Discussion of “Pricing Inequality”

Simon Mongey and Michael Waugh

Discussion by Kunal Sangani

February 2025

Bridging Heterogeneous Agent Macro and Industrial Organization

- Ambitious paper bridging Heterogeneous Agent Macro and Industrial Organization.
- Key insight: Relating price sensitivity in IO models to marginal value of assets.
- Thoughtful model design to integrate both “machineries.”
- Some remaining tensions between model structure and ability to integrate a “wide body of empirical facts.”

Key Insight: Relating Price Sensitivity to Marginal Value of Assets

- Intuition in a stripped down version (no income, no oligopoly forces).
- Value of wealth a is:

$$v_i(a) = \max_j v_{ij}(a)$$

$$\text{where} \qquad v_{ij}(a) = \max_{x_{ij}} \{u(x_{ij}) + \beta v_i(Ra - p_j x_{ij})\} + \psi_j + \zeta_{ij}.$$

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- IO literature gives us choice probabilities ρ_{ij} when ζ_{ij} is Type 1 Extreme Value (η):

$$\rho_{ij} = \frac{\exp(\eta\,[u(x_{ij}) + \beta v_i(Ra - p_j x_{ij}) + \psi_j])}{\sum_k \exp(\eta\,[u(x_{ik}) + \beta v_i(Ra - p_k x_{ik}) + \psi_k])}.$$

  Notice that IO "price sensitivity coefficient" on p_j is $\eta x_{ij} \beta v_i'(a)$.

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- Macro literature links marginal value of wealth $v_i'(a)$ to marginal utility $u'(x_{ij})$:

$$\underbrace{-d\log\rho_{ij}/d\log p_j}_{\substack{\text{Extensive margin} \\ \text{price elasticity}}} = p_j\left(\eta x_{ij}\beta v_i'(a)\right) = \underbrace{\eta x_{ij} u'(x_{ij})}_{\substack{\text{Falls with wealth if} \\ u'(\cdot) \text{ falls fast enough}}}.$$

Key Insight: Relating Price Sensitivity to Marginal Value of Assets

- Natural way to model where differences in price sensitivity in IO models come from.
- Bells and whistles help integrate other forces in literature.
  (E.g., different elasticities within-market vs. across markets $\Rightarrow$ oligopolistic forces.)
- Benefits to bringing IO and HA-Macro literatures together.
  - IO: Equal footing to "demand" and "supply" forces, often studied in isolation in macro.
    - Supply-side: Literature on market power.
      E.g., Atkeson and Burstein (2008), De Loecker et al. (2021), Edmond et al. (2023), Baqaee et al. (2024).
    - Demand-side: Recent but growing literature.
      E.g., Stroebel and Vavra (2019), Brand (2021), Döpper et al. (2021), Nord (2022), Sangani (2022).
  - HA-Macro: Unified model for assessing effects of transfers, income risk, wealth, etc.

My Comments

- A few areas where model falls short of explaining the data:
  1. Marginal value of wealth vs. opportunity cost of time.
  2. Different patterns across different markets. Which relationships are structural?
  3. How does model counterfactual compare to data?

1. Marginal value of wealth or opportunity cost of time?

- In the model, variation in price sensitivity across households comes from differences in the marginal value of wealth, $v_i'(a)$.
- In recent work, price sensitivity comes from different opportunity costs of time.
  - Households with lower cost of time search more for better prices.
  - Variation due to income (marginal hour spent working) or wealth (value of leisure time).

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  - Households with lower cost of time search more for better prices.
  - Variation due to income (marginal hour spent working) or wealth (value of leisure time).
- Difficult to isolate value of wealth vs. opportunity cost of time. But some key hints:
  - Prices paid decline sharply at retirement, even though wealth doesn't.
  - Direct measures of search behavior predict prices paid.
  - Differences in prices/markups paid often due to differences in prices paid for same good, even at the same store!

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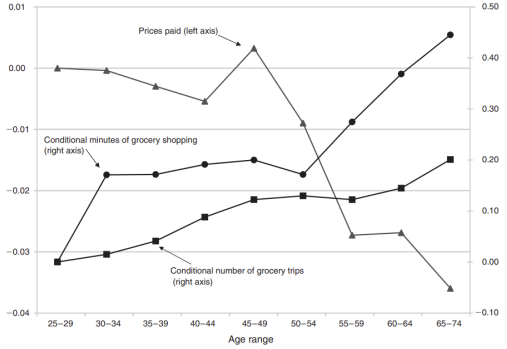

FIGURE 1. PRICE PAID AND SHOPPING FREQUENCY OVER THE LIFE CYCLE: LOG DEVIATION FROM 25- 29-YEAR-OLDS

(a) Aguiar and Hurst (2007).

TABLE 8
EFFECT OF SHOPPING BEHAVIOR ON HOUSEHOLD PRICE INDEXES

	(1)	(2)	(3)
No. shopping trips ($\times 10^2$)	−0.144** (0.005)		
No. stores visited ($\times 10^2$)		−1.063** (0.027)	
Fraction of transactions involving coupons			−0.324** (0.003)
Observations	880,104	880,104	880,104
Households	78,758	78,758	78,758
R^2	0.015	0.021	0.181

(b) Kaplan and Menzio (2015).

- Sharp decline in prices paid when cost of time falls at retirement. (Aguiar and Hurst 2007.)
- Search behavior predictive of prices paid. (Kaplan and Menzio 2015.)

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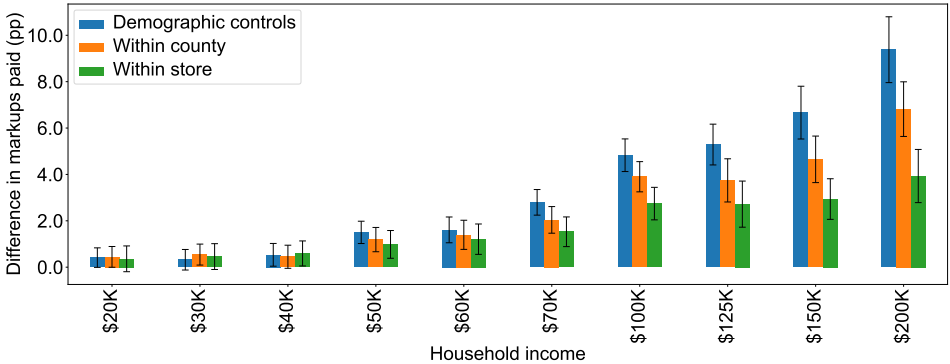
Figure: Differences in retail markups paid for identical products (Sangani 2022).



- High-income households pay 3pp higher retail markups for same barcode (UPC) within store outlet! Search is big enough to explain...
  - Differences in markups across products. [Elasticity: 10% to avg. buyer income.]
  - Differences in markups across households. [Elasticity: 3% to household income.]

2. Different patterns for different markets

- Markups tend to increase with income/wealth in many settings, but not all.
  - Seminal work on “poverty premium” by Caplovitz (1963), Prahalad and Hammond (2002).
  - Within product, high-income buy bulk at lower prices. (Bornstein and Peter 2024).
  - Low-income households pay higher markups for banking services, insurance, auto loans. (e.g., Grunewald et al. 2020).
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- Meanwhile, search offers a natural explanation:
  - Search/savings technologies vary with income (e.g., ability to negotiate offers, stockpile).
  - Markups shaped by race between opportunity cost of time vs. search productivity.

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- Meanwhile, search offers a natural explanation:
  - Search/savings technologies vary with income (e.g., ability to negotiate offers, stockpile).
  - Markups shaped by race between opportunity cost of time vs. search productivity.
- Tension between “parsimony” and ability to integrate a “wide body of empirical facts.”
  - For matching the data, both value of wealth and opportunity cost of time seem important.

2. Different patterns for different markets

- Broader pattern: Which relationships are structural? Which vary across contexts?
  - Model tightly parameterized to match *average* relationships.
  - But average relationships mask heterogeneity across markets.
- Example 1: On average, markups increase with income. But not in all markets.

2. Different patterns for different markets

- Broader pattern: Which relationships are structural? Which vary across contexts?
  - Model tightly parameterized to match *average* relationships.
  - But average relationships mask heterogeneity across markets.
- Example 1: On average, markups increase with income. But not in all markets.
- Example 2: On average, marginal costs increase with firm size.
  - False for Walmart vs. Safeway vs. corner store.
- Example 3: On average, high-income households buy from larger firms.
  - True for some markets (e.g. ground coffee): Starbucks, Peet's $>$ Maxwell House, Folgers.
  - False for others (e.g. butter): Organic Valley $<$ Kerrygold $<$ Land O' Lakes.

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  - False for others (e.g. butter): Organic Valley $<$ Kerrygold $<$ Land O' Lakes.
- Market-specific relationships btwn quality, marginal cost, consumer tastes, firm size.
  - Problematic for counterfactuals if we misspecify avg. correlation as structural relationship.

3. Comparing Model Counterfactual to Phillips Curve Estimates

- Okun's Law: 1% increase in GDP $\approx$ 0.5% decrease in unemployment rate.

- Back-of-the-envelope Phillips Curve slope:

$$\psi = \frac{0.4\% \text{ increase in prices}}{1\% \text{ of GDP transfer}} \frac{1\% \text{ incr. in GDP}}{0.5\% \text{ decrease in unemp.}} = 0.8.$$

  If a 1% of GDP transfer increases realized GDP less than 1%, this *further increases* ψ.

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- Phillips curve is at least 2.5x steeper than recent estimates.

  - Stock and Watson (2020): "Phillips correlation" from 0.67 (1960-83) to 0.03 (2000-19).
  - Hazell, Herreño, Nakamura, and Steinsson (2020) find $\psi \approx 0.1$–0.3.
  - Puzzle: Why do markups in the model respond "too strongly" to transfers?

Other Comments

- Functional form assumptions are not innocuous: E.g., pass-through.
  - Calibration likely yields complete or even over-passthrough (in logs) of cost changes.
  - Heterogeneity in consumer price sensitivity pushes toward over-passthrough.
  - Oligopoly dampens pass-through, but (my guess is) this force is too small.
  - Contrasts with large body of evidence on incomplete pass-through. (Sangani 2024.)
- Can framework accommodate other empirical patterns?
  - **Balanced growth?** Need exogenous force changing spread of taste shocks η over time?
  - **Engel curve for variety?** Rather than scale up consumption, high-income hh's spread consumption over more varieties. (Li 2021).
  - **Consumption patterns?** Identical preferences $\Rightarrow$ consumption patterns of low-income hh's with a wealth shock should resemble high-income hh's. True in the data?

Closing Thoughts

- Ambitious paper and agenda!
- Natural bridge between price sensitivity in IO and marginal value of wealth in macro.
- Marginal value of wealth is an intuitive source for differences in price sensitivity, but...
  - Needs to confront evidence that search / cost of time important for explaining micro data.
  - Needs to confront variation across markets (e.g., markups vs. income).
- Places where predictions of structural model $\neq$ empirical evidence should prompt new areas of investigation.
  - E.g., why does a model that matches the cross-section predict too much responsiveness of markups to income?

Aguiar, M. and E. Hurst (2007). Life-cycle prices and production. *American Economic Review 97*(5), 1533–1559.

Atkeson, A. and A. Burstein (2008). Pricing-to-market, trade costs, and international relative prices. *American Economic Review 98*(5), 1998–2031.

Baqaee, D. R., E. Farhi, and K. Sangani (2024). The supply-side effects of monetary policy. *Journal of Political Economy 132*(4), 1065–1112.

Bornstein, G. and A. Peter (2024). Nonlinear pricing and misallocation. Technical Report 33144, National Bureau of Economic Research.

Brand, J. (2021). Differences in differentiation: Rising variety and markups in retail food stores. Working Paper.

Caplovitz, D. (1963). *The Poor Pay More: Consumer practices of low-income families*. The Free Press.

De Loecker, J., J. Eeckhout, and S. Mongey (2021). Quantifying market power and business dynamism in the macroeconomy. Technical Report 28761, National Bureau of Economic Research.

Döpper, H., A. MacKay, N. H. Miller, and J. Stiebale (2021). Rising markups and the role of consumer preferences. Working Paper.

Edmond, C., V. Midrigan, and D. Y. Xu (2023). How costly are markups? *Journal of Political Economy 131*(7), 1619–1675.

Grunewald, A., J. A. Lanning, D. C. Low, and T. Salz (2020). Auto dealer loan intermediation: Consumer behavior and competitive effects. National Bureau of Economic Research, Working Paper No. 28136.

Hazell, J., J. Herreño, E. Nakamura, and J. Steinsson (2020). The slope of the phillips curve: Evidence from us states. Technical Report 28005, National Bureau of Economic Research.

Kaplan, G. and G. Menzio (2015). The morphology of price dispersion. *International Economic Review 56*(4), 1165–1206.

Li, N. (2021). An engel curve for variety. *Review of Economics and Statistics 103*(1), 72–87.

Nord, L. (2022, August). Shopping, demand composition, and equilibrium prices. Working paper.

Prahalad, C. K. and A. Hammond (2002). Serving the world's poor, profitably. *Harvard Business Review 80*(9), 48–59.

Sangani, K. (2022). Markups across the income distribution: Measurement and implications. Working paper.

Sangani, K. (2024). Pass-through in levels and the unequal incidence of commodity shocks. Working paper.

Stock, J. H. and M. W. Watson (2020). Slack and cyclically sensitive inflation. *Journal of Money, Credit and Banking 52*(S2), 393–428.

Stroebel, J. and J. Vavra (2019). House prices, local demand, and retail prices. *Journal of Political Economy 127*(3), 1391–1436.