Price Discrimination and Online Sales in the Automobile Industry by D′Haultfoeuille, Durrmeyer, Fournel, Iaria

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- Great paper!
- Novel extension of cutting edge estimation techniques
- Novel dataset of dealer locations
- Very careful data construction (driving distances, list prices net of rebates, etc)
- Very interesting, detailed and important counterfactuals

Summary

- Estimate demand for cars with
  - unobserved price discrimination (D'Haultfœuille, Durrmeyer, and Février, 2019)
  - transportation costs
- Consumers i in group d live in municipalities m. Utility for product j is

$$U_{ijdm} = \underbrace{X_j'\beta_d + \alpha_d p_{jd} + \xi_{jd}}_{\text{mean utility } \delta_{jd}} + \underbrace{\mu_{jdm}(\nu_i)}_{\text{heterogeneity within } d} + \gamma_d \text{distance}_{jm} + \varepsilon_{ijdm}$$

- Groups d: e.g., young&poor, young&rich, old&rich, ...

Recovering transaction prices

- Problem: transaction prices p_{jd} vary with group d and are not observed
- Goal: for any parameters θ, find transaction prices $p(\theta)$ that rationalize both demand and supply.
  - Then we are back to standard BLP.
- There is an observed list price $\bar{p}_j$
- Firms choose p_{jd} nationally to maximize profit
  - prices vary across d (price discrimination) but not within d
- Marginal cost c_j constant across d

Recovering transaction prices

- Optimal pricing for group d:

$$p_{jd} = c_j - \left[M_d\left(p_d, \theta\right)\right]_j$$

where $_j$ indicates the j-th row of the vector.

- Matrix M_d is the "markup" for group d (contains s_d, ownership matrix, derivatives of demand)
  - depends on all prices p_d and parameters θ
- Assume list price is the maximum price paid:

$$\bar{p}_j = \max_d p_{jd}$$

- Then

$$\bar{p}_j = c_j - \min_k \left\{\left[M_k\right]_j\right\}$$

$$p_{jd} = \underbrace{\bar{p}_j + \min_k \left\{\left[M_k\right]_j\right\}}_{c_j} - \left[M_d\right]_j$$

Recovering transaction prices

- D'Haultfœuille, Durrmeyer, and Février (2019):
  - given θ, δ: this fixed-point equation is a contraction in p_d (under some conditions)
  - given θ, p: find δ via BLP contraction
  - also works if, e.g., average price is observed
- In practice: iterate between δ and p until convergence

Main counterfactual: online sales

- New online distribution channel:
  - lower travel costs by up to 75%
  - no price discrimination
- Short-term effects: no entry/exit, no change in vertical relations
- Only a share ψ_d of group d can use online channel
  - ψ_d estimated from a survey: proportion of those in d who bought (anything) online in the previous year
- For computational reasons, demand is a nested logit: each product is a nest with two options, in-person and online
- Online prices
  - are set optimally
  - can be different from in-person prices

Main Results

1. Travel costs are very important
   1.1 on average, much more important than price discrimination
2. Price discrimination:
   2.1 lowers CS slightly (young&poor gain, old&rich lose)
   2.2 increases profit slightly (not obvious in oligopoly)
3. Reducing transport costs:
   3.1 prices don't change much
   3.2 increases CS and profit by 10%
4. Introducing online distribution
   4.1 market expansion of 2-9%, mostly driven by old&rich
   4.2 profits increase
   4.3 CS increases on average; mostly benefits the old/rich; others gain little or lose
   4.4 firms reduce in-person price discrimination

Main suggestions

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  - Maybe ξ's for products sold online are more similar?
  - Maybe distance affects demand via consideration sets (Abaluck and Adams-Prassl, 2021; Agarwal and Somaini, 2022): I'm more likely to consider nearby brands, but not faraway brands, but online all products are considered equally?

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Other suggestions (for the authors)

- Why don't profits increase for small reductions in transport cost?
- Can there be at stock-out of a particular model at a dealership? (I've never bought a car)
- MC constant across demographics: maybe clients require more maintenance than others?
- Add to appendix results with heterogeneity in price coeffs
- "consumers save on transportation costs and "reinvest" part of these savings by spending more on better car" - there are no income effects, so this intuition can't be quite right
- Worth citing Einav, Jenkins, and Levin (2012)? They estimate car demand when individuals get discounts. Prices are fully "latent" and depend on list prices (in a way that is estimated)
- Figure 1: the coeffs seem pretty similar to each other. This suggests limited scope for price discrimination?
- "Our estimated willingness to pay to reduce travel distance by one kilometer is EUR18.1 - EUR27.7" Seems high, even if it does reflect all future interactions with dealership
- "(old/rich) is the demographic group estimated to always pay the observed list price for all car models." - is this true in the surveys?
- Why do firms reduce price discrimination offline when the online channel arises? Intuition is not clear to me...
- Show that estimates imply total industry profit in line with outside sources (e.g., expert assessments)

Great paper!

Thank you

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