The Evolution of Market Power in the US Auto Industry

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Overview

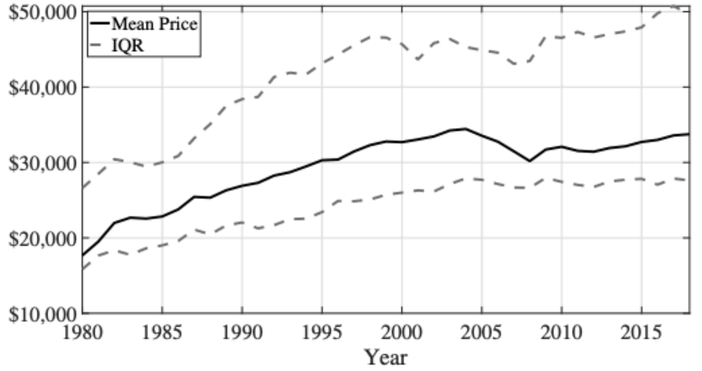
The Evolution of Market Power in the US Auto Industry

- **Research Question:** A change in market concentration when product quality improves over time.
- Demand estimation using BLP approach with time varying value of outside options.
- Welfare Analysis
- **Why is this interesting?**
  - Provide framework mark-up estimation with time varying outside options.
  - Compare and contrast production and demand approaches
  - Sources of improvement in consumer welfare

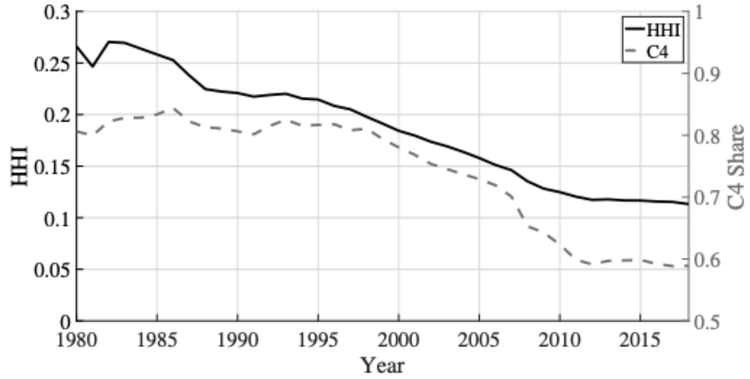
Background

Data (1980-2018)

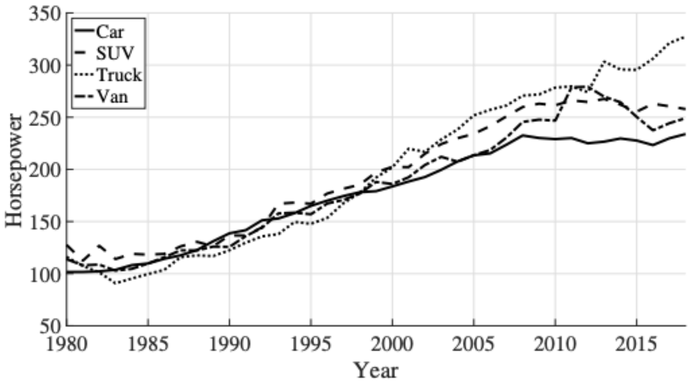
- **Automobile Market Data:** Product characteristics, brand country affiliation, year, prices
- **Price Instrument:** real exchange rate
- **Consumer Choices and Demographics from Consumer Expenditure Survey:** age, household size, share of rural household, household income
- **Second Choice from MartizCX**



(a) Prices



(b) Measures of Concentration



(a) Horsepower

Model

Consumer

- Discrete Choice Model:

$$u_{ijt} = \beta_i x_{jt} + \alpha_i p_{jt} + \xi_{jt} + \epsilon_{ijt}$$

$$u_{i0t} = \gamma_t + \epsilon_{i0t}$$

- Mean unobserved utility is changing over time:

$$\xi_{jt} = \tau_t + \tilde{\xi}_{jt}$$

- regularity condition $\mathbb{E}[\tilde{\xi}_{jt} \,|\, z_{jt}] = 0$

Model

Identification

- $\tau_t - \gamma_t$ is identified but not each of them
- Pakes et al. (1993b): For same vehicle without redesign between two years.

$$\forall j \in \mathscr{C}_t : \mathbb{E}[\xi_{jt} - \xi_{jt-1}] = \mathbb{E}[(\tau_t - \tau_{t-1}) + (\tilde{\xi}_{jt} - \tilde{\xi}_{jt-1})] = 0$$

- Allow interaction of household characteristics and unobserved preferences.

$$s_{jt} = \int_i \frac{\exp(\beta_i x_j + \alpha_i p_j + \xi_j)}{\exp(\gamma_t) + \sum_{\ell} \in \mathscr{J}_t \exp(\beta_i x_\ell + \alpha_i p_\ell + \xi_\ell)} dF(i)$$

Model

Firms and Estimation

- **Firms:** Static, full information, simultaneous move pricing game

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

- **Estimation:** GMM (Petrin, 2002; Berry et al., 2004)

  Step 1: Estimate consumer heterogeneity and mean consumer valuations.

  Step 2: estimate $\bar{\alpha}, \bar{\beta}$, fixed effects using 2SLS

  Step 3: separate τ_t, γ_t

Estimation and Results

Table 4: Coefficient Estimates

			Demographic Interactions						
	$\bar{\beta}$	σ	Income	Inc.^{2}	Age	Rural	Fam. Size 2	FS 3-4	FS 5+
Price	-3.200	–	0.094	-0.464	2.068	–	–	–	–
	(0.065)		(0.009)	(0.112)	(0.104)				
Van	-7.292	5.348	–	–	–	–	1.668	3.563	5.653
	(0.24)	(0.102)					(0.144)	(0.151)	(0.202)
SUV	-0.083	3.646	–	–	–	–	–	–	–
	(0.072)	(0.064)							
Truck	-7.533	6.309	–	–	–	3.009	–	–	–
	(0.284)	(0.188)				(0.313)			
Footprint	0.517	1.884	–	–	–	–	0.483	0.463	0.645
	(0.033)	(0.044)					(0.045)	(0.048)	(0.06)

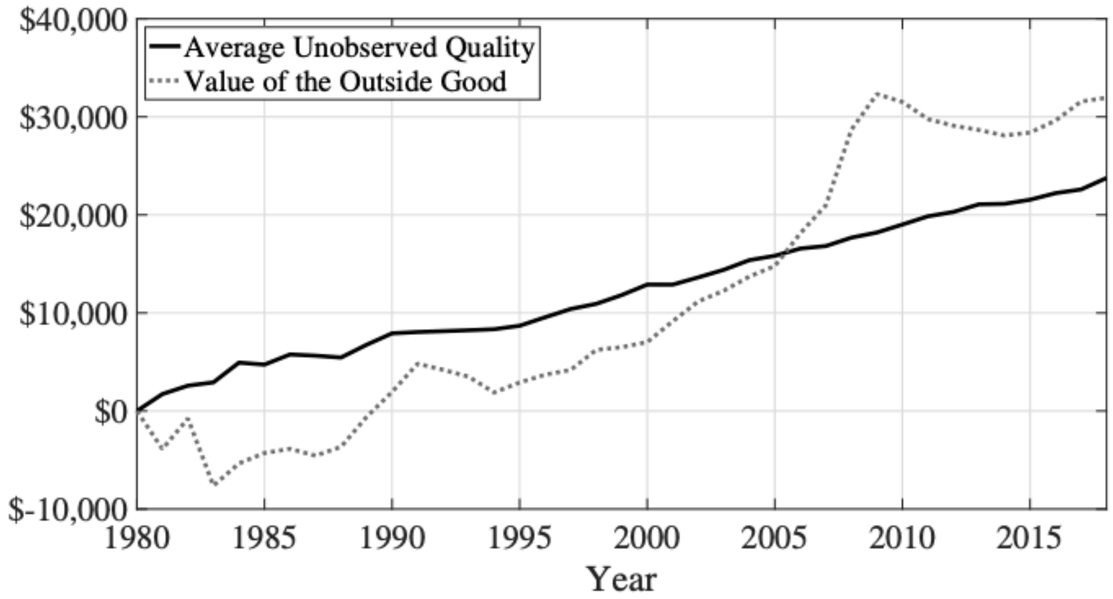
Table 5: Own Price Elasticities by Income Quintile Over Time

	Income Quintile				
Year	1	2	3	4	5
1980	-5.96	-5.78	-5.49	-5.13	-4.30
2000	-8.24	-7.83	-7.40	-6.88	-6.21
2018	-9.37	-8.56	-7.69	-6.90	-6.46

Estimation and Results

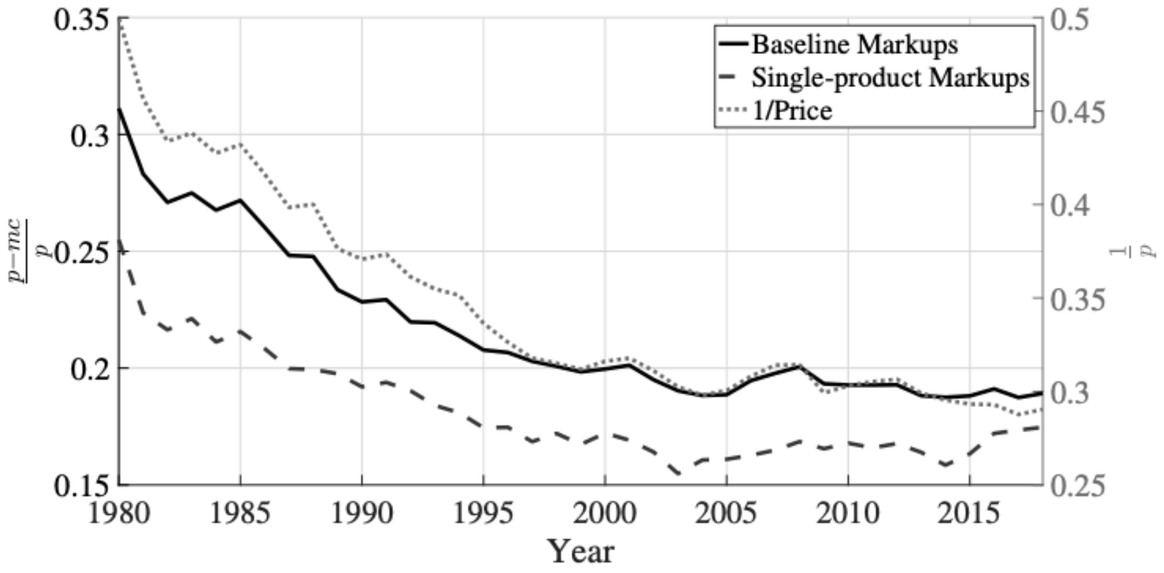
Decomposition of Time Effects

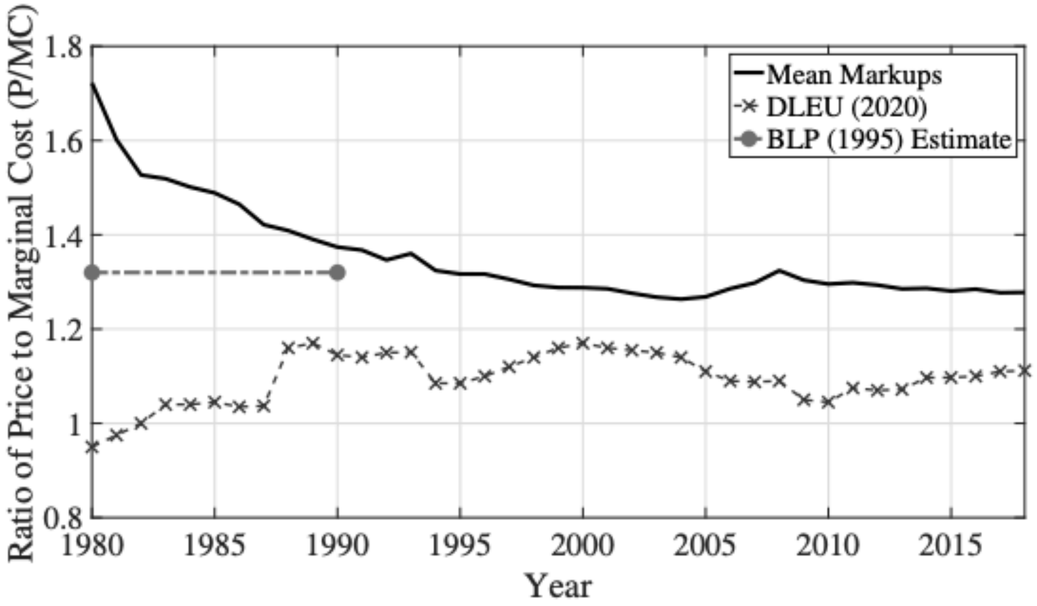
Figure 4: Quality and Aggregate Components of Time Effects



Markup Estimates

Explaining the Evolution of Markups





(a) Price over Marginal Cost

The Evolution of Welfare

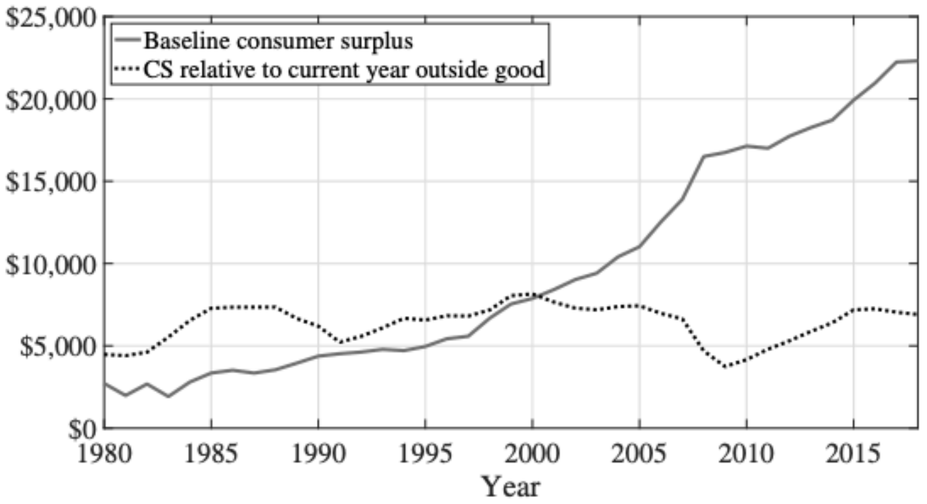
Compensating Variation

Product Bundle with Outside Good

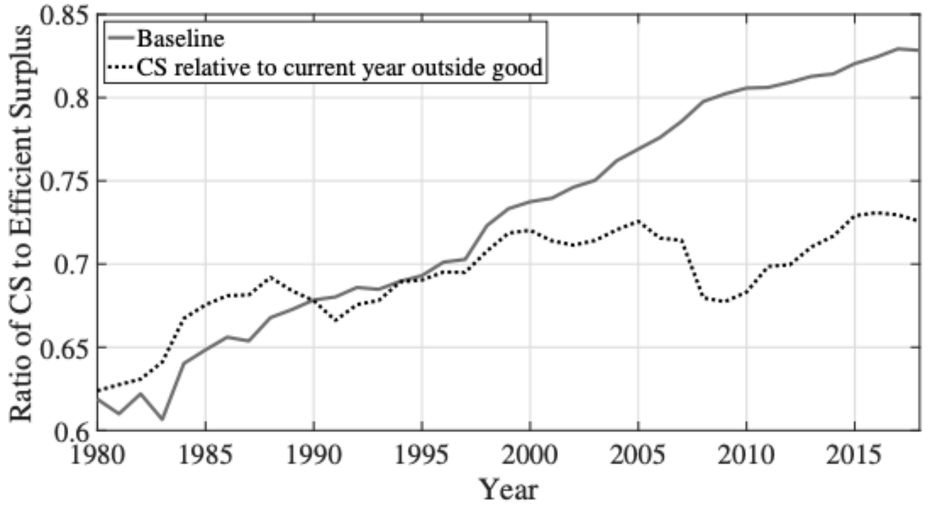
Only Outside Good

$$CS_t(\gamma) = \int_i \frac{1}{\alpha_i} \left[\log\left(\exp(\gamma) + \sum_{j \in \mathcal{J}_t} \exp(\beta_i x_{jt} + \alpha_i p_{jt}^{\gamma} + \xi_{jt}) \right) - \gamma \right] dF_t(i)$$

Figure 11: Consumer Surplus Comparison



(a) Consumer Surplus Comparison

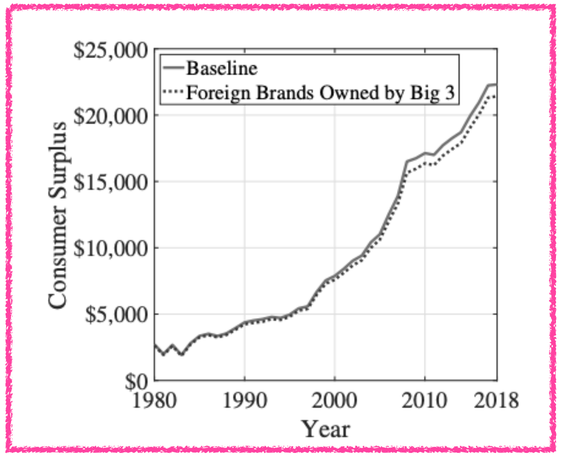


(b) CS as a Share of Total Available Surplus

The Evolution of Welfare

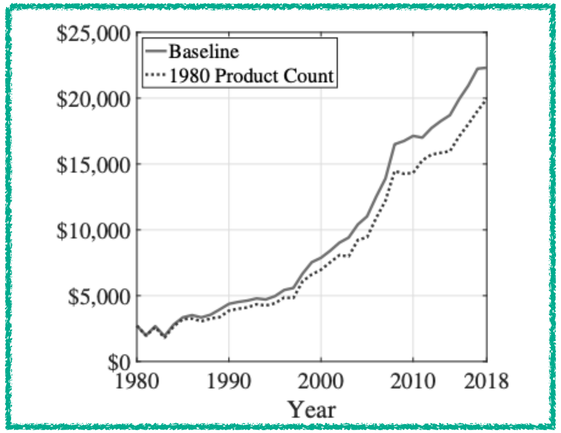
Why does consumer surplus rise?

1. **Increased Competitive Pressure from Foreign Brands.**



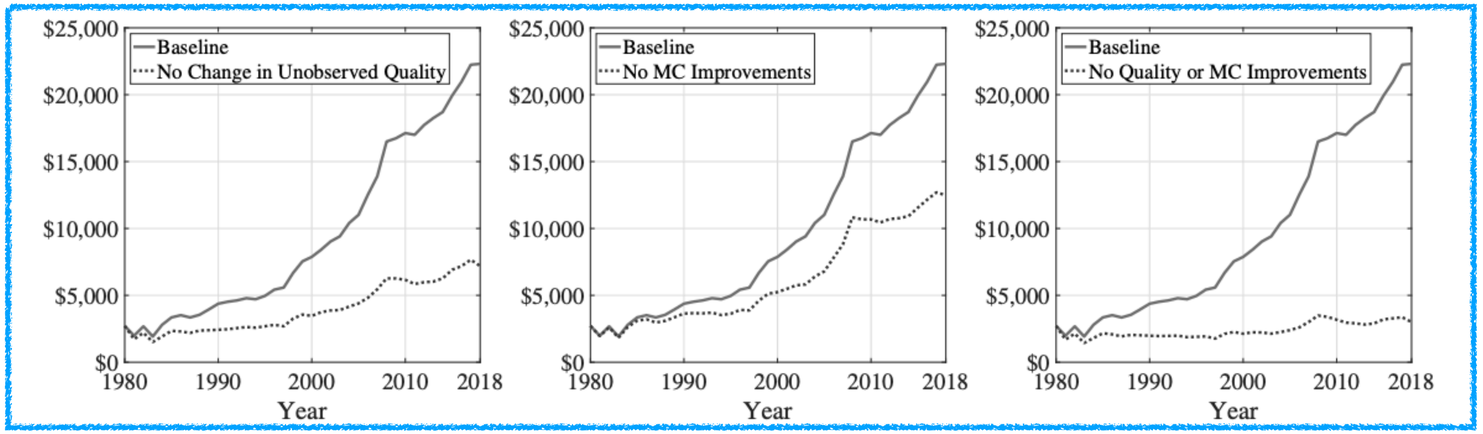
2. **Product Proliferation**

   - Variety Effect
   - Competitive Pressure



3. **Changing Product Attributes.**

4. **Decreasing Costs.**



Conclusion

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- **Employing a supply and demand industry oligopoly model with micro data.**
  - Concentration has decreased.
  - Markups have decreased.
  - Consumer Welfare has increased: Product quality improvement and marginal cost decrease.
- **Possible Extension:**
  - Testing different models of firm conduct over time.
  - Adding related financing market and value chain analysis.
  - Used car market