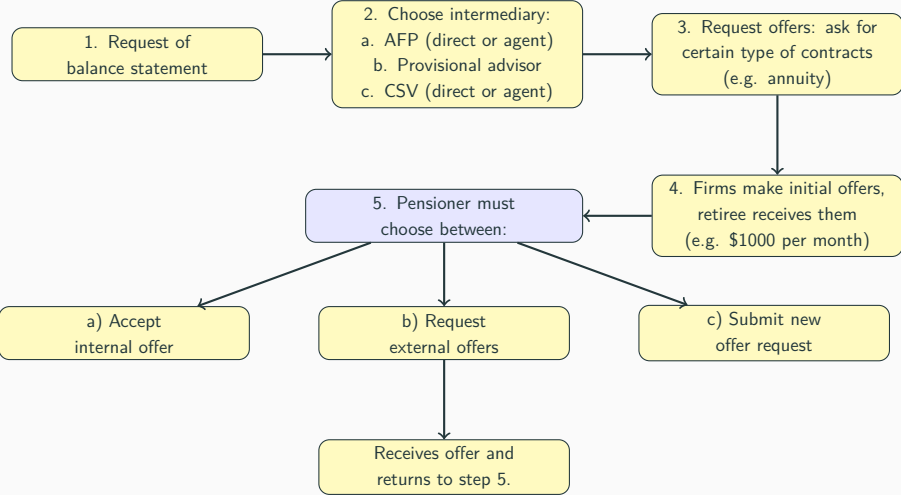
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SCOMP Process Flow Diagram



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└ Setting and Data

└ SCOMP Process Flow Diagram

SCOMP Process Flow Diagram



- ▶ SCOMP data at the individual level
 - Posted and revised prices, and consumer decisions
 - Total savings
 - Demographics: age and gender Certificate with initial prices
- ▶ Retirement insurance companies: risk ratings

Particularities of the data/setting:

- ▶ One observes all the offers received by the buyers
- ▶ One observes the same information as the firms (gender, age, savings)

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└─ Setting and Data

└─ Data

- Data
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└─ Empirical Evidence

└─ Outline

Setting and Data

Empirical Evidence

Model

Descriptive Evidence

- ▶ Most buyers request external offers and the improvement is sizeable. External offers
- ▶ Products are differentiated Foregone value
- ▶ Selection into companies Heterogeneity in algorithm precision
- ▶ Firms learn about other firms' prices Learning

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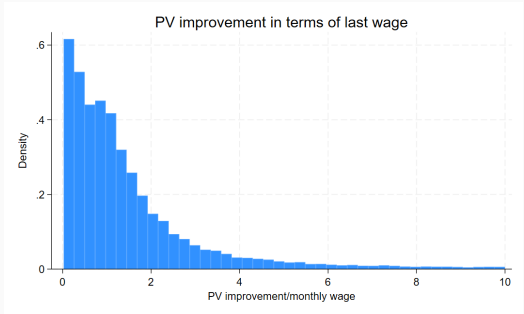
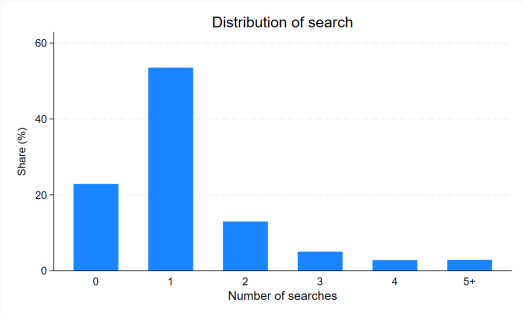
└ Empirical Evidence

└ Descriptive Evidence

Descriptive Evidence

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Prevalence of external offers



► 75% of the purchases are through external offers. [Go back](#)

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└ Empirical Evidence

└ Prevalence of external offers

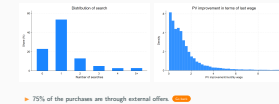
That only some people use the aftermarket suggest:

- There are search costs
- Firms could be discriminating based on the search likelihood.

Any assessment of the welfare effects of the aftermarket has to consider that by banning it buyers will save in search costs, but will not be able to improve on the initial posted prices.

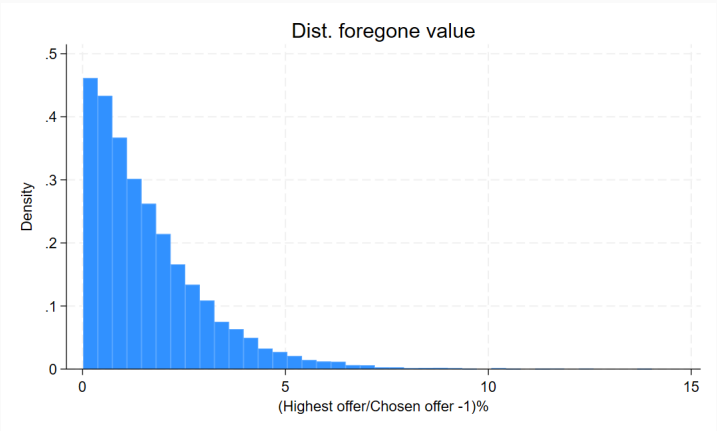
In a model where search costs are not correlated with valuations, the aftermarket prices by the sellers are the same as the initial prices.

Prevalence of external offers



Differentiation

Buyers do not always buy highest annuity. Average foregone value is 1.57 monthly wages.

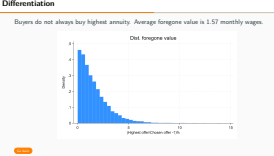


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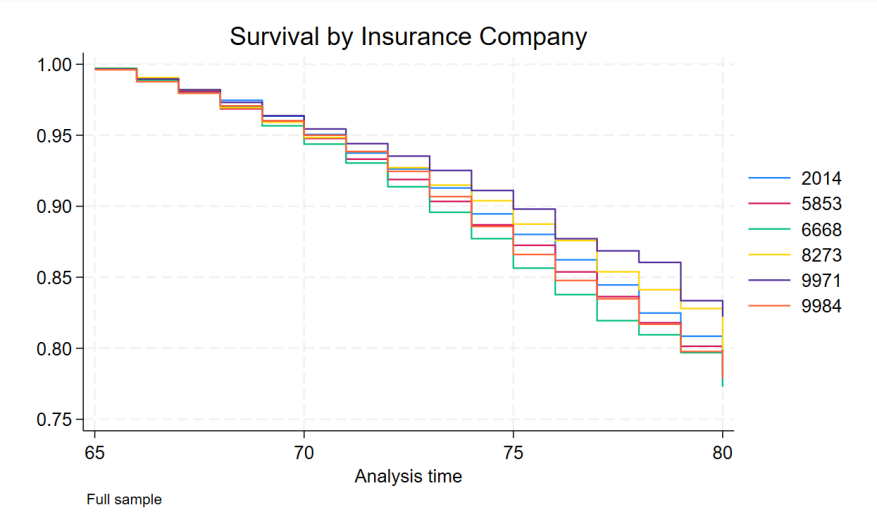
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- └ Empirical Evidence
- └ Differentiation



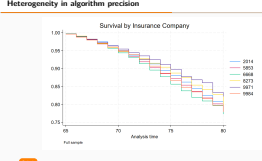
Heterogeneity in algorithm precision



Equilibrium effects of price updating: evidence from a centralized marketplace for annuities

Empirical Evidence

Heterogeneity in algorithm precision



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Increase	Increase	Increase	Increase	Increase	Increase	Has External Offer
main							
Avg. Gap	0.316*** (0.006)	0.155*** (0.010)	0.155*** (0.010)	0.139*** (0.016)	0.147*** (0.019)	0.071*** (0.020)	
Max. Gap		0.110*** (0.009)	0.110*** (0.009)		-0.021 (0.029)	-0.006 (0.028)	
gap_from_avg							-0.191*** (0.032)
Constant	1.893*** (0.010)	1.375*** (0.082)	1.375*** (0.082)	1.381*** (0.045)	1.387*** (0.046)	1.511*** (0.121)	-2.012*** (0.028)
Observations	14133	14133	14133	2046	2046	2046	16164

Average: is the difference between the mean of other firms' initial offers and own initial offer

Max Gap: is the difference between the highest other firm's initial offer and own initial offer.

Cols (1)-(3) use the population of initial offers that are not the highest, (4)-(6) only use the highest offer

Cols (4) and (6) include firm fixed effects

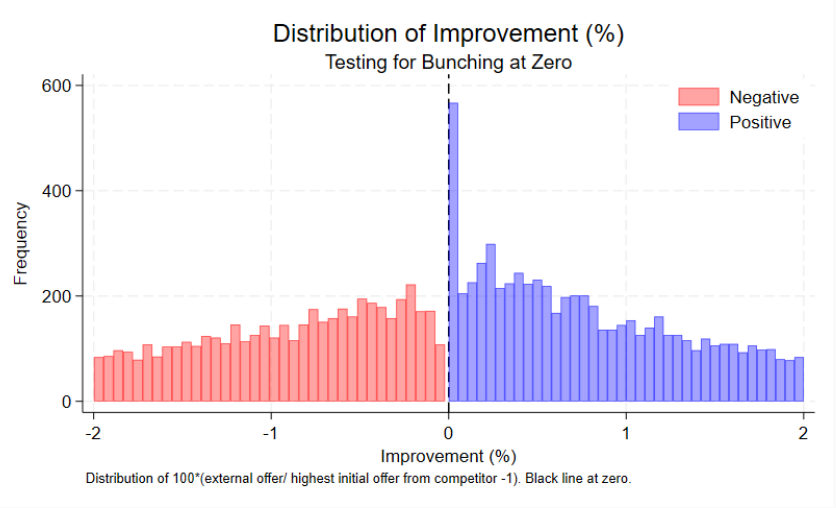
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Empirical Evidence

Learning

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
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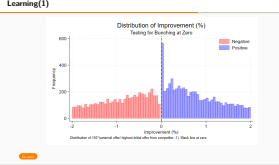
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Equilibrium effects of price updating: evidence from a centralized marketplace for annuities

- Empirical Evidence
- Learning(1)



Setting and Data

Empirical Evidence

Model

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Equilibrium effects of price updating: evidence from a centralized marketplace for annuities

└─ Model

└─ Outline

Setting and Data

Empirical Evidence

Model

- ▶ **Goal:** Rationalize the increase in offers between initial and external offers
- ▶ **Key mechanism:** Firms learn competitors' offers when consumer requests external offers
- ▶ **Setup:**
 - One consumer and J firms
 - Firm j has private cost $c_j \sim F_j$ (due to interest rate variation)
 - Consumer chooses firm with probability $D_j(p)$ (logit demand)
- ▶ **Innovation:** Two-stage pricing with learning opportunity

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Equilibrium effects of price updating: evidence from a centralized marketplace for annuities

└ Model

└ Learning Model: Overview

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- ▶ **Innovation:** Two-stage pricing with learning opportunity

Two-Stage Game: Timeline

1. Stage 1 (Initial offers):

- Firms simultaneously post initial prices p_j^{T1}
- Consumer observes all offers

2. Consumer decision:

- With probability $1 - \lambda$: accepts one of the initial offers
- With probability λ : requests external offer from random firm

3. Stage 2 (External offers):

- Selected firm observes all initial offers p^{T1}
- Can update its offer: $p_j^{T2}(c_j, p^{T1}) = \min(p_j^{T1}, p^*)$
- Consumer chooses among all available offers

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└ Model

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Second Stage: Optimal Pricing with Learning

When selected for external offer, firm observes competitors’ initial prices

Optimal updated offer:

$$p_j^{T2}(c_j, p^{T1}) = \min(p_j^{T1}, p^*)$$

where

$$p^* = \arg \max_{p_j} (p_j - c_j) D_j(p_j, p_{-j}^{T1})$$

Key insight: Firm can only lower its price (or keep it unchanged)

After observing competitors, firm best-responds to known prices rather than expected prices

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└ Second Stage: Optimal Pricing with Learning

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After observing competitors, firm best-responds to known prices rather than expected prices	

Expected Profits in Second Stage

When consumer searches, firm j faces two scenarios:

1. Selected for external offer ($\frac{1}{J}$ probability):

$$\pi_j^{(j)}(p^{T1}, c_j) = (p_j^{T2}(c_j, p^{T1}) - c_j)D_j(p_j^{T2}(c_j, p^{T1}), p_{-j}^{T1})$$

2. Competitor j' selected ($\frac{1}{J}$ probability):

$$\pi_j^{(j')}(p^{T1}, c_j, c_{j'}) = (p_j^{T1} - c_j)D_j(p_{-j'}^{T1}, p_{j'}^{T2}(c_{j'}, p^{T1}))$$

Expected second stage profits:

$$\pi_j^{T2}(p^{T1}, c_j, c_{-j}) = \frac{1}{J} \left[\pi_j^{(j)}(p^{T1}, c_j) + \sum_{j' \neq j} \pi_j^{(j')}(p^{T1}, c_j, c_{j'}) \right]$$

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└ Model

└ Expected Profits in Second Stage

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Expected Profits in Second Stage	
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First Stage: Strategic Pricing

Firms anticipate the second stage when setting initial prices

Expected profits in first stage:

$$\pi_j^{T1}(p^{T1}, c_j, c_{-j}) = (1 - \lambda) \underbrace{(p_j^{T1} - c_j) D_j(p^{T1})}_{\text{Immediate acceptance}} + \lambda \underbrace{\pi_j^{T2}(p^{T1}, c_j, c_{-j})}_{\text{Search occurs}}$$

Equilibrium condition:

$$p_j^{T1}(c_j) = \arg \max_{p_j} \int \pi_j^{T1}(p_j, p_{-j}^{T1}(c_{-j}), c_j) dF(c_{-j} | c_j)$$

Trade-off: higher initial price (if accepted) vs. competitive position if search occurs

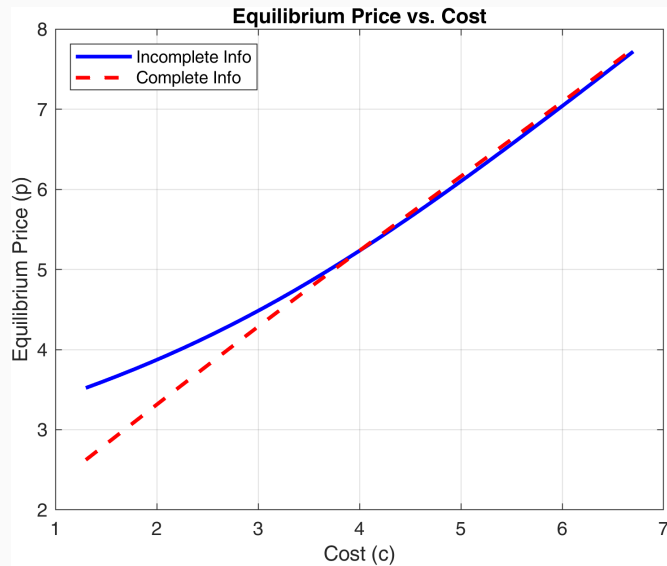
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└ Model

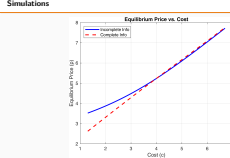
└ First Stage: Strategic Pricing

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Trade-off: higher initial price (if accepted) vs. competitive position if search occurs



Equilibrium effects of price updating: evidence from a centralized marketplace for annuities

- Model
- Simulations



MODALIDAD RENTA VITALICIA INMEDIATA

RENTA VITALICIA INMEDIATA SIMPLE

Annuitize full wealth, 0 guarantee, 0 deferral

N° Oferta	Compañía de Seguros de Vida Brand Name	Pensión final Mensual sin Retiro de Excedente UF	Pensión final Mensual en UF Considerando un retiro de excedente de 0,00 UF	Pensión con retiro de Excedente Máximo		Clasificación de riesgo de la Compañía de Seguros (2)
				Pensión final Mensual UF	Excedente UF	
43872093	CRUZ DEL SUR	26,61	<- Monthly payment		Risk rating ->	AA-
43872099	RENTA NACIONAL	26,58				BBB-
43872083	METLIFE	26,52				AA
43872100	CORPSEGUROS	26,34				AA-
43872094	PRINCIPAL	26,28				AA
43872097	CORPVIDA	26,26				AA-
43872084	EUROAMERICA VIDA	26,25				AA-
43872090	PENTA VIDA	26,25				AA-
43872091	OHIO NATIONAL	26,24				AA
43872098	SURA	26,21				AA
43872095	CN LIFE	25,90				AA
43872092	BICE VIDA	25,86				AA+
43872085	CHILENA CONSOLIDADA	25,59				AA
43872086	CONSORCIO VIDA	25,36				AA+

Equilibrium effects of price updating: evidence from a centralized marketplace for annuities

Model

Initial prices

MODALIDAD RENTA VITALICIA INMEDIATA

RENTA VITALICIA INMEDIATA SIMPLE		Annuitize full wealth, 0 guarantee, 0 deferral				
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43872098	SURA	26,21				AA
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