The Evolution of Market Power in the US Auto Industry

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Overview

- BLP looks at demand for cars at a single point in time.

- This is an extension, and has more detailed data (second choice product choices).

- Also looks at consumer welfare, and how consumer surplus has changed over time.

- Even though prices have gone up, consumers are better off and are capturing more total surplus, largely due to higher quality cars.

Estimation

- Estimation via BLP; need instruments

- **Instrument:** lagged real exchange rate in country of manufacture

  – Captures input cost variation through local labor costs

  – Also captures variation through the nominal exchange rate

Industry Overview

- Looking at automobiles from 1980–2018.

- HHI (measured at the parent company level) fell from > 2500 to ~ 1200

- SUVs became really popular, going from $\sim 0\%$ of the market to $\sim 50\%$ by 2018

- Vehicles became larger and more powerful

Model (Consumers)

- Differentiated product demand and oligopoly model (BLP)

$$u_{ijt} = \beta_i \mathbf{x}_{jt} + \alpha_i p_{jt} + \xi_{jt} + \varepsilon_{ijt}$$

- $\mathbf{x}_j$ vehicle attributes

- p_j price

- ξ_{jt} unobserved, vehicle-specific term

- ε_{ijt} idiosyncratic consumer-vehicle specific term

Model (Consumers)

- Unable to separately identify annual average unobserved quality, τ_t and value of the outside option, γ_t

- Add restriction

$$\forall j \in \mathcal{J}_t : E[\xi_{jt} - \xi_{jt-1}] = E[(\tau_t - \tau_{t-1}) + (\overline{\xi}_{jt} - \overline{\xi}_{jt-1})] = 0$$

- Models within a generation don't change very much; identify γ_t in two steps:

  1. $\tau_t - \gamma_t$ is identified via standard discrete choice arguments

  2. We can construct $\overline{\xi}_{jt}$ from identified objects, so the moment condition identifies τ_t

Model (Consumer Preferences)

$$\alpha_i = \overline{\alpha} + \sum_h \alpha_h D_{ih}$$

$$\beta_{ik} = \overline{\beta}_k + \sum_h \beta_{kh} D_{ih} + \sigma_k \nu_{ik}$$

- D_{ih} taken from CPS

- ν_{ik} assumed independent draws from standard normal

$$s_{jt} = \int_i \frac{\exp(\beta_i x_j + \alpha_i p_j + \xi_j)}{\exp(\gamma_t) + \sum_{l \in \mathcal{J}_t} \exp(\beta_i x_l + \alpha_i p_l + \xi_l)} dF(i)$$

- Compute second choice vehicles by integrating consumers' choice probabilities with the first choice vehicle removed

Model (Firms)

- Firms m play a static, full-information, simultaneous-move pricing game each year

- Choose prices for all vehicles to maximize firm profit; observed profits form a Nash Equilibrium

$$s_{jt} + \sum_{k \in \mathcal{J}_t^m} (p_{jt} - c_{jt}) \frac{\partial s_{jt}}{\partial p_{kt}} = 0 \qquad \text{(FOC)}$$

- Solve for marginal costs; use estimated MCs to compute price-cost ratios and for counterfactual analysis

Model (Firms)—Limitations

- Nash-Bertrand assumption rules out cartels and other changes in conduct

- If firms become more/less collusive then the implied MCs will be wrong

- Do not try to measure changes in conduct (other IO papers do this)

- *Do* look at alternative conduct assumptions for robustness and counterfactuals
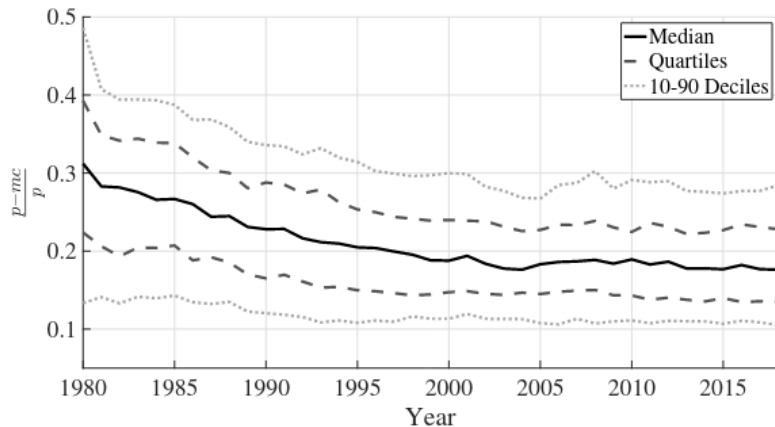
Estimation

- Estimate via GMM; three distinct steps

    1. Jointly estimate consumer heterogeneity and mean consumer valuations; use micro-moments from purchase data and second-choice data

    2. Estimate $\overline{\alpha}$ and $\overline{\beta}$, and year FE by regressing estimated consumer mean valuations on product characteristics, prices, make dummies and year dummies

    3. Use the empirical analogue of the continuing product condition to estimate τ_t and γ_t

Parameter Estimates

- Higher income people are less price sensitive

- Older households less price sensitive

- Larger households want larger vehicles

- Rural households have a stronger preference for trucks

- Consumers hold on to cars for longer ($3.9 \rightarrow 5.9$ years)
  - Not a parameter estimate, but the authors interpret this as an improvement in unobserved quality

Markups

Figure 5: Markups Over Time

Explaining the Evolution of Markups

- Estimate markups are similar if the authors assume single-product firms or industry wide collusion

- Decreases in concentration are not driving the decline in markups

- **Economic intuition:** prices are increasing but shares aren't decreasing because car quality is increasing

- Robustness check: Would need a cartel of the six biggest firms to overturn this result

Production Approach—Differences

Figure 9: Comparison to De Loecker et al. (2020)
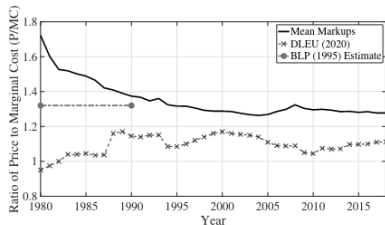
(a) Price over Marginal Cost
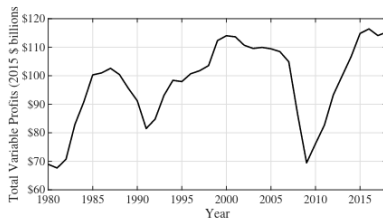
(b) Total Variable Profits

Notes: Panel (a) displays our estimate, the estimate for the U.S. automobile industry from De Loecker et al. (2020), and the average estimate across 1971-1990 from Berry et al. (1995). Panel (b) displays our estimate of total variable profits, sales multiplied by margins, summed across all products.

- Demand/conduct approach could be wrong because the exclusion restriction is violated for the IV, or because Nash assumption is wrong

- Production estimates could be wrong because of data problems

Welfare

Figure 10: Consumer Surplus, Producer Surplus, and Deadweight Loss
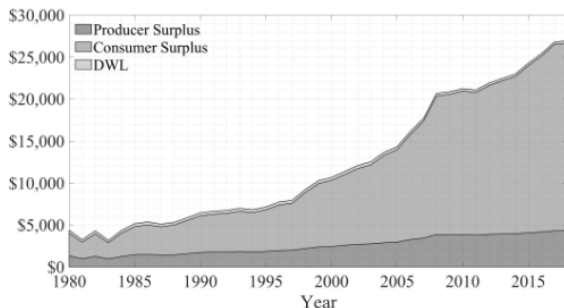
- Surplus rises from $\$5,000 \to \$25,000$
- Efficient market; very small DWL
- Most of the increase in competition comes from the entry of second- and third firms; auto industry features > 4 firms at all times so it's reasonable to think it is competitive

Why does CS rise?

1 Increased Competitive Pressure from foreign brands
  – The only way to overturn this mechanism is to assume that all car firms operate as a single cartel

2 Product Proliferation
  – Consumers like variety

  – Additional products crowds the characteristics space and increases competitive pressure

  – Results indicate that this isn't a significant driver of the increase in consumer surplus

Why does CS rise?

3 Changing Product Attributes
   - Large effect due to improvements in unobservable vehicle quality

   - A large portion of increased surplus is due to new features (rear-view camera, bluetooth, better reliability)

4 Decreasing Costs
   - Marginal costs for a fixed set of characteristics declines over time

   - Removing these cost reductions eliminates about half of CS increases