Discussion of “Supermarket Price Setting on the Two Sides ...”
by Karadi, Amann, Bachiller, Seiler, Wursten

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Inflation in standard sticky price models: empirical challenges

\[ \pi = \int -x\Lambda(x)f(x)dx \]

\[ x = p - p^* \quad \text{distance from desired price } p^* \quad \text{("price gap")} \]
\[ \Lambda(x) \quad \text{probability of adjusting price} \]
\[ f(x) \quad \text{distribution of price gaps} \]

- **Key assumptions:** representative firm, single product, no discounts, inf many competitors

1. **Price gaps** \( x \) are unobserved
   - Fit indirectly by matching predicted unconditional moments
   - Fit indirectly by matching conditional moments, e.g., sufficient statistics

2. **“Other stuff”:** discounts, multi-product/-sector, few competitors, strategic behaviour, ...
   - Expand data, extend models
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New empirical proxy for price gap (Karadi-Schoenle-Wursten, 2022)

\[ x_{p,s,t} = p_{p,s,t} - \frac{1}{N_{S_t \setminus s}} \sum_{S_t \setminus s} p_{p,s,t} - \alpha_{cs} \]

- **\( p_{p,s,t} \)**: log price for product \( p \) store \( s \) month \( t \)
- **\( S_t \setminus s \)**: other stores that sell product \( p \) and changed its price in \( t \)
- **\( \alpha_{cs} \)**: average raw gap in store \( s \) category \( c \)

  - Very detailed: product is a barcode, \( \approx 2.2 \) million products
  - Great store coverage: 75% of stores in EU4, 50 major metro areas in US
  - Allows tracking price of identical product across stores
  - Allows filtering/controlling “Other stuff”
  - Quantity weights, careful cleaning
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Compute probability of adjustment $\Lambda(x)$ and gap distribution $f(x)$

- Frequency of reference price changes lower in EU4
- Price increases are more likely than decreases (more asymmetry in EU4)
- Price gaps are symmetric (smaller in EU)
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Significant differences across 5 countries

- Italy’s hazard looks a lot like US (but still smaller gaps)
- Germany is the stickiest and most asymmetric
- France is most symmetric and has smallest gaps
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Comment 1. Account for empirical $\Lambda(x)$ and $f(x)$ using standard model

- **Stylized example:**
  - i.i.d. zero-mean cost shocks $c$ with c.d.f. $F(c)$
  - adjustment bounds: $s, S$

- **Adjustment decision:**
  $$I(x, c) = \begin{cases} 
  \text{adjust,} & s \leq x - c \leq S \\
  \text{not adjust,} & \text{otherwise}
  \end{cases}$$

- **Adjustment probability:**
  $$\Lambda(x) = \int I(x, c) dF(c) = 1 - F(x - s) + F(x - S)$$

- **Baseline:** $F$ normal with st.dev. $\sigma = 1$, bounds $s = -1.2$, $S = 1.2$
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Inaction bands and adjustment probabilities in stylized model

\[ \text{Probability of adjustment} \]

\[ \text{Price gap, } x \]

\[ \text{Cost shock, } c \]
Inaction bands and adjustment probabilities in stylized model

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Discussion of Karadi et al. (2022)
BOC Workshop, 30 September 2022
Inaction bands and adjustment probabilities in stylized model

![Graph showing inaction bands and adjustment probabilities](image)

- Baseline
- Larger shocks, 2σ

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Inaction bands and adjustment probabilities in stylized model

![Graphs showing inaction bands and adjustment probabilities. The left graph plots cost shock vs. price gap with lines labeled Baseline and Larger shocks, wider band. The right graph plots price gap vs. probability of adjustment with a decreasing curve.]
Inaction bands and adjustment probabilities in stylized model

- **Baseline**
- **Thick tails**
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Comment 1. Account for empirical $\Lambda(x)$ and $f(x)$ using standard model

- Establish **mapping** between $\Lambda(x)$ and $f(x)$ and fundamentals
- Which **fundamentals** account for differences: US vs EU4, within EU4?
- Are prices in Europe more constrained?
  - Wider sS band or smaller $c$ shocks?
Comment 2. Revisit implications for monetary non-neutrality

\[
\frac{\partial \pi}{\partial m} = \int \Lambda(x)f(x)dx + \int x\Lambda'(x)f(x)dx
\]

intensive

extensive (dominant)
Extensive margin adjustments amplify price response

![Graph showing price gap vs cost shock and probability of adjustment.](image-url)
Extensive margin adjustments amplify price response
Extensive margin adjustments amplify price response

![Graph showing the effect of cost shocks and price gaps on the probability of adjustment.](image)

- **Baseline**
- **Money shock = +0.5**

- **Price gap, x**
  - **Probability of adjustment**
  - **Cost shock, c**

- **no changes**
  - **price increases**

- **price decreases**
  - **no changes**
Extensive margin adjustments amplify price response

- Baseline
- Money shock = +0.5

- Price gap, x
- Cost shock, c
- Probability of adjustment

- no changes
- price decreases --> no changes
- price decreases --> price increases
- price increases --> price increases

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- \(\Lambda(x)\) and \(f(x)\) are sufficient statistics for response to \(m\) (on impact)
  - Clarify what is added by matching hazard by age
  - Richer than Alvarez-Lippi-Le Bihan (ALL) sufficient statistic (\(\sim\) Frequency/Kurtosis)

- Can outline empirical “reach” of ALL’s sufficient statistic
  - Alvarez et al. (2021): ALL sufficient statistic is validated in French micro data
  - Hong et al. (2021): ALL sufficient statistic is not validated in US micro data

- Can point to empirically relevant extensions of ALL’s theory
  - examine the mapping from \(\Lambda(x)\) and \(f(x)\) to Frequency/Kurtosis
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Comment 3. Unaccounted heterogeneity within store (same product)

- Bonomo et al. (2022): partial synchronization of daily price changes within a store
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- Partial synchronization for a top-10 US retailer (Cavallo and Kryvtsov, 2022)
- Measured $\Lambda(x)$ would be flatter
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Comment 3. Unaccounted heterogeneity across stores (same product)

- Stores compete locally: need to incorporate location in price gap definition

- Small number of competitors implies strategic pricing
  - Dynamic oligopoly: Wang and Werning (2022, AER), Mongey (2022, R&R Econometrica)
  - Larger monetary non-neutrality, market concentration matters
Summary

- **Important questions, excellent paper!**
  - New measure of price gaps
  - Accounting for differences in pricing behaviors in US and EU4

- **Comments/suggestions:**
  - Account for empirical $\Lambda(x)$ and $f(x)$ using standard model
  - Revisit implications for monetary non-neutrality, build on ALL and recent empirical work
  - Control for unaccounted heterogeneity within/across stores