Bargaining Under Price Transparency: Evidence from Hospital-Insurer Negotiations

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The rise of price transparency policies

- Health care prices are high and vary dramatically within narrowly defined products
  - In our setting, 75th percentile $\approx 2\times$ 25th percentile
  - Implies market frictions
- Price transparency is a potential policy lever
  - Costly price discovery seen as a key friction
  - Actions by states, employers, insurers, White House (2019, 2025 EOs)

Price transparency is controversial

EXECUTIVE ORDERS

Executive Order on Improving Price and Quality Transparency in American Healthcare to Put Patients First

HEALTHCARE | Issued on: June 24, 2019

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Executive Order on Improving Price and Quality Transparency in American Healthcare to Put Patients First

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Why Transparency on Medical Prices Could Actually Make Them Go Higher

By Margot Sanger-Katz

The New York Times

June 24, 2019

HEALTH

Hospitals are posting prices for patients. It's mostly industry using the data

FEBRUARY 10, 2026 · 5:00 AM ET

By Darius Tahir

npr

Potential pitfalls of price transparency

- Patient-driven
  - Does not resolve patient moral hazard due to insurance
  - Patients may (correctly or incorrectly) interpret price as a signal of quality
  - Price information could still be too complex for patients
- Firm-driven
  - May increase prices by facilitating collusion

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- Firm-driven
  - May increase prices by facilitating collusion
- **This paper:** non-collusive mechanisms for price increases

This paper

1. How do patients respond to health care price transparency?
   - Find no meaningful demand response (precise zeros)

2. How do firms respond to health care price transparency?
   - Price effects despite lack of demand response
   - Lowest-priced insurer loses its price discounts
   - Not consistent with standard collusion, competitive downward pressure, info about hospital costs, info about insurers' WTP
   - Consistent with info influencing contract negotiations à la Cullen and Pakzad-Hurson (2023)

Literature

- Patient responses to HC price transparency: Mehrotra et al. (2014); Desai et al. (2016, 2017); Brot-Goldberg et al. (2017); Brown (2019); Whaley (2019); Prager (2020)
- Prices after transparency
  - Posted prices: Albæk et al. (1997); Luco (2019)
  - Negotiated prices: Grennan and Swanson (2020); Brown (2019); Cullen and Pakzad-Hurson (2023)

New Hampshire's price transparency intervention ($\times 2$)

- Two simultaneous price transparency interventions in 2007
  - Among the earliest large-scale price transparency initiatives

1. Consumer-facing online price search tool
   - Public website listing prices of $\approx$40 "shoppable" outpatient services
   - Estimates patient's insurer-specific out-of-pocket price for typical service bundle

2. Price database for sophisticated market players
   - All-Payer Claims Data (APCD) allows sophisticated users to calculate all prices

Data

- **Claims data:** New Hampshire APCD, 2005–2013
  - All commercially insured residents' health care claims
  - Amounts paid by insurer and patient
- **NH price transparency website service list:** NH CHIS, Brown (2019)
- **Additional hospital characteristics:** American Hospital Association annual surveys

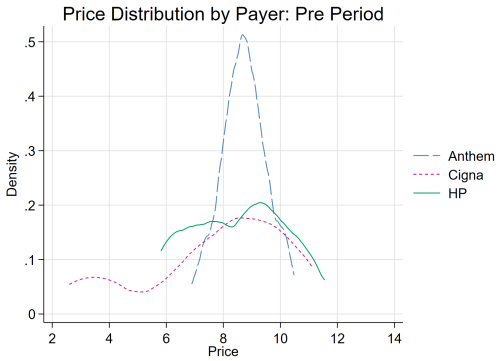
New Hampshire market context

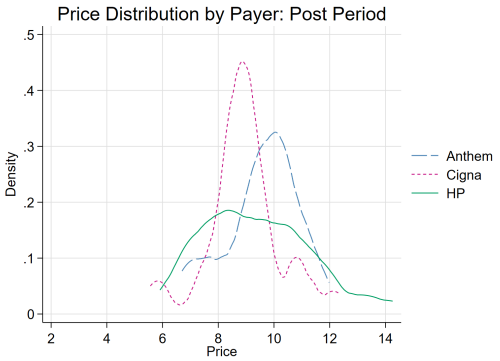
- Top 3 insurers have ~80% market share
  - Anthem is largest at 40-60%, Cigna and Harvard Pilgrim each ~20%
- Small, mountainous state
  - 26 general acute care hospitals, 13 of them Critical Access
- Substantial price dispersion
  - Within insurer, 75th percentile price $\approx 2\times$ 25th percentile

Measuring prices

- Object of negotiation: {insurer, hospital, year} level prices p^I_{mht}
  - Weighted average across all claims, deflated by resource intensity r_j (Gowrisankaran et al. 2015; Ho and Lee 2017, 2019; Ghili 2022; Prager and Tilipman 2025)
  - Health care CPI-deflated to 2013 dollars
  - For demand side, separate by on-tool procedures vs. others
- Out-of-network prices in case of disagreement p^O_{mht}: follow Prager and Tilipman (2025)

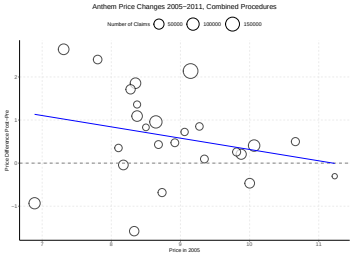
Prices pre- and post-transparency



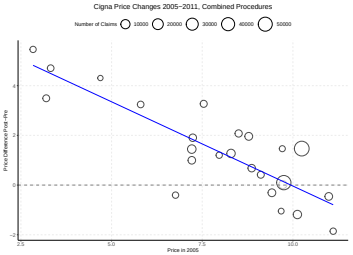


Price trends, on- and off-tool | Price quantile regs

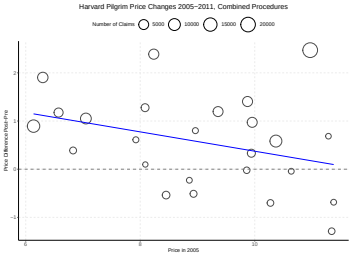
Lowest-priced hospitals gain most



Anthem

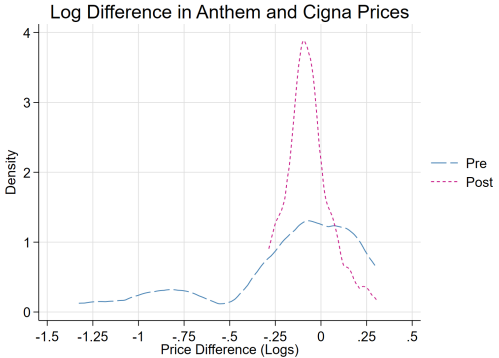


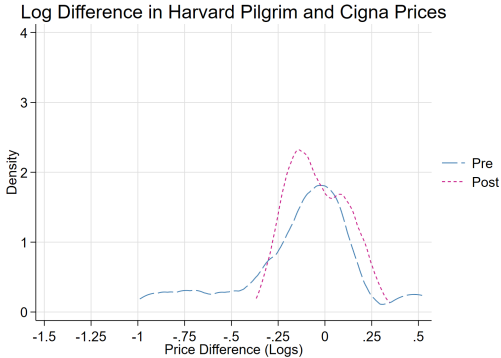
Cigna



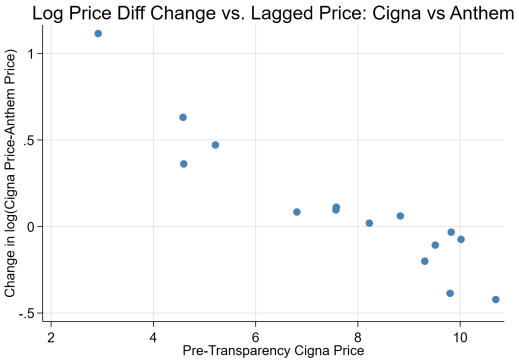
Harvard Pilgrim

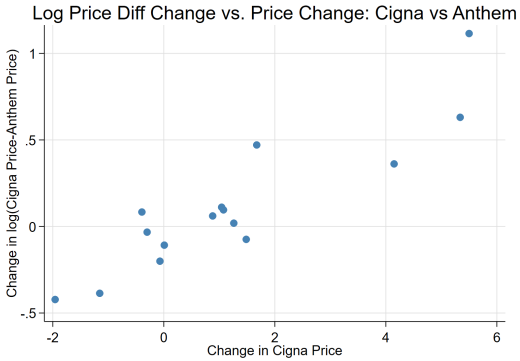
...especially wrt Cigna





Cigna converges toward Anthem





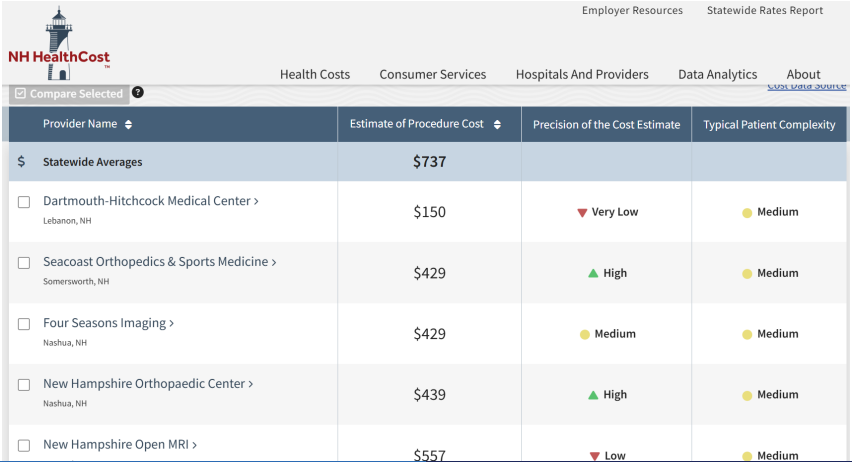
Cigna wrt Harvard | Harvard wrt Anthem

Taking stock

- Price distribution compresses, mostly from the bottom tail
- Possible explanations:
  1. **Demand pressure** drives prices $\downarrow$, but supply side dominates
  2. Insurers and hospitals **react to the information directly**

Consumer-facing price search tool

https://nhhealthcost.nh.gov/ output for a back MRI:



Demand estimation

- Multinomial logit discrete choice model of *outpatient* demand
- Broader choice set
  - Hospitals ($\approx \frac{1}{2}$ of volume) within 100 miles
  - Non-hospital "clinics" within 15 miles
  - Two pooled outside options: other hospital, other non-hospital
- Out-of-pocket price for patient i with insurance m at hospital h with treatment j:

$$p^{I}_{mht} \times r_j \times \text{coinsurance}_i$$

Demand responses do not drive price patterns

Price: pre, not on tool	1.77e-09	(3.45e-09)
Price: post, not on tool	2.09e-08	(1.39e-08)
Price: pre, on tool	3.85e-09	(3.29e-09)
Price: post, on tool	**1.55e-09**	**(1.06e-09)**
Distance	-0.155***	(2.42e-04)
Distance Squared	0.000790***	(3.56e-06)
Distance×Teaching Hospital	0.0384***	(3.23e-04)
Distance×Severity Weight	5.31e-09	(1.51e-08)
Distance×Age 40-60	-0.00244***	(1.05e-04)
Distance×Age Over 60	-0.00215***	(1.82e-04)
Choice sets	945,097	
Observations	32,608,779	

* p $<$ .1, ** p $<$ .05, *** p $<$.01. Out-of-pocket prices measured in $1,000s.

Many zeros in the literature

- Brown (2019) studies same NH price tool, finds price-shopping and price responses

- Large literature finding no price-shopping (Mehrotra et al. 2014; Desai et al. 2016, 2017; Lieber 2017; Brot-Goldberg et al. 2017; Barnes et al. 2024)
- Smaller literature finding minimal price responses (Christensen et al. 2020; Whaley 2019)

Not explained by standard models

- In the data: for hospitals with $p^{\text{pre}}_{mh} < p^{\text{pre}}_{m'h}$, see $p_{mh} \uparrow$ rather than $p_{m'h} \downarrow$, and $\Delta p_{mh} \propto p_{m'h}$
- Not rationalized by demand responses or standard collusion
- Not rationalized by standard asymmetric info models
  - Info about hospitals' costs should allow high-priced insurers to $\downarrow$ prices
  - Info about insurers' WTP should allow low-priced hospitals to $\uparrow$ prices, $\not\propto$ other insurers' prices

Dynamic asymmetric bargaining models

- Under some conditions, hospital bargaining weight $\uparrow \approx_{obs}$ insurer transparency $\uparrow$
- Dynamic asymmetric bargaining model of Cullen and Pakzad-Hurson (2023):
  - Party h (employer/hospital) knows its agreed prices with all counterparties m (workers/insurers)
  - h sets minimum acceptable price $\underline{p_h}$; m sets maximum payable price $\overline{p_m}$
  - h's bargaining weight β_h determines $\Pr(p^* = \overline{p_m})$: $\beta_h \uparrow \Longrightarrow \mathbb{E}(p^*) \uparrow$

Transparency in this bargaining model

- After transparency, insurers m probabilistically observe prices paid by m' and use them to renegotiate
  - CPH (2023) show transparency $\uparrow$ is obs. equivalent to $\beta_h \uparrow$
- Predictions about transparency
  - Worsens outcomes for the side gaining information: always-informed side reluctant to give anyone a good deal
  - When the always-informed side has lower bargaining power, it gains more from transparency

Mapping model to data

- Estimate hospital bargaining weights pre- and post-transparency
  - Check for increases in β_h
  - Check for largest $\Delta\beta_h$ among hospitals with lowest initial β_h
- Why not use Δp directly as in CPH (2023)?
  - Price = $f(\beta_h, h$'s agreement surplus, m's agreement surplus)
  - CPH (2023) cannot directly estimate bargaining weights, but we can

Model stages

Bargaining game between insurers and hospitals negotiating over prices:

1. Insurers and hospitals bargain over in-network prices
   Empirics: GMM estimation using FOC moments, inference of conduct parameters
2. Enrollees get sick, choose hospitals; hospitals get paid
   Empirics: standard discrete choice model of consumer demand for hospitals

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Baseline: Nash-in-Nash bargaining

- Insurer m and hospital h bargain bilaterally over price
  - No threat of replacement: insurers have complete networks

- Solution is the price p^* that maximizes the product of m's and h's expected surpluses from agreement ($\cdot^I$) relative to disagreement ($\cdot^O$):

$$\text{Nash product} = \underbrace{\left(\Pi^I_{m(h)} - \Pi^O_{m(h)}\right)}_{\text{insurer's surplus}}^{1-\beta_{mh}} \cdot \underbrace{\left(\Pi^I_h(m, p_{mh}) - \Pi^O_h(m, p_{mh})\right)}_{\text{hospital's surplus}}^{\beta_{mh}}$$

Hospital objectives

- Hospitals maximize profits:

$$\Pi_h^I(m, p_{mh}) - \Pi_h^O(m, p_{mh}) = (p_{mh} - c_h)q_{mh}^I - (p_{mh}^O - c_h)q_{mh}^O$$

  - p_{mh}, p_{mh}^O: in-network price, out-of-network price
  - c_h: hospital marginal cost
  - q_{mh}^I, q_{mh}^O: volume of patients from insurer m, in case of agreement vs. disagreement

Insurer objectives

- Insurers maximize a weighted difference of enrollee surplus (WTP) and costs:

$$\Pi_m(p_{mh}) = \alpha(W^I_{mh} - W^O_{mh}) - (p_{mh}q^I_{mh} - p^O_{mh}q^O_{mh}) - (\psi^I_{mh} - \psi^O_{mh})$$

  - α: weight insurer places on enrollee expected utility
  - W^I_{mh}, W^O_{mh}: expected utility in case of agreement vs. disagreement (where $W^I_{mh} > W^O_{mh}$)
  - ψ^I_{mh}, ψ^O_{mh}: insurer payments to other hospitals in case of agreement vs. disagreement

Equilibrium negotiated prices

- Nash-in-Nash price in year t is given by

$$\beta_{mh\tau} \frac{-q^I_{mh}}{\alpha(W^I_{mh} - W^O_{mh}) - (p^*_{mh}q^I_{mh} - p^O_{mh}q^O_{mh}) - (\psi^I_{mh} - \psi^O_{mh})}$$

$$= (1 - \beta_{mh}) \frac{-q^I_{mh}}{(p^*_{mh} - c_h)q^I_{mh} - (p^O_{mh} - c_h)q^O_{mh}}$$

  - $\beta_{mh\tau}$ is hospital h's bargaining weight vis-à-vis insurer m
  - $\tau \in$ {pre-transparency, post-transparency}

Estimation

- Invert for marginal costs à la GNT (2015):

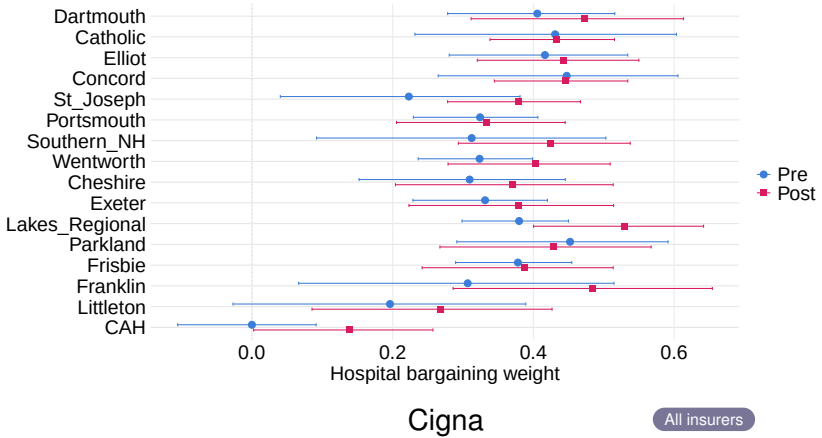
$$c_h = \frac{1}{(1-\beta_{mh\tau})\left(q^I_{mht} - q^O_{mht}\right)} \left[\begin{array}{l} p_{mht} q^I_{mht} - \beta_{mh\tau}\alpha\left(W^I_{mht} - W^O_{mht}\right) \\ -p^O_{mht} q^O_{mht} + \beta_{mh\tau}\left(\psi^I_{mht} - \psi^O_{mht}\right) \end{array} \right]$$

- Produces GMM moment for estimation:

$$\xi_{mht} = \lambda g_{mht} - c_h$$

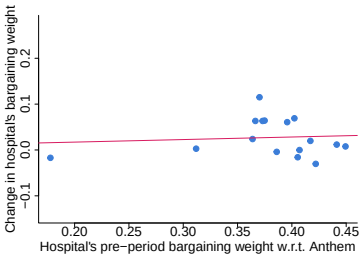
  - g_{mht} are observables (mainly hospital FEs)
  - $\hat{\lambda}$ is the vector of coefficient estimates
  - Instrument with FEs, WTP with uniform distances, (log) enrollees within 20mi

Nash bargaining weights, pre- vs. post-transparency

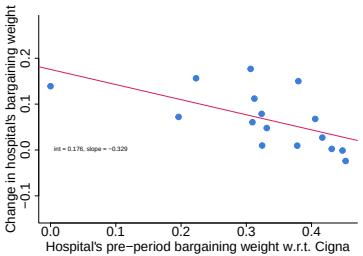


Wald test of pre- vs. post-transparency coeff equality (all insurers): $p < 0.001$

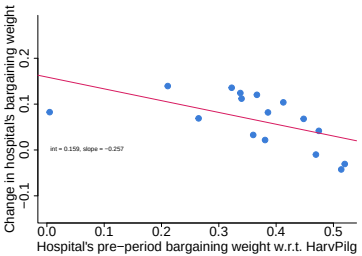
Nash bargaining weights, pre- vs. post-transparency



Anthem



Cigna



Harvard Pilgrim

- ✓ Increases in β_h
- ✓ Largest $\Delta\beta_h$ among hospitals with lowest initial β_h

Nash bargaining weights $\propto$ surplus changes

- Data consistent with CPH (2023) model, but at a cost
  - Model assumes price $\in \{\underline{p_h}, \overline{p_m}\}$
  - Additional assumptions

- In general bargaining models, changing β_h is obs. equivalent to changing insurer surplus
  - Price $\uparrow$ can be rationalized by $\beta_h \uparrow$ or by insurer's agreement surplus $\uparrow$
  - Can map $\Delta\beta_h$ directly to agreement surpluses instead of price observability

Hypothesis 1: spillovers

- $\Delta\beta_h$ may capture changes in insurer competition over enrollees
  - Low $p_{m'h}$ reduces insurer m's profits (through premium competition, etc.)
- Post-transparency, insurer m can credibly monitor the prices of m'
  - $\implies p_{m'h}$ enters into m's objective function $\forall m, m'$, symmetrically for $p_{mh} \gtrless p_{m'h}$

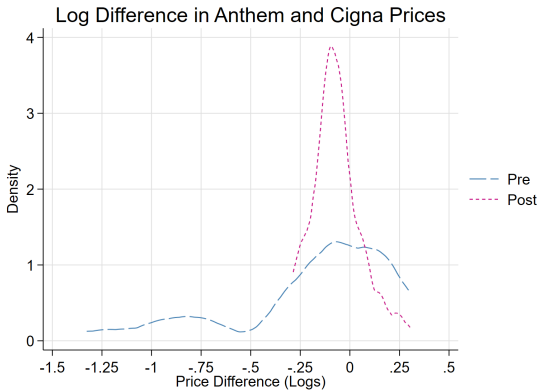
$$\tilde{\Pi}_m(p_{mh}) = \alpha(W^I_{mh} - W^O_{mh}) - (p_{mh}q^I_{mh} - p^O_{mh}q^O_{mh}) - (\psi^I_{mh} - \psi^O_{mh}) + \sum_{m' \neq m} \lambda_{m,m'} p_{m',h}$$

- Prediction: $p^{post}_{mh} = a \cdot p^{pre}_{mh} + b \cdot p^{pre}_{m'h}$

Hypothesis 2: MFN clause

- (Dominant) insurer may have a most favored nation (MFN) clause in a contract
  - Clause of the form $p_{mh} \leq \kappa_{m,m'} p_{m'h}$
  - Caps the price as a function of rival price
  - Can allow hospital to raise rival's price in eqm
- Post-transparency, insurer m can credibly monitor the prices of m'
  - $\Longrightarrow p_{m'h}$ enters into m's objective function, only if $p_{mh} > \kappa_{m,m'} p_{m'h}$

Anthem, Cigna consistent with MFN



Post-transparency, Cigna prices $\approx 0.8\times$ Anthem prices

Game plan

1. [done] Re-estimate bargaining model using pre-transparency data
2. [done] Predict post-period prices using pre-transparency parameters
3. [to do?] Estimate spillovers, MFN necessary to rationalize difference from observed post-transparency prices

Game plan

1. [done] Re-estimate bargaining model using pre-transparency data
2. [done] Predict post-period prices using pre-transparency parameters
3. [to do?] Estimate spillovers, MFN necessary to rationalize difference from observed post-transparency prices

- Today: setup only
  - Question: worth pursuing?

Estimating spillovers (hypothesis 1)

- Add other insurers' spending on this hospital to m's objective function:

$$\Pi^{I}_{m(h)} - \Pi^{O}_{m(h)} + \sum_{m' \neq m} \lambda_{mm'h} p_{m'h} q_{m'h}$$

- Linearity implies

$$\frac{q^{I}_{mh}}{1 - \hat{\beta}_{mh}} \left(p^{I}_{mh} - \hat{p}^{I}_{mh} \right) = \sum_{m' \neq m} \lambda_{mm'h} p_{m'h} q_{m'h}$$

  - p^{I}_{mh} is the observed post-transparency price
  - $\hat{p}^{I}_{mh}$ is the post-transparency price predicted from pre-transparency estimates

- Add econometric error to RHS, estimate by 2SLS

Estimating MFN (hypothesis 2)

- Let Anthem have an MFN clause wrt Cigna's prices, binding if $p_{Ch} < \kappa_{A,C} p_{Ah}$
  - Probabilistically enforced with $\eta_{ht} \sim \mathcal{N}\left(\kappa_{A,C}, s^2_{\kappa_{A,C}}\right)$:

$$\begin{aligned}\Pr(\text{MFN binds}) &= \Pr\left(p_{Ch} < \kappa_{A,C} p_{Ah} + \eta_{ht}\right) \\ &= \Phi\left(\frac{\kappa_{A,C} p_{Ah} - p_{Ch}}{s_{\kappa_{A,C}}}\right)\end{aligned}$$

  - Expected prices:

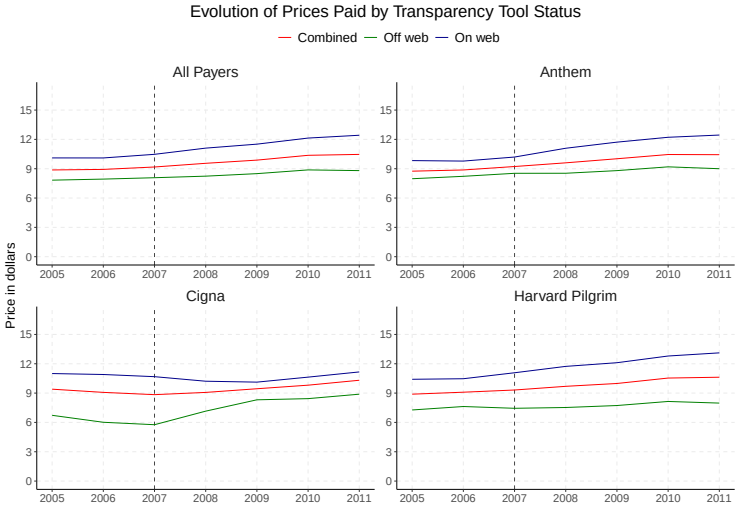
$$\text{Anthem: } \mathbb{E}\left(p^I_{A,h}\right) = \Pr(\text{MFN binds}) \frac{p^I_{C,h}}{\kappa_{A,C}} + (1 - \Pr(\text{MFN binds})) \hat{p}^I_{A,h}$$

- Add to spillovers estimation, now with GMM

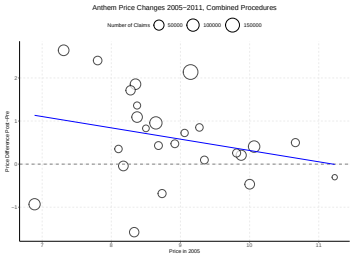
Price transparency raised prices

- ...Despite demand non-response
- Not a standard collusion story
  - Price distribution shifted only moderately higher
  - Lowest tails of prices pulled toward center
  - Hospitals unable to sustain low-priced insurer's large price discounts, consistent with dynamic asymmetric bargaining models

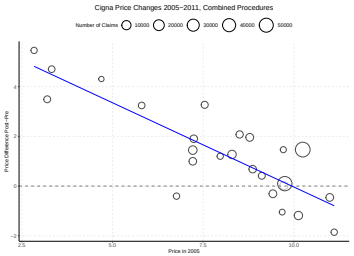
Price trends, on- and off-tool



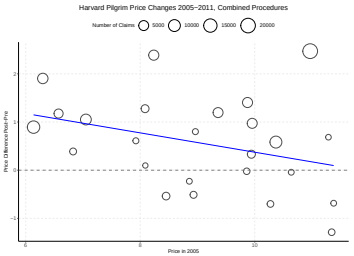
Lowest-priced hospitals gain most



Anthem



Cigna



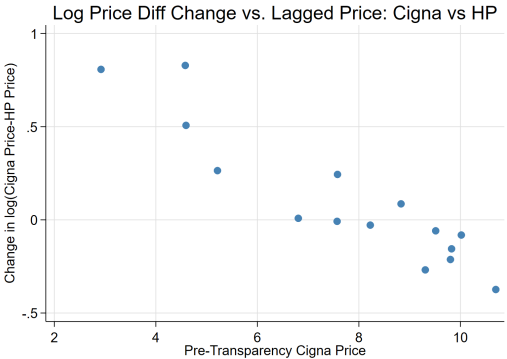
Harvard Pilgrim

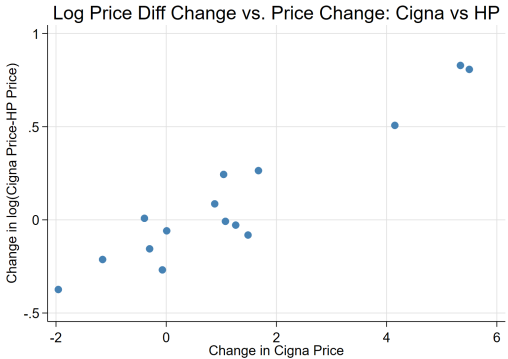
Price changes: quantile regs of log price change

	25^{th} Percentile	50^{th} Percentile	75^{th} Percentile
	(1)	(2)	(3)
Anthem	0.067	0.070	0.066
	(0.017)	(0.025)	(0.022)
Cigna	0.112	0.132	0.110
	(0.039)	(0.057)	(0.029)
Harvard Pilgrim	0.055	0.056	0.046
	(0.018)	(0.029)	(0.029)

Standard errors in parentheses. Includes hospital fixed effects.

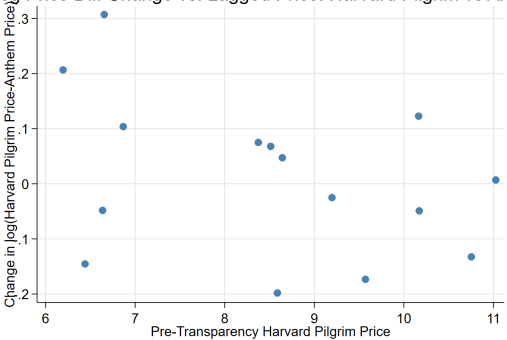
Cigna also converges toward Harvard Pilgrim



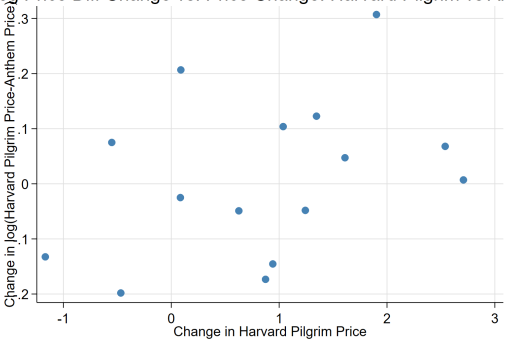


Harvard Pilgrim does not converge toward Anthem

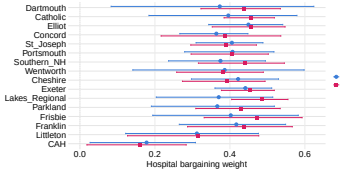
Log Price Diff Change vs. Lagged Price: Harvard Pilgrim vs Ant



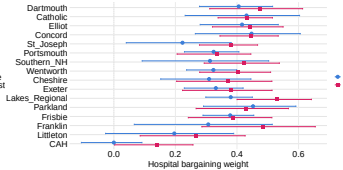
Log Price Diff Change vs. Price Change: Harvard Pilgrim vs Ant



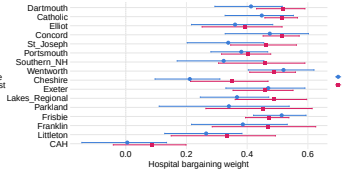
Nash bargaining weights, pre- vs. post-transparency



Anthem



Cigna



Harvard Pilgrim

Wald test of pre- vs. post-transparency coeff equality: $p < 0.001$

slide title

- bullet
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