The Rise of Niche Consumption

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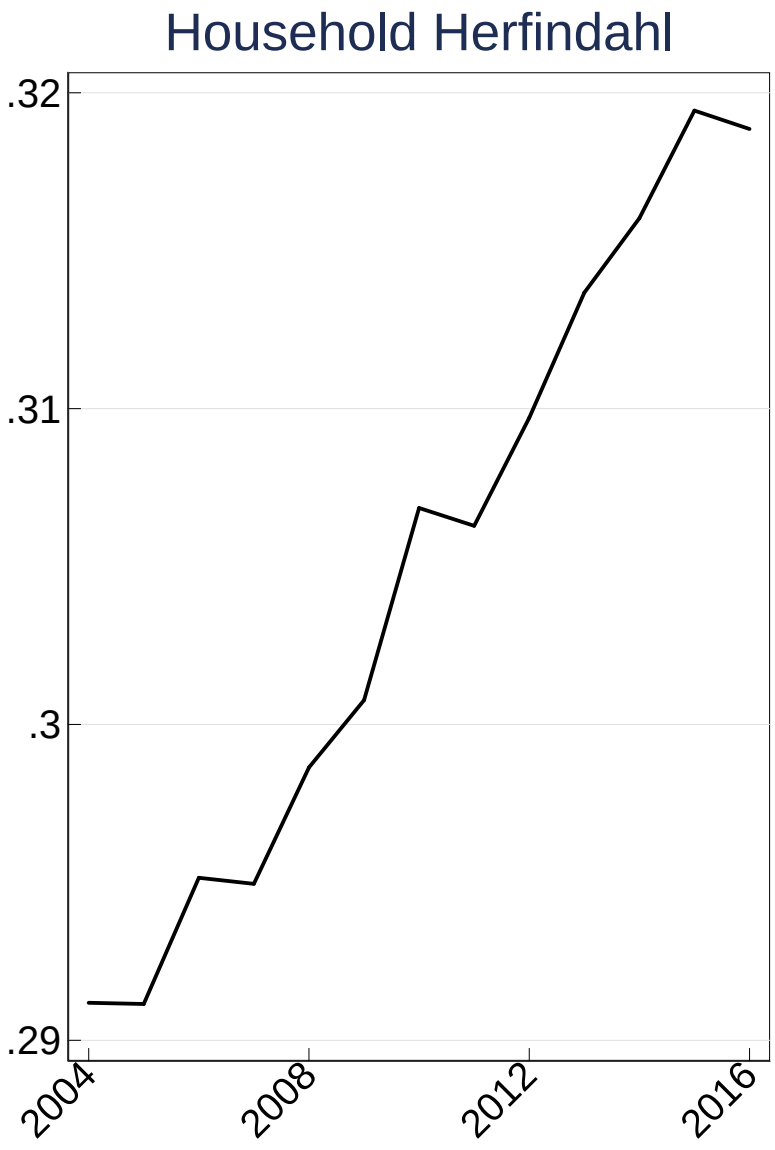
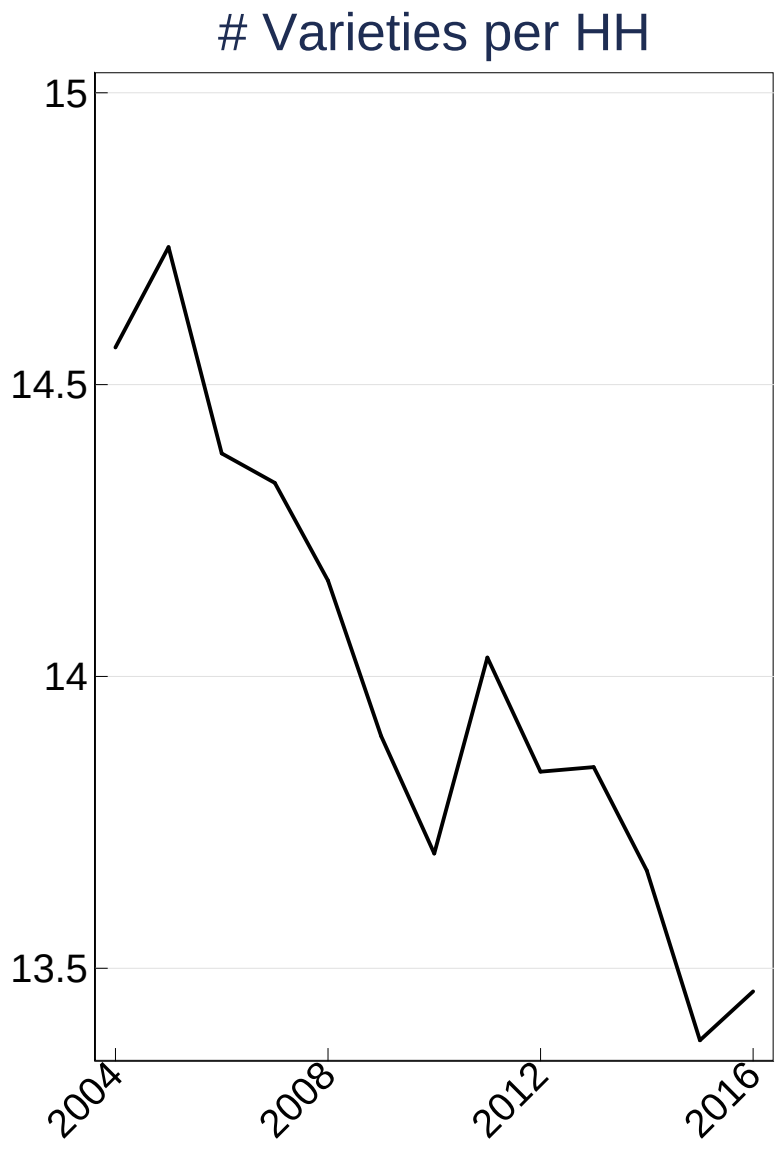
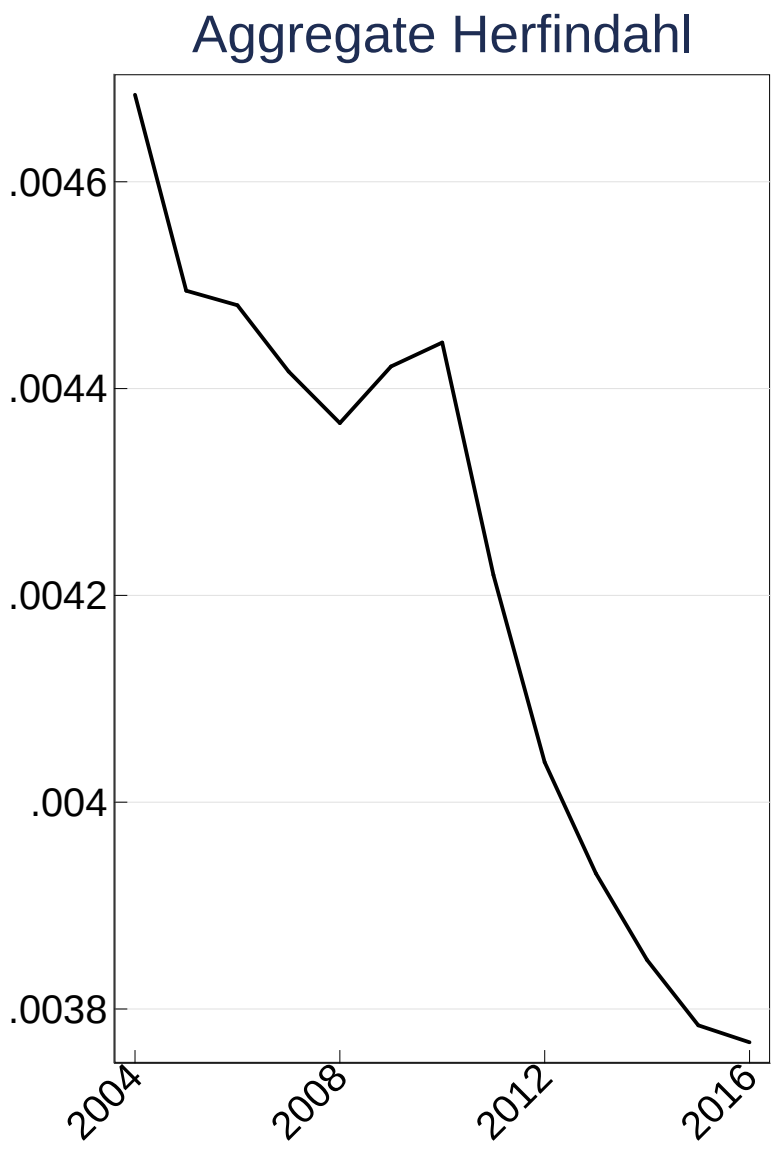
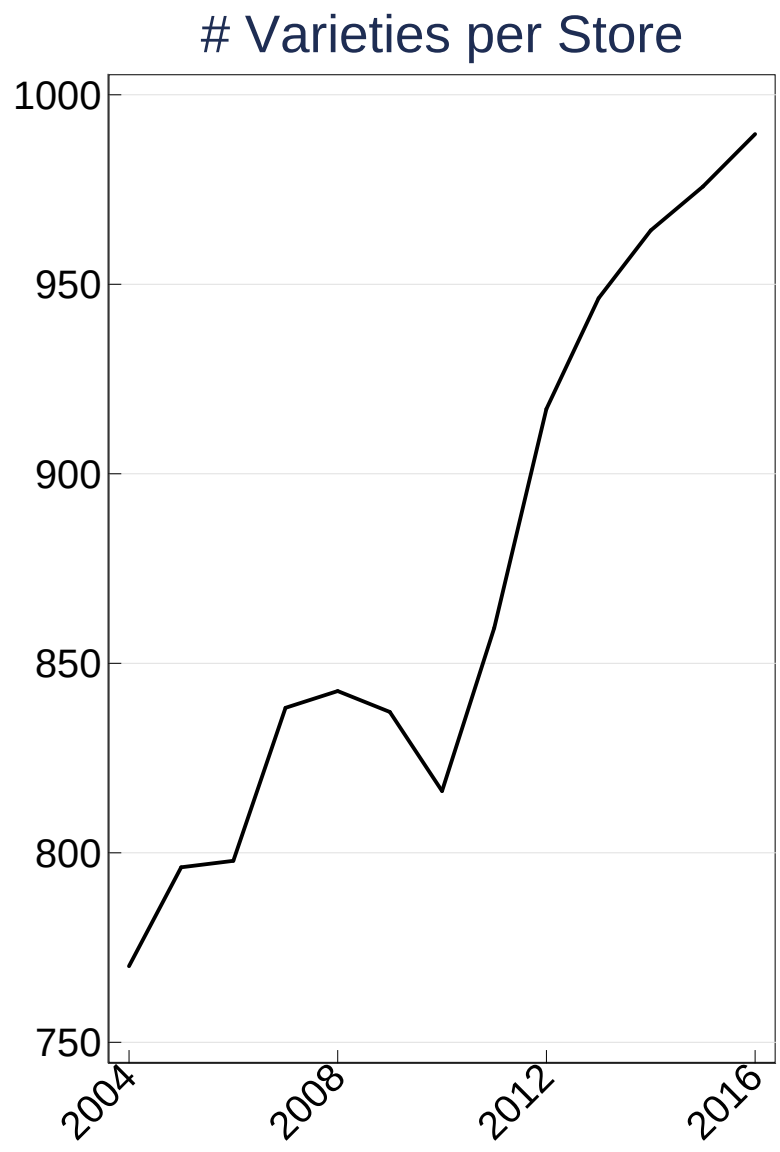
Households Concentrating Spending (Within Category)





Economy Spreading Out Spending (Within Category)





How To Reconcile?

- Households increasingly like their "top" products, but differ on what those top products are: growing "niche" consumption!

- Another dimension of growing fragmentation in economy:
  - Digital content (e.g. Aguado et al. 2015)
  - Political idiology (e.g. Gentzkow et al. 2017)
  - Job polarization (e.g. Autor et al. 2006)

Examples of Fragmenting Product Space

- Varieties ↑ and concentration ↓ in each. But household taste not spread evenly over products, so HH concentration ↑

How to Understand These Facts?

- Build a model with following elements:
  - Households choose number of varieties to consume
  - Households spend a lot on some varieties, a little on others
  - Different households consume different varieties

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- Commonly used models won't do
  - Standard love-of-variety: $\mathcal{H}^{\text{HH}} = \frac{1}{N}$
  - Standard discrete choice: $\mathcal{H}^{\text{HH}} = 1$
  - Representative HHs: $\mathcal{H}^{\text{HH}} = \mathcal{H}^{\text{Agg}}$

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  - Representative HHs: $\mathcal{H}^{\text{HH}} = \mathcal{H}^{\text{Agg}}$
- Implications through lens of model:
  - Innovation cost $\downarrow$ or idiosyncratic tastes $\uparrow$ (isomorphic)
  - Welfare gains from better product selection

Agenda

- Concentration and extensive margin in AC Nielsen Homescan
- A model of a household's variety choice
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Baseline Data Sample

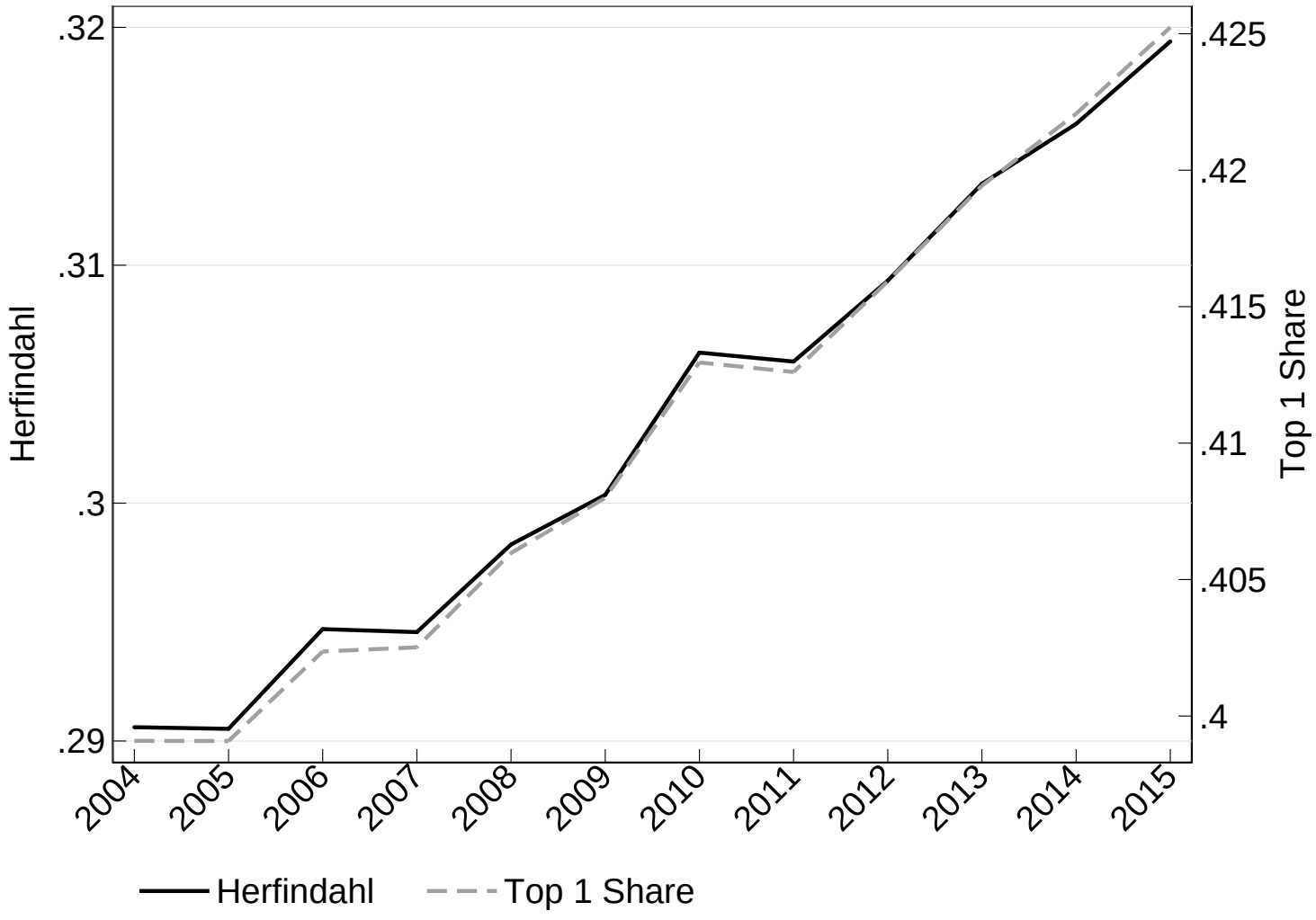
- Nielsen Homescan 2004-2015
  - All households using sampling weights
  - Non-magnet, non-fresh produce, non-generic items
  - Balanced set of narrow product categories (modules)
- Products are UPCs (baseline) or brand (robustness)
- 107 categories (e.g. carbonated beverages or laundry supplies)
- Average over category concentration measures with constant weights across time to eliminate composition

Measuring Concentration

- Household Concentration:
  - Within categories, **for each household**, calculate product spending shares and Herfindahls
  - Average over households and categories to get average Household Herfindahl by year: $\mathcal{H}_t^{\text{HH}}$

- Aggregate Concentration:
  - Within categories, **add up all households' product spending**, calculate shares and Herfindahls
  - Average over categories to get average Aggregate Herfindahl by year: $\mathcal{H}_t^{\text{agg}}$

Fact 1: Household Product Concentration is Increasing



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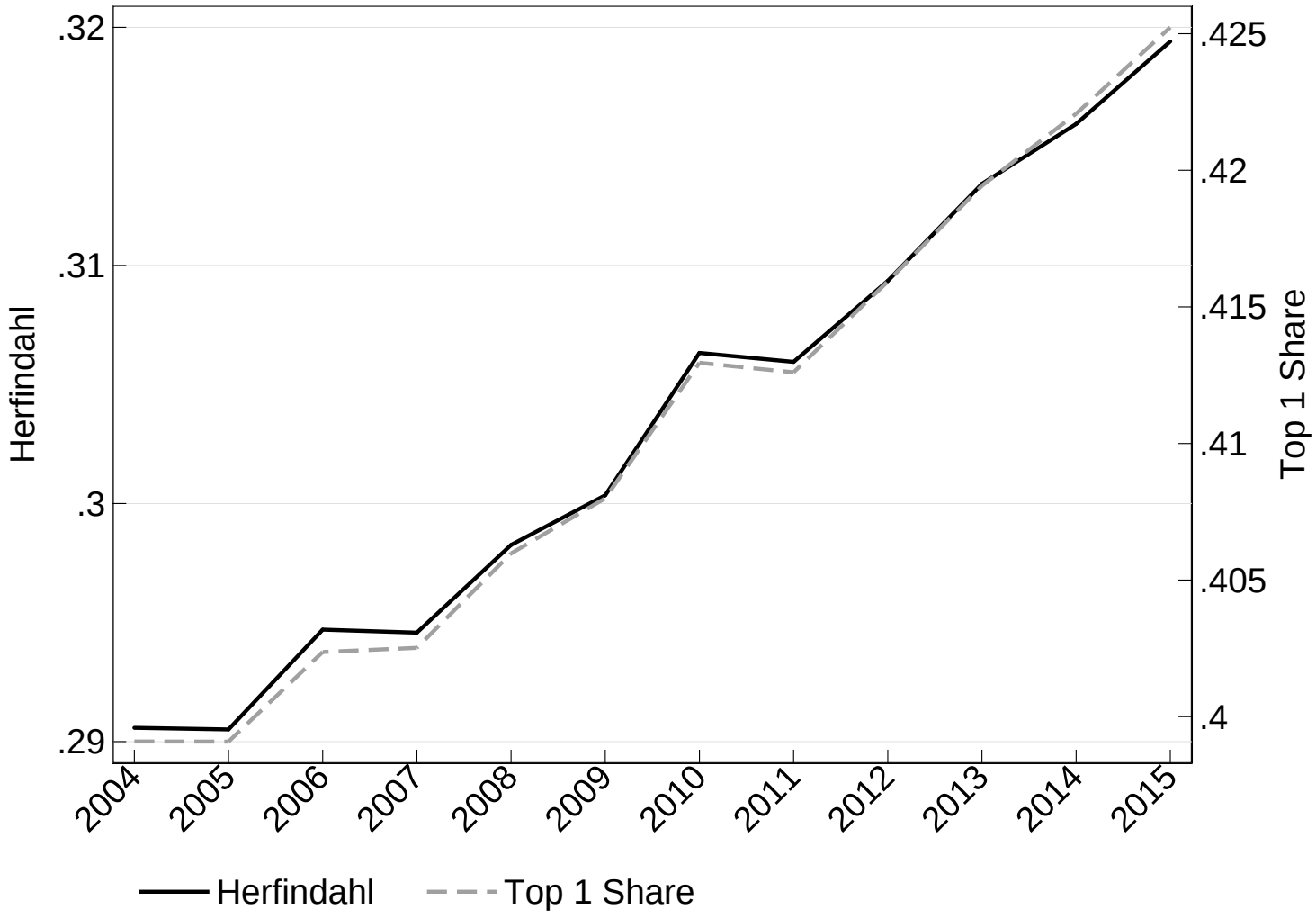
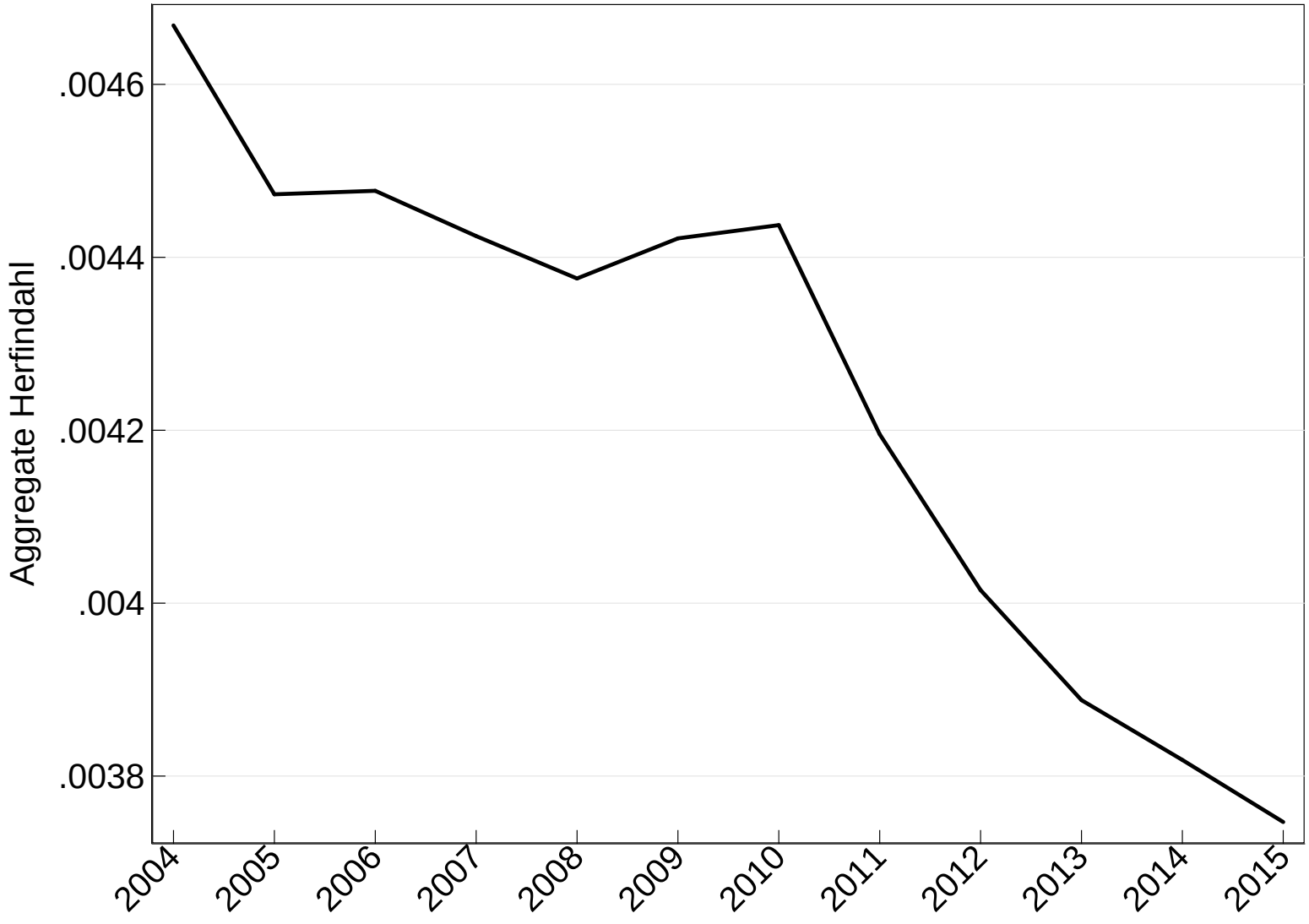


- Are these the Autor et al (2017) "super-stars"?

Fact 2: Aggregate Product Concentration is Decreasing



Results are Highly Robust

- Holds whether defining "products" as UPCs or brands
- Pervasive across product categories and locations
- Even within most individual retailers
- Seen *within* all demographic groups, so *not* about:
  - rich vs. poor
  - black vs. white
  - college vs. non-college
  - old vs. young
  - urban vs. rural
  - etc. Detailed results

Largely Driven by Extensive Margin (Churning Varieties)

- Trends substantially dampened if restrict to balanced products

  details

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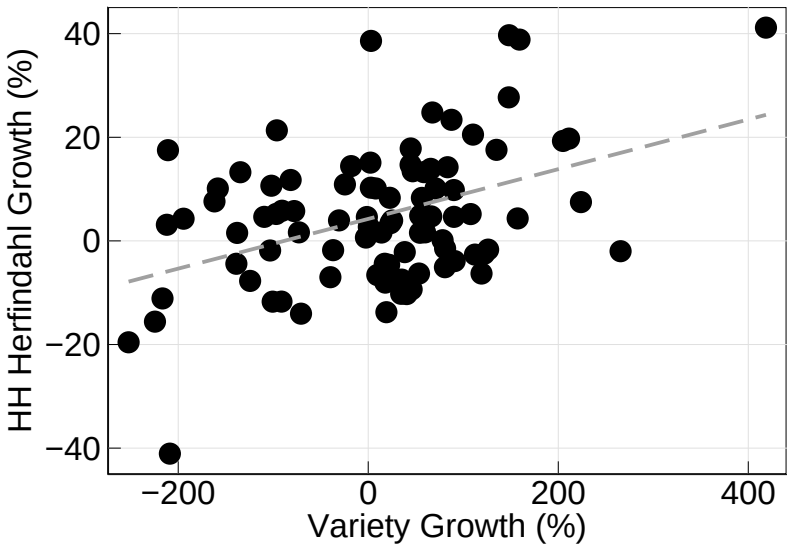
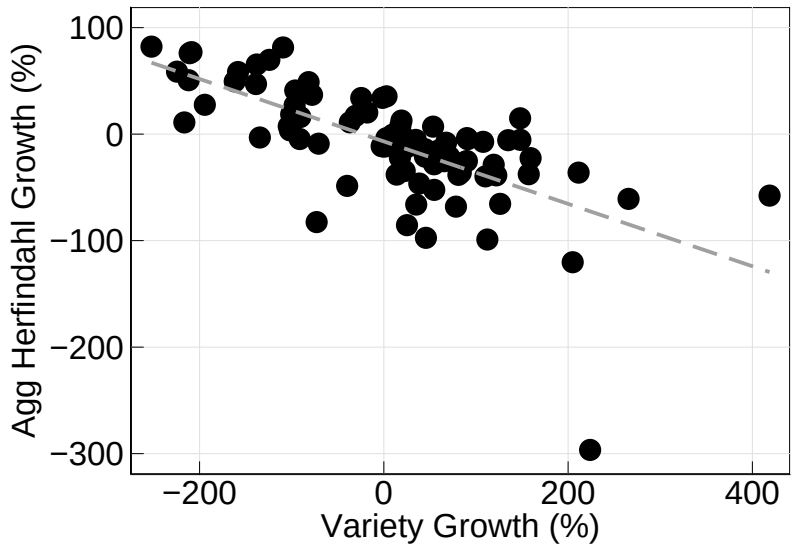
- Trends strongest in retailers with most variety growth:





How to Think about These Patterns?

- We find household consumption segmentation interesting *per se*, consistent with trends in other walks of life.
- But, we develop a model to think about the driving forces and implications for welfare and market power.
- Many models (discrete-choice, basic CES) ill-suited, often specify number of varieties or have identical households

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Setup for Household i

- HHs $i \in [0,1]$ spend E on goods $k \in [0,N]$ to maximize:

$$U_i = \left(\int_{k \in \Omega_i} \left(\gamma_{i,k} C_{i,k} \right)^{\frac{\sigma-1}{\sigma}} dk \right)^{\frac{\sigma}{\sigma-1}} - F \times \left(|\Omega_i| \right)^{\epsilon}$$

- Let $\tilde{\gamma}_{i,k} = \gamma_{i,k}/p_k$ be price-adjusted taste, distributed Pareto:

$$Pr\left(\tilde{\gamma}_{i,k} < y \right) = G\left(y \right) = 1 - \left(y/b \right)^{-\theta},$$

  where larger θ means a flatter distribution of tastes.

- Price Index:

$$\begin{aligned} P = P_i &= \left(\int_{k \in \Omega_i} \left(\tilde{\gamma}_{i,k} \right)^{\sigma-1} dk \right)^{\frac{1}{1-\sigma}} \\ &= \underbrace{\left(1 + \frac{1-\sigma}{\theta} \right)^{\frac{1}{\sigma-1}} b^{-1}}_{= \text{Ave Price}} \times \underbrace{\left(|\Omega_i| \right)^{\frac{1}{1-\sigma}}}_{\text{Variety Gains}} \times \underbrace{\left(\frac{|\Omega_i|}{N} \right)^{\frac{1}{\theta}}}_{\text{Selection}} \end{aligned}$$

Choice of Varieties and Concentration

- Optimal number of varieties given by:

$$|\Omega_i| = |\Omega| = \left(\frac{bE\left(\frac{1}{1-\sigma} - \frac{1}{\theta}\right)\left(1 + \frac{1-\sigma}{\theta}\right)^{\frac{1}{1-\sigma}} N^{\frac{1}{\theta}}}{F\epsilon} \right)^{\left(\epsilon - \frac{1}{1-\sigma} + \frac{1}{\theta}\right)^{-1}},$$

- "Cutoff" variety whose taste satisfies: $\frac{|\Omega|}{N} = 1 - G\left(\tilde{\gamma}^*\right)$.

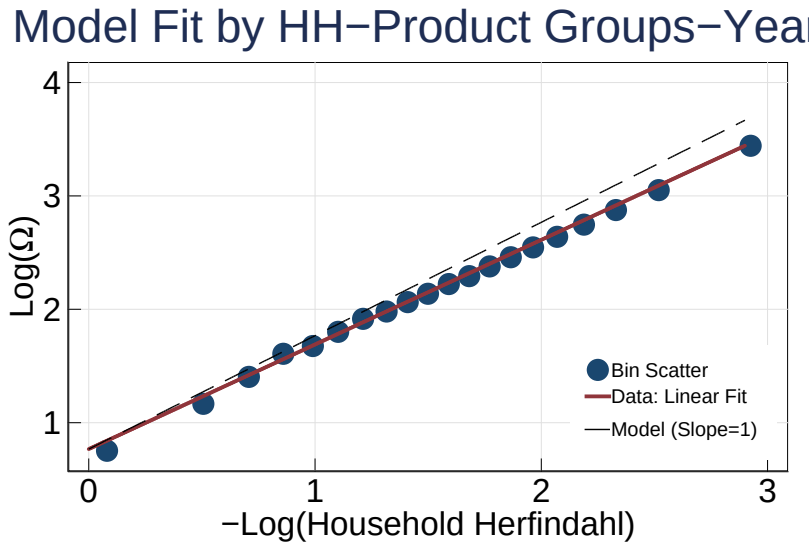
Household Herfindahl

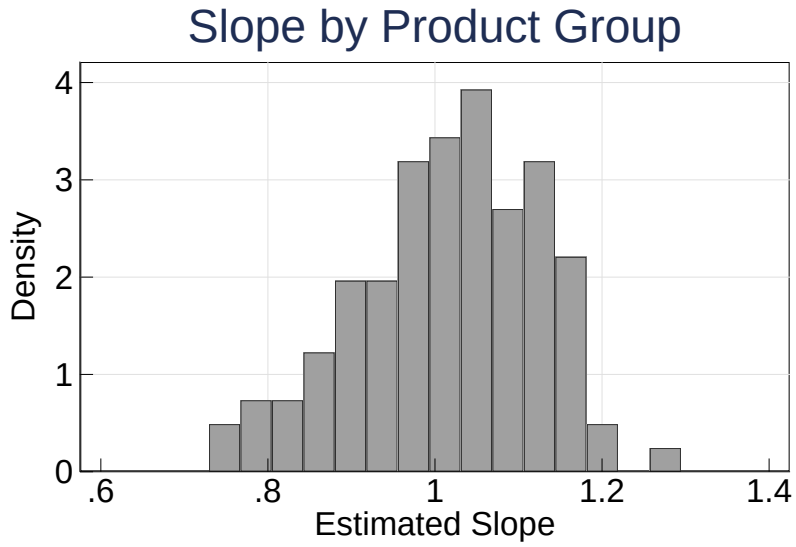
- Closed-form solution for Household Herfindahl:

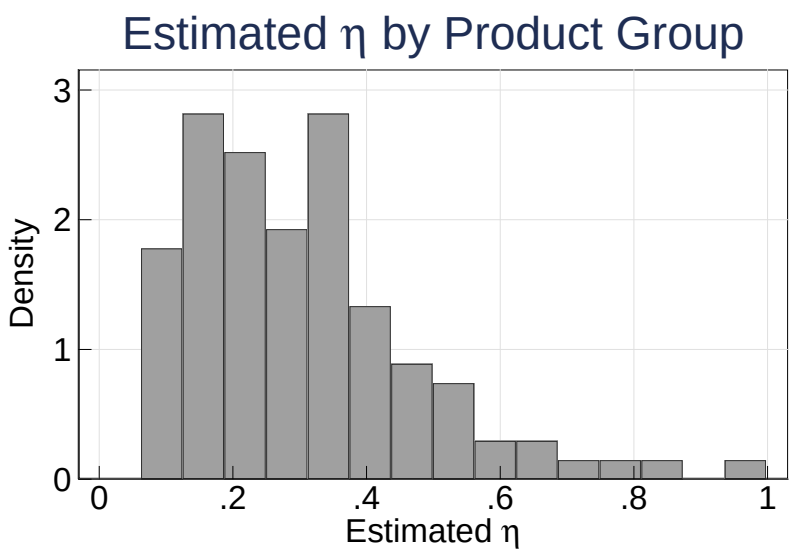
$$\begin{aligned}\mathcal{H}^{\mathsf{HH}} &= N\int_{\tilde{\gamma}_i^*}^{\infty}\left(P_i\tilde{\gamma}_{i,k}\right)^{2(\sigma-1)}dG\left(y\right)\\ &= \frac{\left(\eta+1\right)^2}{4\eta}\frac{1}{|\Omega|},\end{aligned}$$

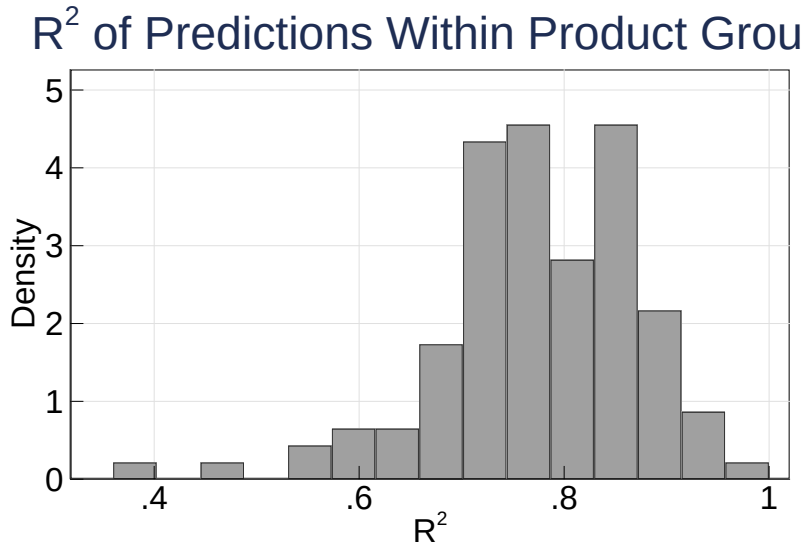
where $\eta = 1-2\left(\sigma-1\right)/\theta \in (0,1)$.

How Does this Fit the Data?









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Rank Function

- All HHs same # varieties $|\Omega|$, price P, and shares $(P\tilde{\gamma}_{i,k})^{\sigma-1}$, but Chobani may have large $\tilde{\gamma}$ for some HHs and not others
- Assume each HH "ranks" products from favorite to least:

$$r_{i,j} = (1-\alpha)\, j + \alpha x_{i,j},$$

  $j \in [0, N]$ is common, $x_{i,j} \sim U[0, N]$ is idiosyncratic taste

- If $\alpha = 0$, we have representative HHs
- If $\alpha > 0$, HHs like different products

Key Cutoffs

- Goods $j \in (0, j^*]$ have positive spending, where:

$$j^* = \left(2\alpha|\Omega|N/\left(1-\alpha\right)\right)^{\frac{1}{2}}$$

- Goods $j \in (j^*, N)$ are not purchased (i.e. failed products)

- Worst idiosyncratic draw x_j^* yielding positive consumption of j:

$$x_j^* = \left(1-\alpha\right)\left(j^* - j\right)/\alpha$$

Aggregate Market Shares

- Index HHs by their $x_{i,j}$'s and integrate spending shares:

$$s_j = \frac{\frac{1}{N}\int_{x=0}^{x_j^*} E \times s_{i,j}\, dx}{\int_i E\, di} = \frac{\eta+1}{\eta j^*}\left(1-\left(\frac{j}{j^*}\right)^{\eta}\right)$$

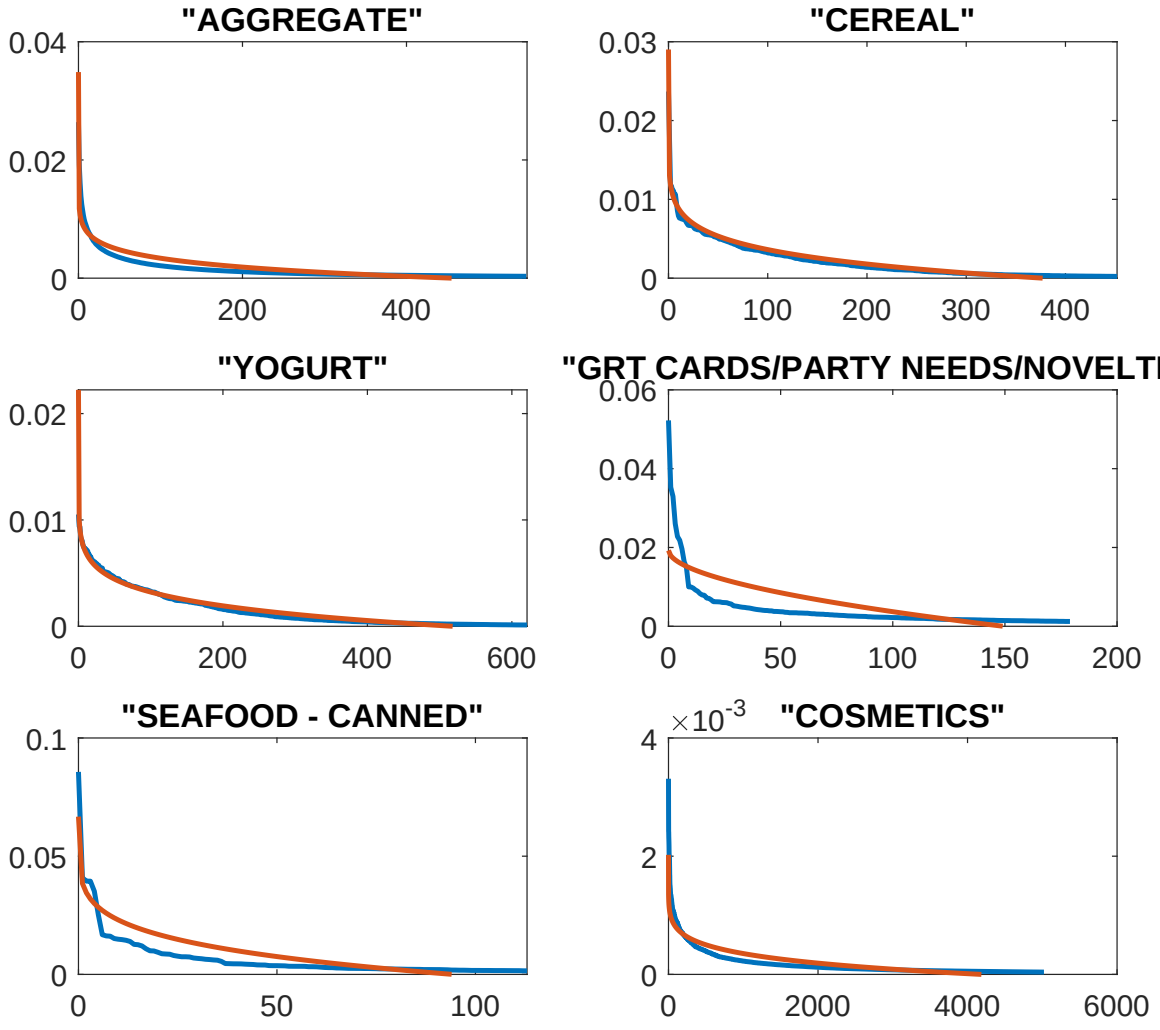
- This gives us the Aggregate Herfindahl:

$$\mathcal{H}^{\text{Agg}} = \frac{2(\eta+1)}{(2\eta+1)}\left(\frac{1}{2\tilde{\alpha}|\Omega|}\right)^{\frac{1}{2}},$$

where we define $\tilde{\alpha} = \alpha N/(1-\alpha)$.

How Does this Fit the Data?

- Given observed $|\Omega|$, pick η and $\tilde{\alpha}$ to match H^{Agg} and $\mathcal{H}^{\text{HH}}$
- Do for overall economy and for each product group:



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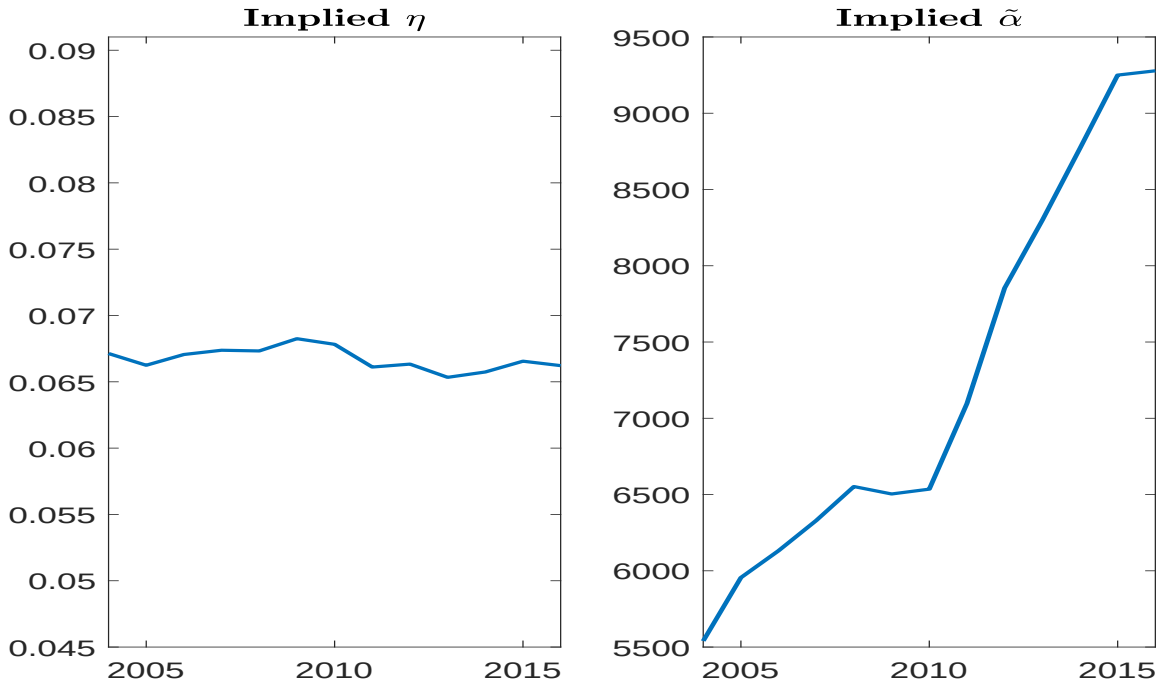
What Does Model Say about Herfindahls Trends?

- Using data on $|\Omega^t|$ and on:

$$\mathcal{H}^{\text{HH,t}} = \frac{(\eta^t + 1)^2}{4\eta^t} \frac{1}{|\Omega^t|} \quad \text{and} \quad \mathcal{H}^{\text{Agg,t}} = \frac{2(\eta^t + 1)}{(2\eta^t + 1)} \left(\frac{1}{2\tilde{\alpha}^t |\Omega^t|} \right)^{\frac{1}{2}} :$$



- η decreased by 1%. $\tilde{\alpha}$ increased by 68%.

What Drove the Rise of Niche Consumption?

- **Conclusion 1**:
  - Matching empirical $\Delta\mathcal{H}^{\text{Agg}} < 0 < \Delta\mathcal{H}^{\text{HH}}$ *requires* $\alpha \uparrow$ or $N \uparrow$
  - Pervasiveness within groups suggests $N \uparrow$ rather than $\alpha \uparrow$

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  - Pervasiveness within groups suggests $N \uparrow$ rather than $\alpha \uparrow$

- **Conclusion 2**:
  - Other shocks required since $N \uparrow$ implies $|\Omega| \uparrow$ (counterfactual)
  - Candidates include increases in ϵ or F

What are the Implications of $N \uparrow$?

- Consider $N \uparrow$ by 68% as calculated above
- Welfare changes from:
  - Love-of-Variety Gains $(|\Omega|)^{\frac{1}{1-\sigma}}$: 1.95%
  - Selection Gains $\left(\frac{|\Omega|}{N}\right)^{\frac{1}{\theta}}$: 9.10%
  - Fixed Cost Losses $(F \times |\Omega|^{\epsilon})$: -1.08%
  - Total $d \ln U$: 10.1%
- Shows up partly in the *Ideal* price index, not measured one

What if We Additionally Match $\mathcal{H}^{\text{HH}} \uparrow$ and $|\Omega| \downarrow$?

- Same $N \uparrow$ plus $\epsilon \uparrow$ 4%?:
  - Love-of-Variety Losses $(|\Omega|)^{\frac{1}{1-\sigma}}$: -3.11%
  - Selection Gains $\left(\frac{|\Omega|}{N}\right)^{\frac{1}{\theta}}$: 11.71%
  - Fixed Cost Losses $(F \times |\Omega|^{\epsilon})$: -0.46%
  - Total $d \ln U$: 7.87%

- Same $N \uparrow$ plus $F \uparrow$ 25%?:
  - Love-of-Variety Losses $(|\Omega|)^{\frac{1}{1-\sigma}}$: -3.11%
  - Selection Gains $\left(\frac{|\Omega|}{N}\right)^{\frac{1}{\theta}}$: 11.71%
  - Fixed Cost Losses $(F \times |\Omega|^{\epsilon})$: -0.83%
  - Total $d \ln U$: 7.46%

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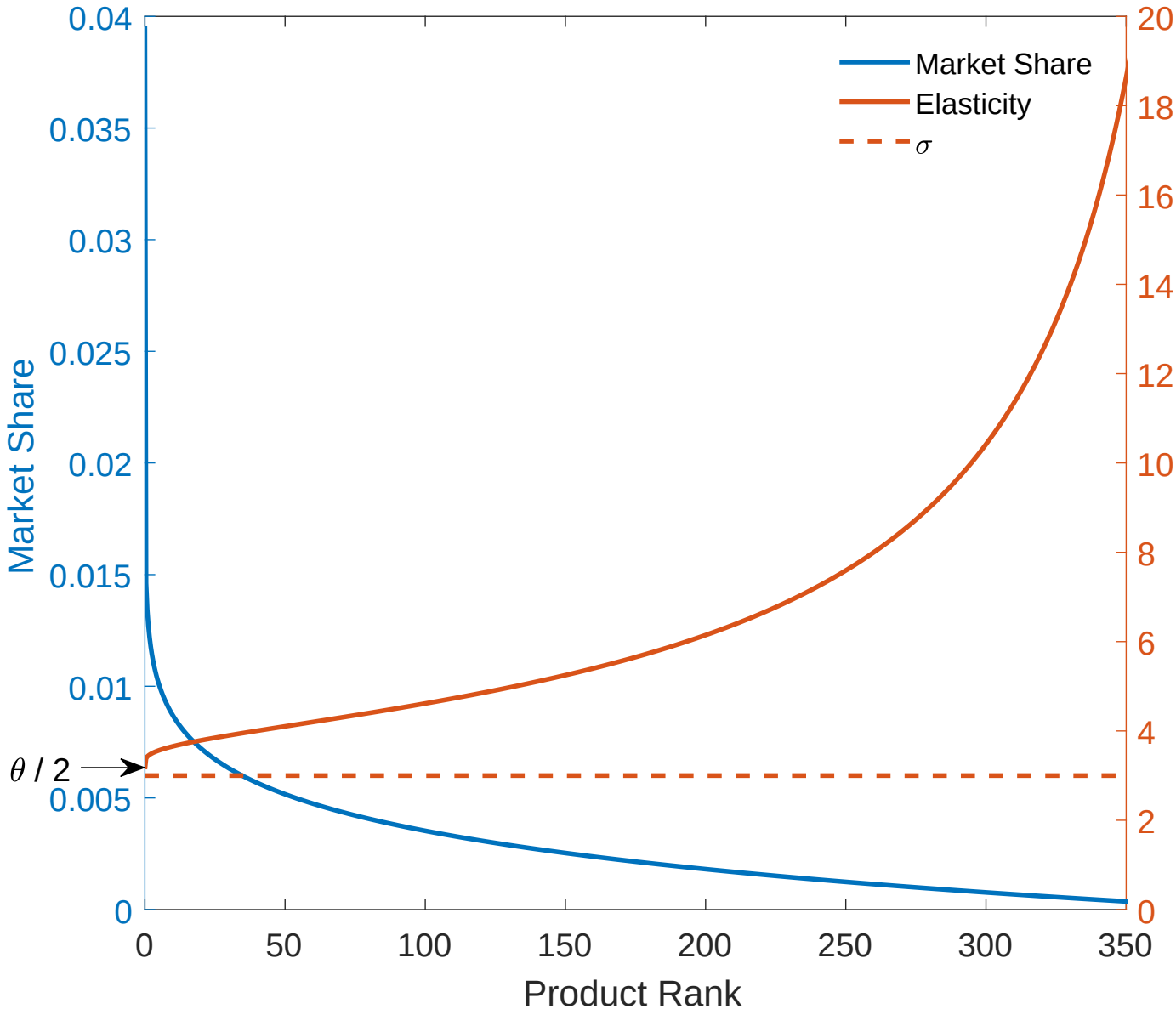
Does Rise in Niche Consumption Affect Market Power?

- Herfindahls classically used to comment on market power
- Unlike standard CES, elasticity of demand reflects intensive *and* extensive margins:

$$\epsilon_j = \underbrace{\sigma}_{\text{Intensive Margin}} + \underbrace{\left(1 - \left(\frac{j}{j^*}\right)^{\eta}\right)^{-1} [\theta/2 - (\sigma - 1)]}_{\text{Extensive Margin}} > \sigma$$

- Extensive margin becomes more important as $j \to j^*$ so markups increase with market share

Approximate Elasticity of Demand for Good j



Will $N \uparrow$ Change Aggregate Profits?

- Define "aggregate" markup, μ^{Agg}, as:

$$\begin{aligned}
\mu^{\text{Agg}} &= \frac{\text{Total Revenues}}{\text{Total Costs}} \\
&= \frac{\int_0^{j^*} s_j dj}{\int_0^{j^*} s_j \frac{\epsilon_j - 1}{\epsilon_j} dj} \\
&= \left[\frac{\theta + (\sigma - 1)^2}{\sigma^2} - \frac{1}{2} \frac{\eta \theta^2}{\sigma^2} \left(\frac{\eta + 1}{2 + \theta} \right) \times {}_2F_1 \left(1, \frac{1}{\eta}; 1 + \frac{1}{\eta}; \frac{2\sigma}{2 + \theta} \right) \right]
\end{aligned}$$

- Note that μ^{Agg} is only a function of σ and θ

- Changes in α, N, F, and ϵ matter for $\mathcal{H}^{\text{HH}}$ or $\mathcal{H}^{\text{Agg}}$ and have distributional impact, but unrelated to "aggregate" markup

Explanation

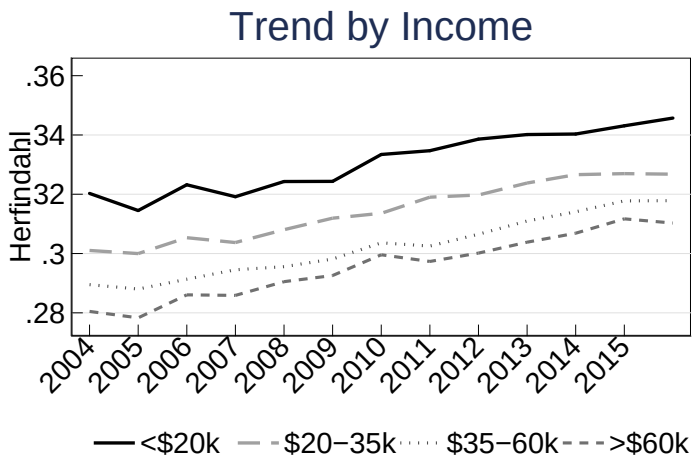
- Math:
  - N only enters s_j and ϵ_j through j^*
  - s_j and ϵ_j only functions of $\frac{j}{j^*}$
  - Since integrate from j to j^*, change of variables shows μ^{Agg} independent of j^*

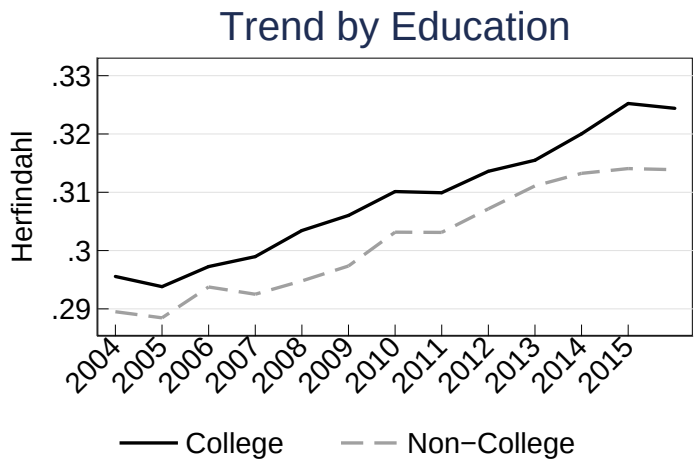
- Intuition:?
  - Two opposing forces exactly cancel
  - Selection Effects $\uparrow$: For fixed j an increase in $j^* \implies$ lower extensive margin, greater market power and $\mu_j \uparrow$
  - Competition $\uparrow$: $j^* \uparrow \implies$ decline in sales and profits for initial high markup items

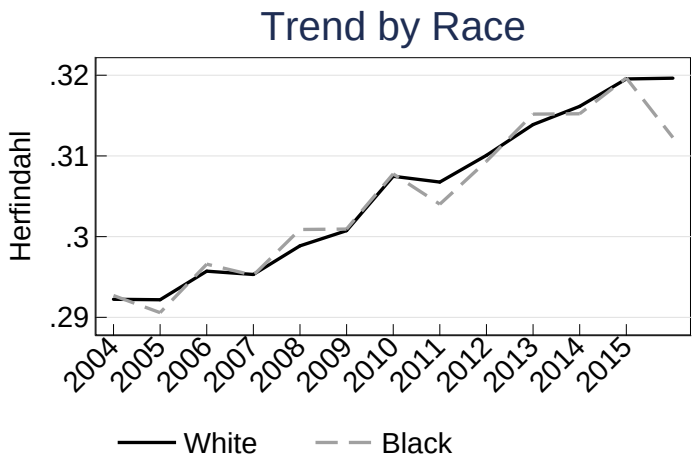
Summary and Next Steps

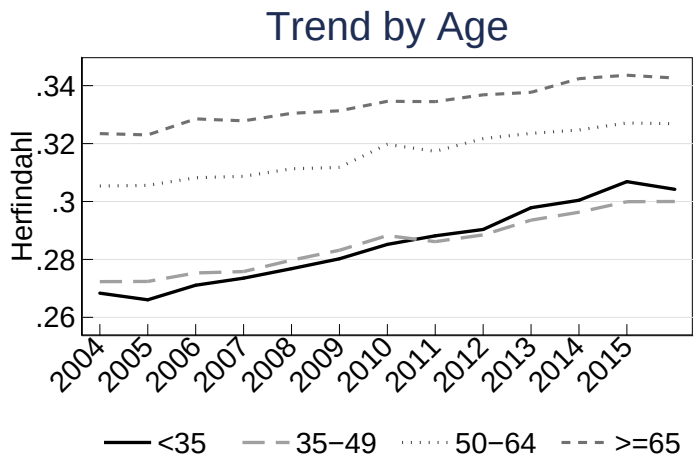
- Increasing importance of niche consumption – HHs are concentrating while the aggregate economy is not
- Model and data suggest key role for increased product entry
- Greater welfare from better product selection (unmeasured)
- Differing importance of extensive/intensive margins imply markup differences across products. Cancel in aggregate.

HH Result Holds Within Demographic Groups

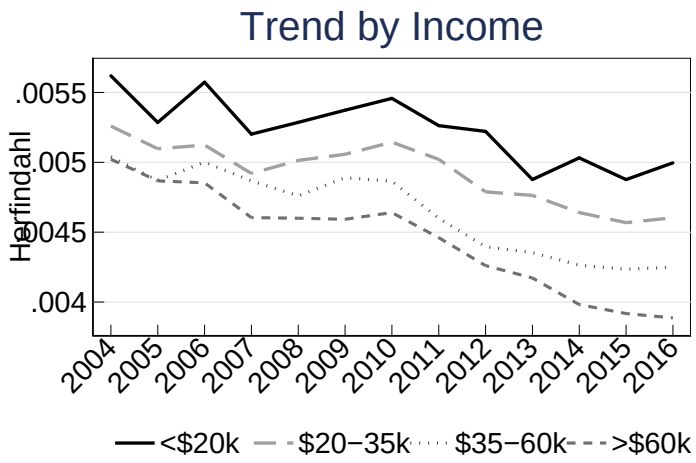


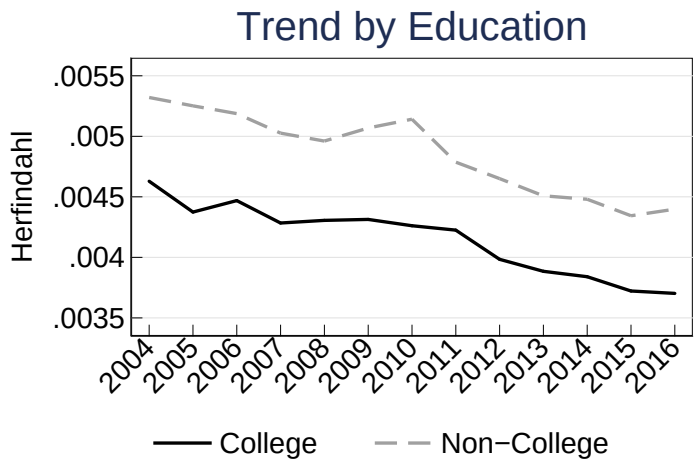


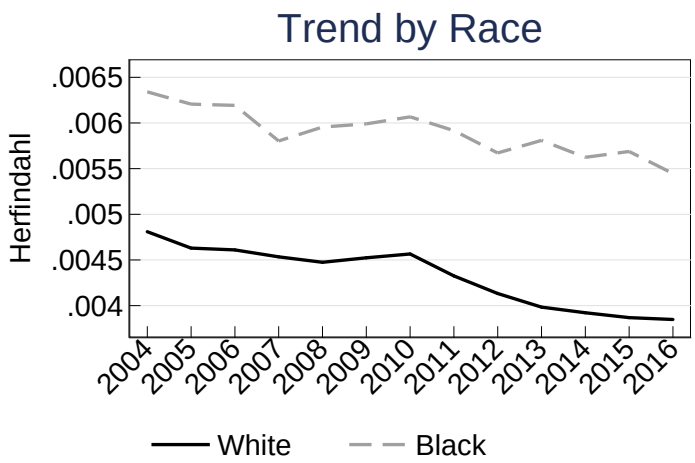


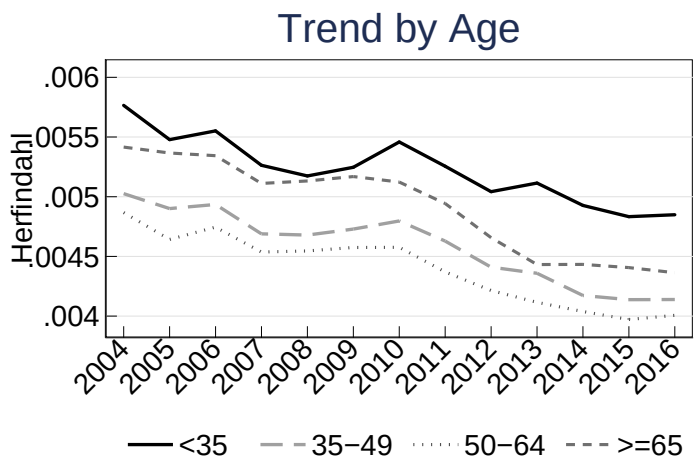


Aggregate Result Holds Within Demographic Groups









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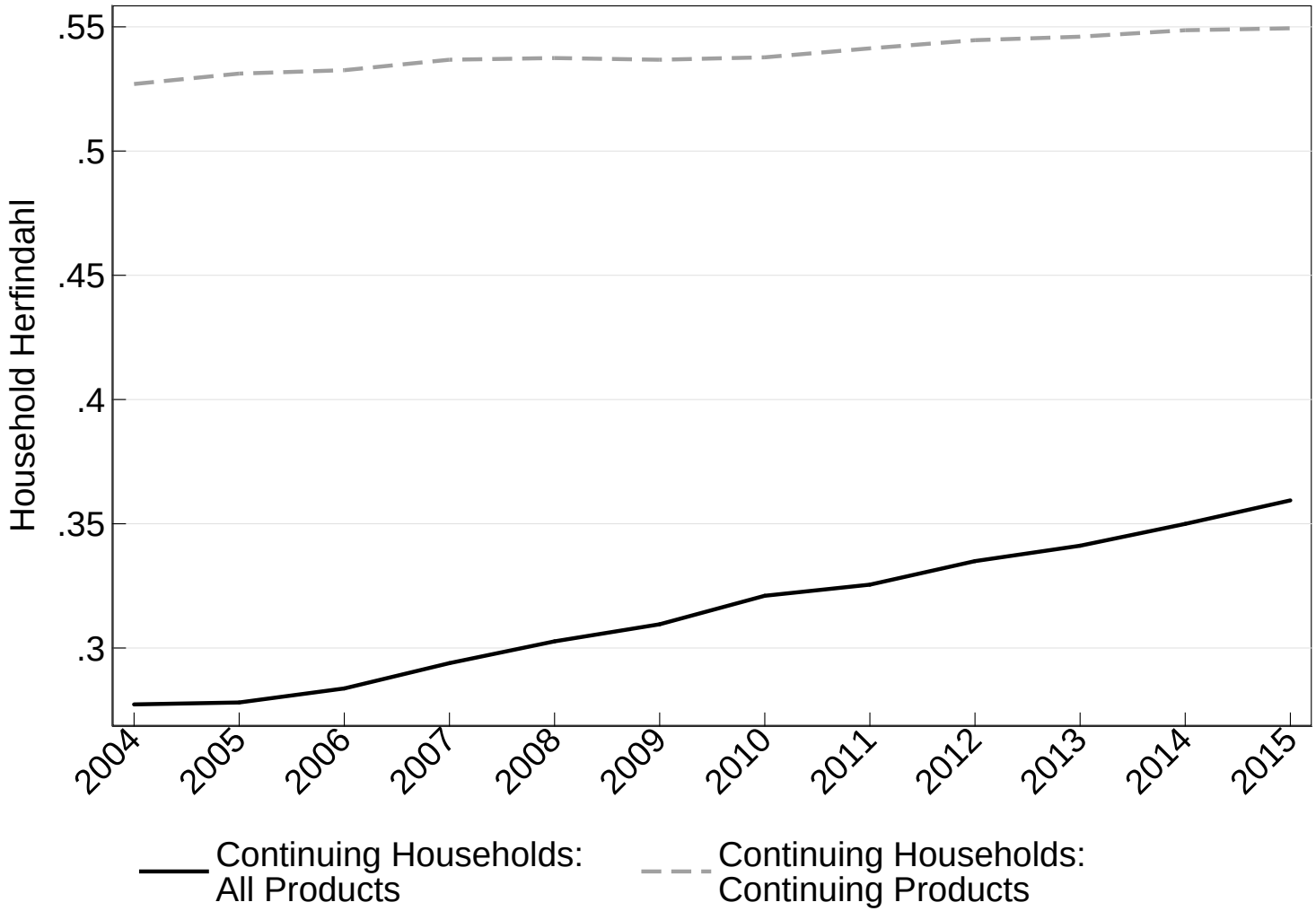
Largely Driven by Extensive Margin (Churning Varieties)



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Online Spending?