- Bargaining between large health care providers and insurers (especially the US model)
- Hospitals bargaining over price per patient per day
- Pharmaceuticals bargaining over price per dosage
- Patients pay through insurance premium
- Related setting   purchasing department

- Hospital price is not (major) part of the patient choice
- Demand for A increases if B drops out of the network
- Patients may choose insurance that will not have their ex-post preferred hospital
- Insurer may be consumer surplus maximizing

- Current applied theory analysis of price per-unit NiN bargaining (Horn-Wolinsky 1988) assumes the opposite on all four insurer-market features
- Consumers pay the full price when buying
- Demand for A xed at equilibrium level
- Consumers choose downstream product (insurer) based on upstream product
- Downstream is pro t maximizing

- Estimate/model patient demand model from each hospital to determine
  - Patient's option value from access to each hospital
  - Insurer's expected bene t/loss from adding/removing a hospital to/from the network
  - Hospital's expected bene t from joining an insurer's network
  - (usually out of scope) Competition model between insurers
- Use the Nash-in-Nash bargaining model to estimate Hospital costs and bargaining parameters given observed prices
- Counterfactual analysis holding bargaining parameters xed

Plenty of applied theory (much in marketing) on general setting

- Not much theory for the speci c structure

One insurer, two hospitals ($i \in \{A, B\}$)

Cost of serving a patient is zero

Hospitals' bargaining power $b \in (0, 1)$

Intro

$$p^A = b \left[\quad (1 \quad a)\; 10 + a \underbrace{\quad p^B + 5}_{} \right]$$

- Patients that prefer A but would stay with the insurer
- Adding A to the network creates $v_a^A + \quad p^B \quad v_a^B > v_a^A$ per patient going to A
- A's per-patient value is in ated if p^B is higher than the value of B to A's patients
- A takes advantage of the insurer's pre-commitment to serve A's patients.

Equilibrium of the bargaining game is such that

$$p^A(p^B) = p^A$$
$$p^B(p^A) = p^B$$

Multiple hospitals, multiple insurers

Main qualification: insurers maximize (fraction of) patient surplus, not short term revenue

Theorem

In the general model with NiN bargaining there is a $\bar{b} < 1$ such that for any $b > \bar{b}$; the surplus generated by each insurer is negative.

Regularity assumptions

- At least two hospitals
- Hospitals are substitutes
- Value of a hospital is highest to those that would choose it as first option
- IIA

Sequential Bargaining Structure

- Equivalent question: can the insurer commit not to reopen to a failed negotiation?
- Blue Cross CEO: We can and want to only do sequential negotiations
  - Limited negotiating resources
  - Reduce hospital leverage and negotiation failures
- Ultimately empirical question
  - Proposed estimation generalization should answer

Suppose A goes rst

If A in the network, B's price determined like in previous version, can be higher than value

If A isn't in the network, B's price is lower

$$p^B = b\,\frac{a\ \ 5+10}{1+a}$$

A's negotiated price is lower: accounts for the e ect on B's price

[redacted]

- Insurer sets the price for each hospital
- If a hospital disagrees:
  - Revert to the sequential game
  - The disagreeing hospital is rst
- Equilibrium prices   maximize insurer pro t while preventing deviation (IC)

$$p_j = (1 \quad d) \quad p_j^{\text{Deviate}}(p \quad _j) + d\, p_j^{\text{First}}$$

If hospitals are su ciently impatient, everyone deviates

Each hospital's price is a NiN

Insurer would choose an order and avoid the repeated threat

No market breakdown

When estimating, we observe prices, want to infer b, costs.

RSN model:

$$p_j = d\,p_j^{First} + (1 \quad d)\,p_j^{Deviate}$$

Estimation Insight

Conditional on the other prices, $p_j^{Deviate} = p_j^{Nash \ in \ Nash}$

- Observe p 6
- Suppose the true model is RSN with $d \to 1$ (so $b \approx 0.8$)
- Estimating with $d = 0$ (Nash-in-Nash) increases hospital margins for every b
- Results in lower estimates of b (hospital bargaining power) and/or hospital costs

When b is high, NiN predicts mergers decrease prices and increase total welfare by construction

- Formal condition: merging hospital's price is higher than its value as an alternative to the merging partner
- Same intuition as Cournot Complements
- If NiN is the correct model for these markets, mergers can be good for consumers, bad for hospitals
- If NiN is not the correct model for these markets, mergers can seem better to regulators than they are

Under-estimating hospital bargaining power will tend to favor mergers

E ect of under-estimating pre-merger costs?

- NiN incorporates speci c assumptions
- NiN assumptions imply very high pro ts for upstream providers with strong bargaining power
- NiN potential for market breakdown
- Models based on sequential Nash bargaining
  - Have di erent assumptions
  - Limit upstream pro ts
  - Avoid market breakdown
- Estimation can be generalized to accommodate both
- Data can test the models

$$
\begin{aligned}
p &= d p_j^{First} + (1 \quad d)\, p_j^{Deviate} \\
&= d q + c \;\; ((1 \quad d b) I + d \;) \qquad (1 \quad d)(\;\; + \;\;) \qquad ^{1} q
\end{aligned}
$$

$$
p_j^{Deviate} = c \quad (\;\; + \;\;) \qquad ^{1} q
$$

$$
\begin{aligned}
p_j^{First} = b t \, & \frac{q_j v_j + å_{k2J;k6=j} \; b q_{k;j} v_{k;j} \quad (1 \quad b) q_{j;k} v_{j;k}}{q_j + b \, å_{k2J;k6=j} q_{k;j}} \\
& + b \frac{å_{k2J;k6=j} (1 \quad b) q_{j;k} c_k}{q_j + b \, å_{k2J;k6=j} q_{k;j}} \\
& + (1 \quad b) c_j
\end{aligned}
$$

$$p = d p_j^{First} + (1 \quad d)\, p_j^{Deviate}$$

$$= d q + c \quad ((1 \quad d b) I + d \,) \qquad (1 \quad d)(\; + \;) \qquad ^{1} q$$

$$p_j^{Deviate} = c \quad (\quad + \;) \qquad ^{1} q$$

$$p_j^{First} = b t \, \frac{q_j v_j + å_{k2J;k6=j} \; b q_{k;j} v_{k;j} \qquad (1 \quad b) q_{j;k} v_{j;k}}{q_j + b\, å_{k2J;k6=j} \; q_{k;j}}$$

(q T1 7 7.97 T7.97q

$$+ b \; å_{k2J;k6=j} (1 \quad b) q_{j;k} \; c$$

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