Income Fluctuations and Firm Choice

Scott R. Baker, Brian Baugh, Lorenz Kueng

Workshop on New Consumption Data
August 2018

Introduction

How do Households Respond to Income Fluctuations?

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  - Cross-section: *Product choice* (e.g. Engle curve, consumption variety)
  - Spending *changes*
    - Spending *levels* (e.g. excess sensitivity, MPCs)
    - Spending *composition* (e.g. durables v. non-durables)
    - *Timing* (e.g. anticipation, intertemp. substitution, home production)

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This paper:

- Household **retailer choice**: *Where* do households spend?

Learning about Household Retailer Choice

- Importance of household consumption decisions:
  - Stickiness of household preferences for particular retailers
  - Overlap in retailer patronage of low- and high-income households
  - Retailer-specific customer bases and MPCs
  - Systematic shifts between firms with different characteristics: ownership, quality, size, age, labor intensity
- How do households interact with private retailers:
  - Declining number of public firms in US
  - Is there a substantial divergence between public and private retailers?

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Previous work only offers indirect evidence:

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- *Scanner data:* only single retailer (e.g. Safeway) or de-identified firms (e.g. AC Nielsen)

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This paper:

- Transaction-level data!
  - Allows for retailer identification
  - Can link to external company information (e.g. Compustat)
  - Can observe both public and private retailers

Research Question

How does household retailer choice vary?

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1. ... in the cross-section?
2. ... within households as income changes?
3. ... in ways linked to retailer characteristics?

Summary of Results

- New stylized facts on how households allocate spending *across* retailers *within* a category
  - Substantial dispersion in retailer choice, both across & within HHs
  - Frequenting new & different retailers strongly increasing in income
  - Taste for smaller and more local retailers differs markedly by type

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  - Frequenting new & different retailers strongly increasing in income
  - Taste for smaller and more local retailers differs markedly by type
- Retailer choice matters for financial markets & the economy
  - Substitution patterns are correlated with retailer attributes
    - → Systematic substitution between retailers with varying levels of profitability, ownership structures, labor intensity, size
    - → Retailer-specific spending elasticities predict firm betas
    - → Conditional on size, public and private retailers treated similarly

Outline

1. Data
2. Empirical Results
   A. Cross-Sectional Distribution of Retailer Choice
   B. Dynamics of Household Retailer Choice
   C. Retailer Choice and Firm Attributes
3. Conclusion

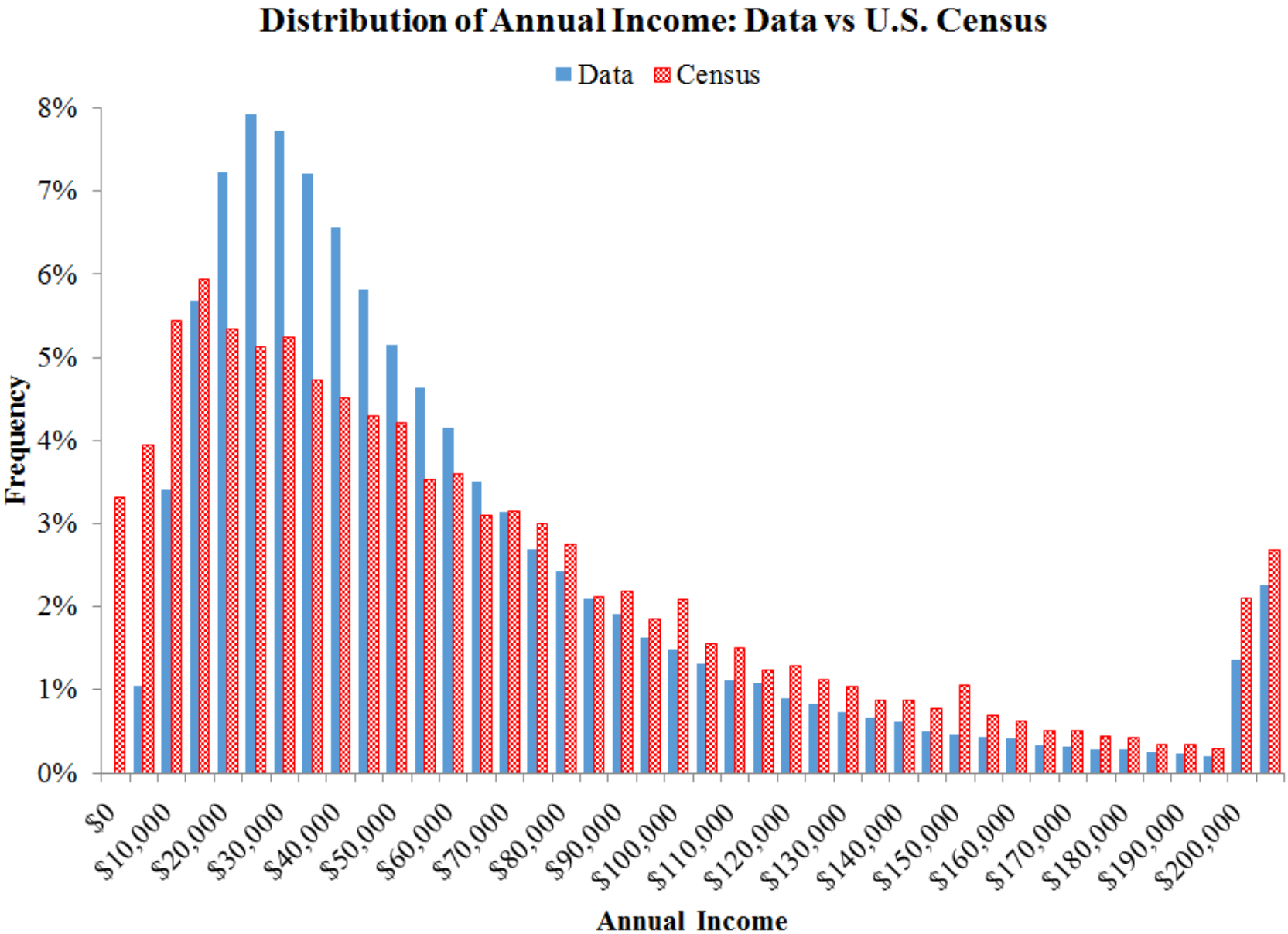
Household Financial Data

- From large online personal financial aggregator
- Over 2 million active users (2010-2015)
- 3 billion unique categorized transactions:
  - Date and time
  - Transaction amount
  - Associated financial account
  - Category
  - Transaction description string

Data Cleaning and Sample Selection

- Require:
  - 3+ years of panel inclusion
  - No excessive unmatched transfers (eg. to unlinked credit cards)
  - Over $5,000 annual observable household income
  - Under $500,000 annual observable household income
- Robust to changes in income thresholds

Data Spans a Wide Household Income Distribution



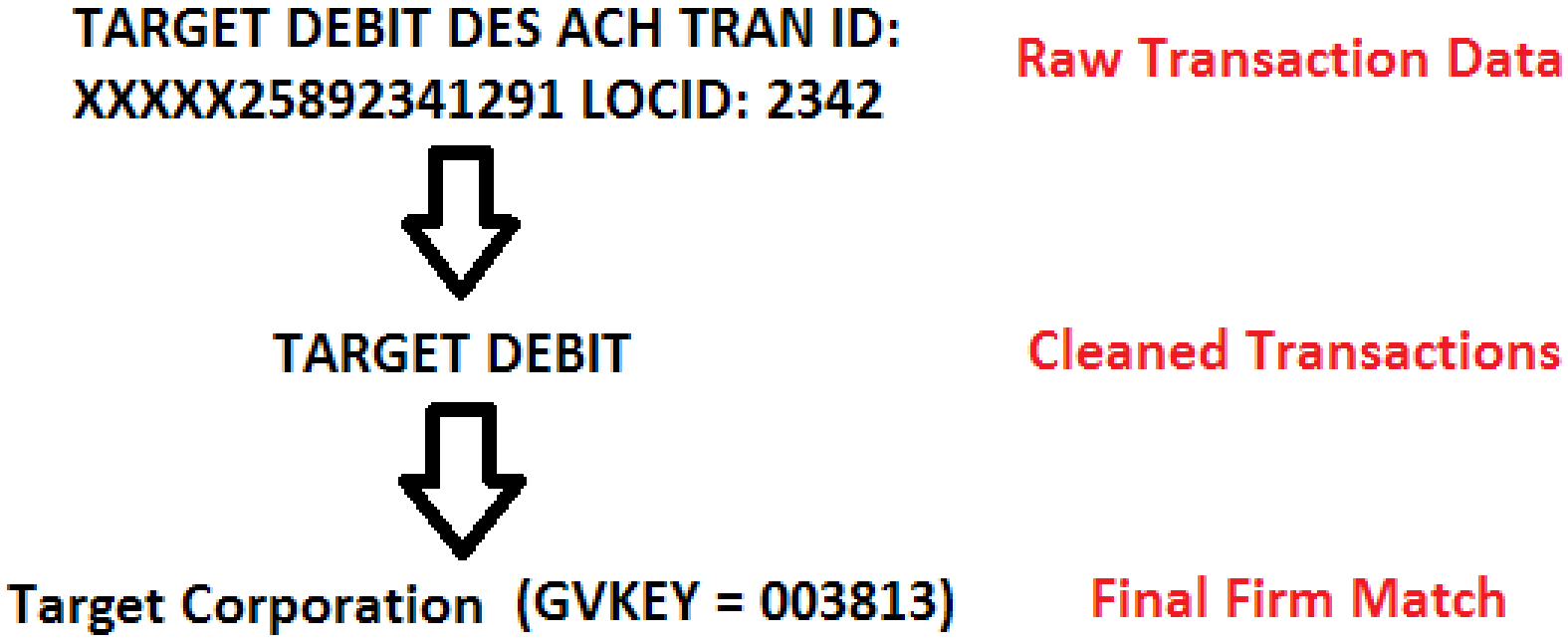
Focus on Four Retail Categories

	Mean	Std. Dev
Monthly Income	\$5,114	\$4,616
Monthly Retail Spending		
Clothing	\$109	\$221
General Merchandise	\$317	\$404
Restaurants	\$127	\$149
Groceries	\$240	\$328

Match Transactions to Firms Using Text Descriptions

- Transaction descriptions contain information on retailer names
- Use range of techniques to map transactions to firms:
  - Remove common text (eg. 'Inc', 'ACH', 'XXXX') and punctuation
  - Categorical (eg. provider-derived spending categories)
  - Alphabetical (eg. Levenshtein distance)
  - Hand matching
- Match approximately 300 publicly-traded retailers and 700 private retailers

From Transaction Description to Compustat



Substantial Cross-sectional Variation in Retailer Choice

	Agg.	Groc.	Rest.	General	Clothes
Transactions	21.3	5.1	9.0	5.7	1.5
Unique Retailers	11.6	2.1	5.8	2.6	1.0
New Retailers	3.3	0.4	1.8	0.6	0.5
Average 'Size' ('000)	2,926	1,978	2,485	4,400	530

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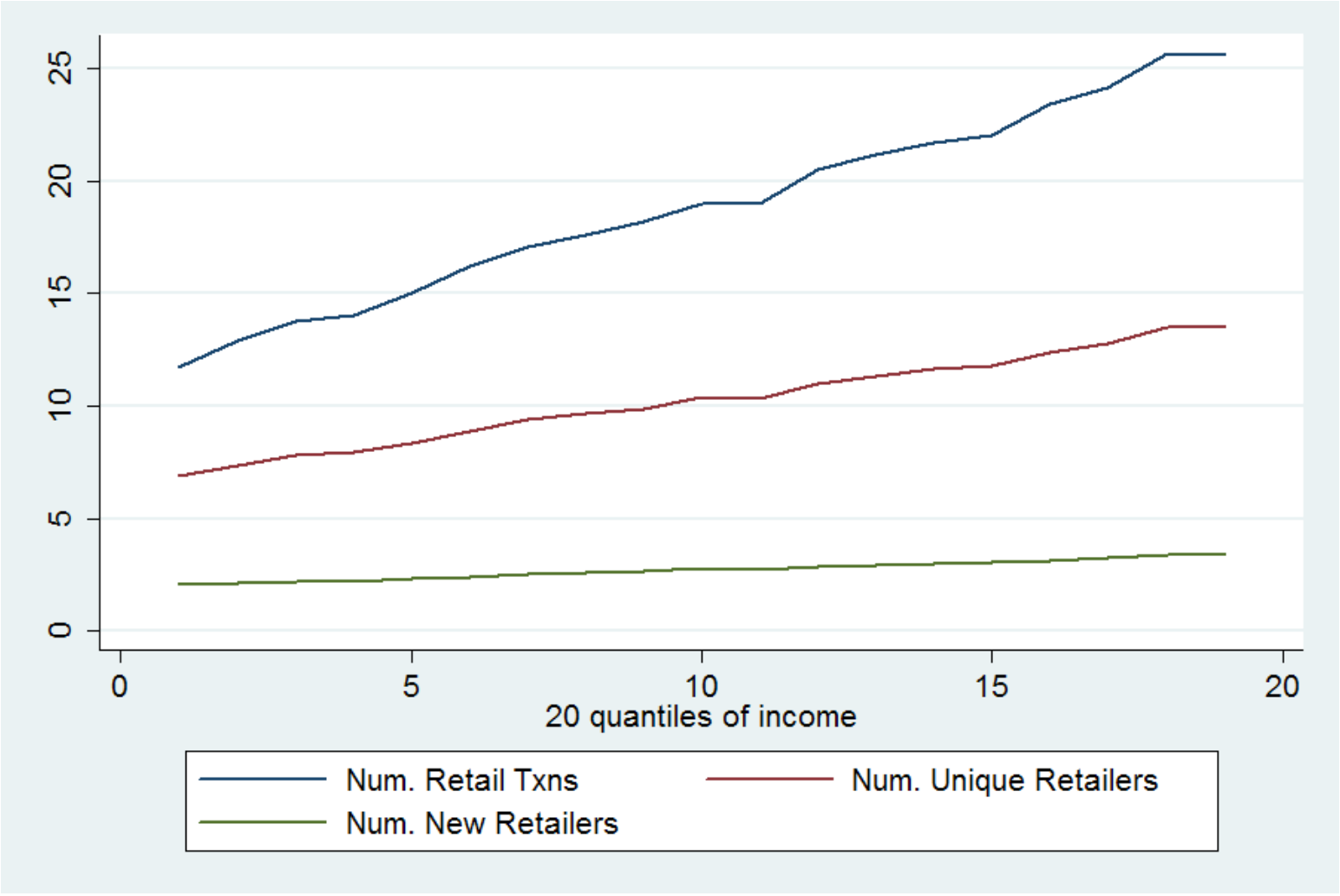
To what extent do households of varying incomes differ in their retailer choices?

Income Predicts Variety in Retailer Choice

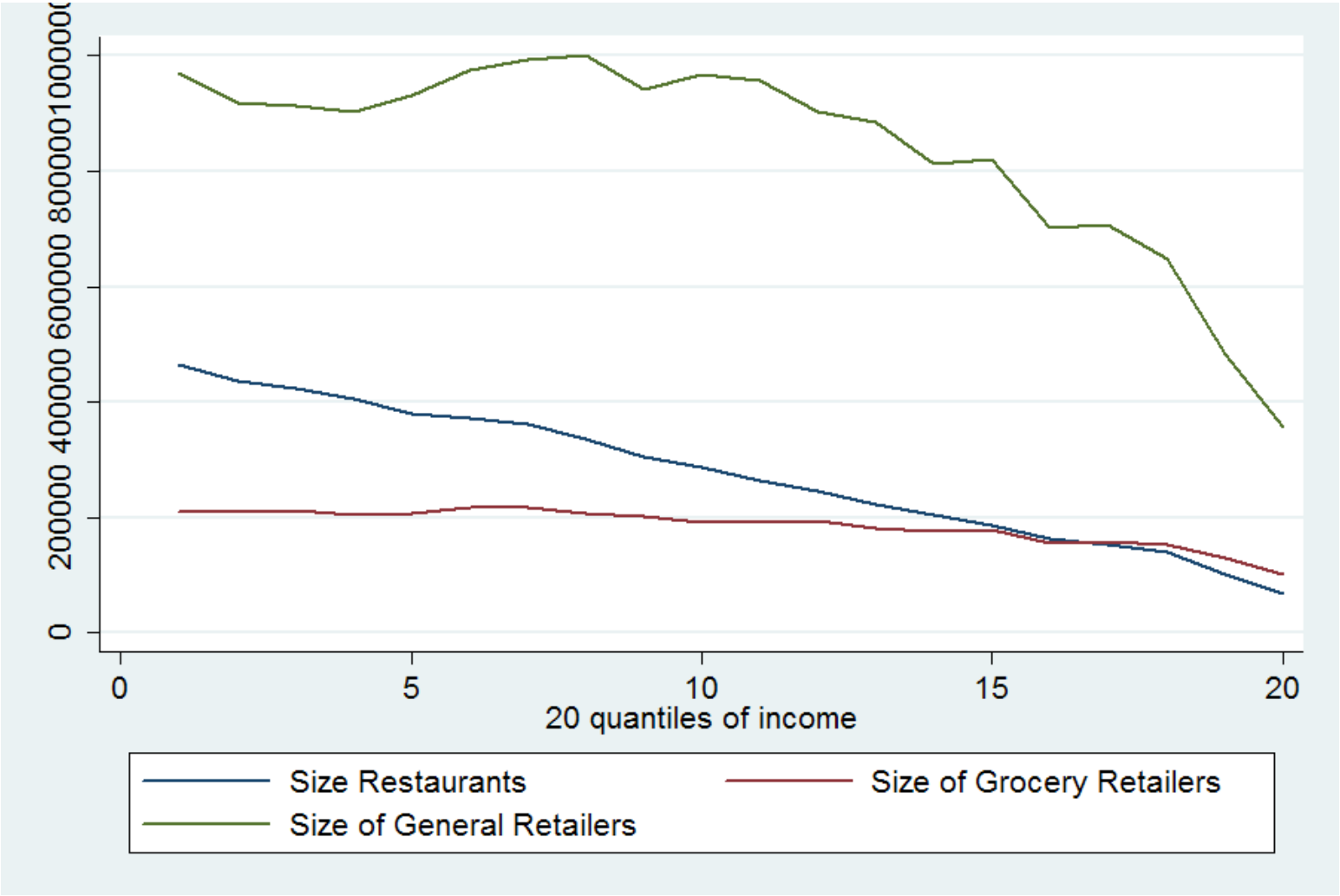


Richer households show higher levels of shopping trips, numbers of unique retailers, and numbers of new retailers

Richer Households Move Towards Smaller Retailers

Average dollar for richest decile goes to a retailer 70% smaller than for the bottom decile

Significant Heterogeneity in Size by Category



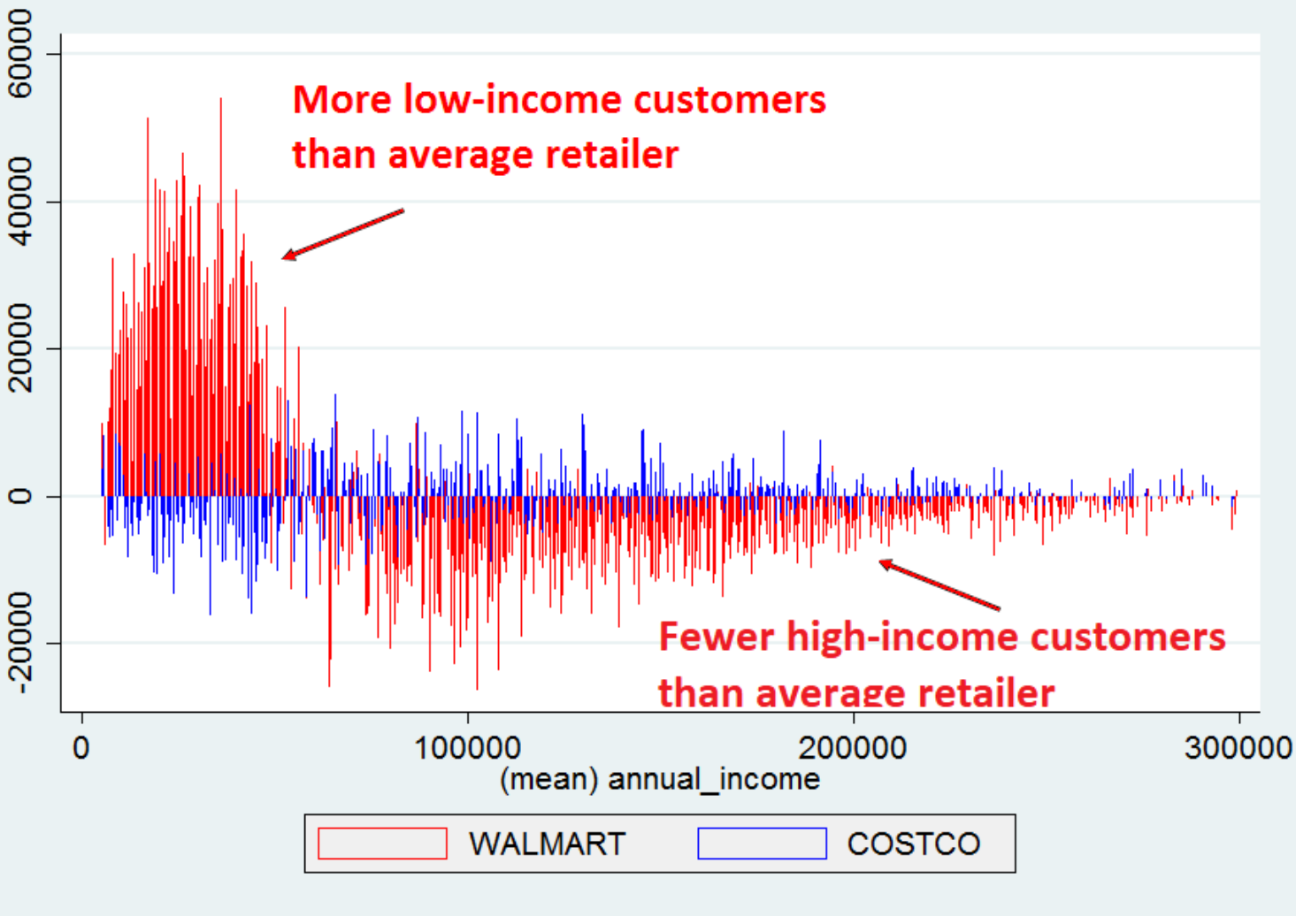
Richer households substitute towards 'smaller' restaurants and general retailers but less variation in grocery spending

Disparate Retailer Choices?

- Households with different levels of income shop quite differently:
  - Richer households shop at a wider range of stores
  - Richer households visit smaller retailers in most categories
  - Richer households tend to try new retailers more often

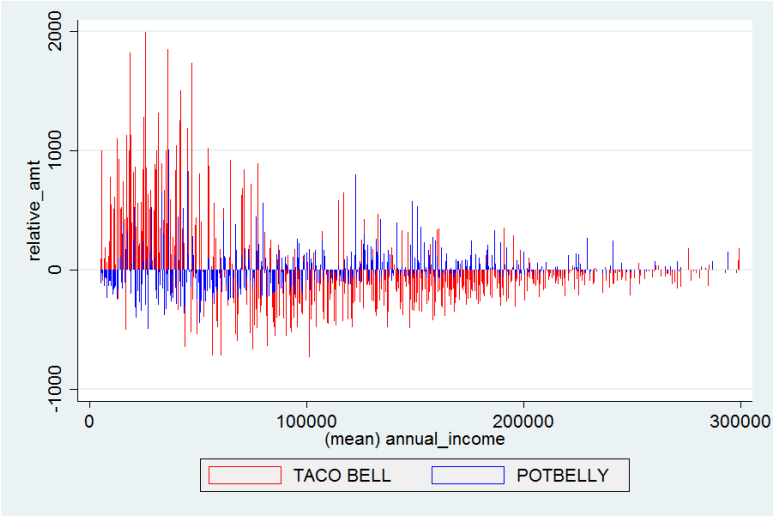
Does this variation manifest as segregation in customer bases?

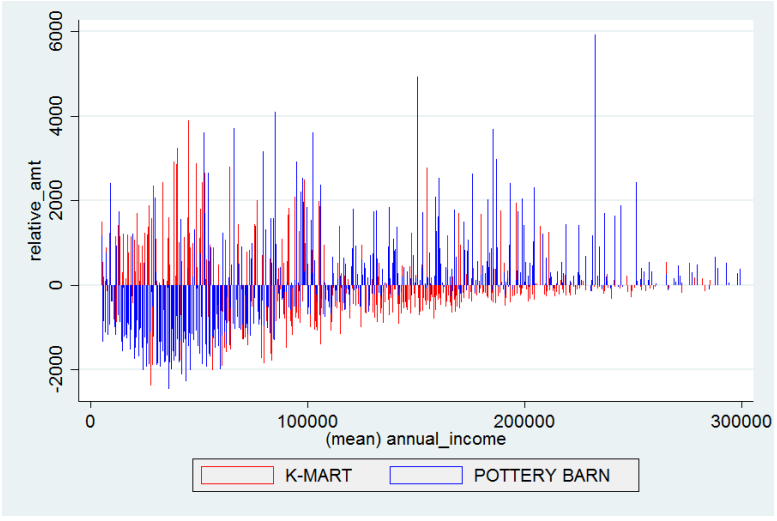
Variation in Retailer-Specific Customer Bases

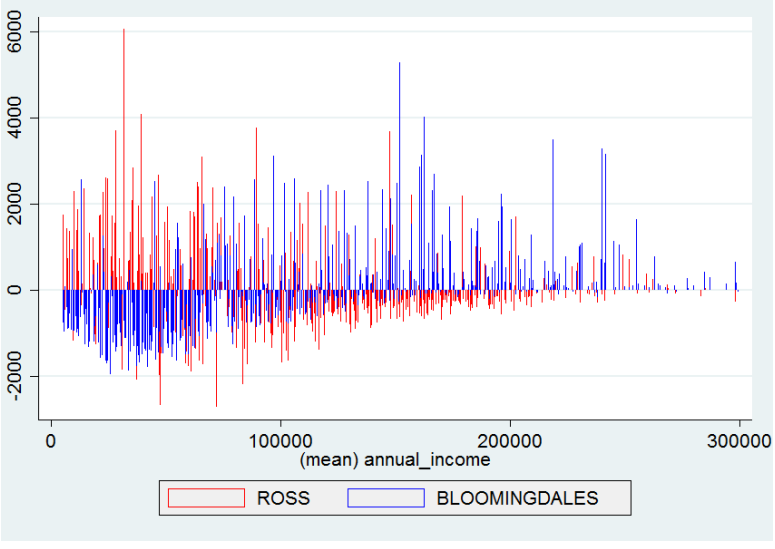


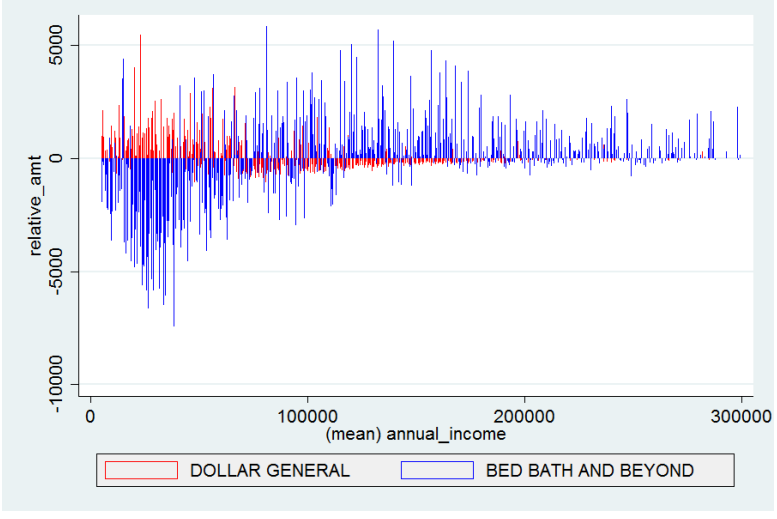
Can easily identify retailers with relatively high- and low-income customer bases

Differences Hold Across Many Retailers









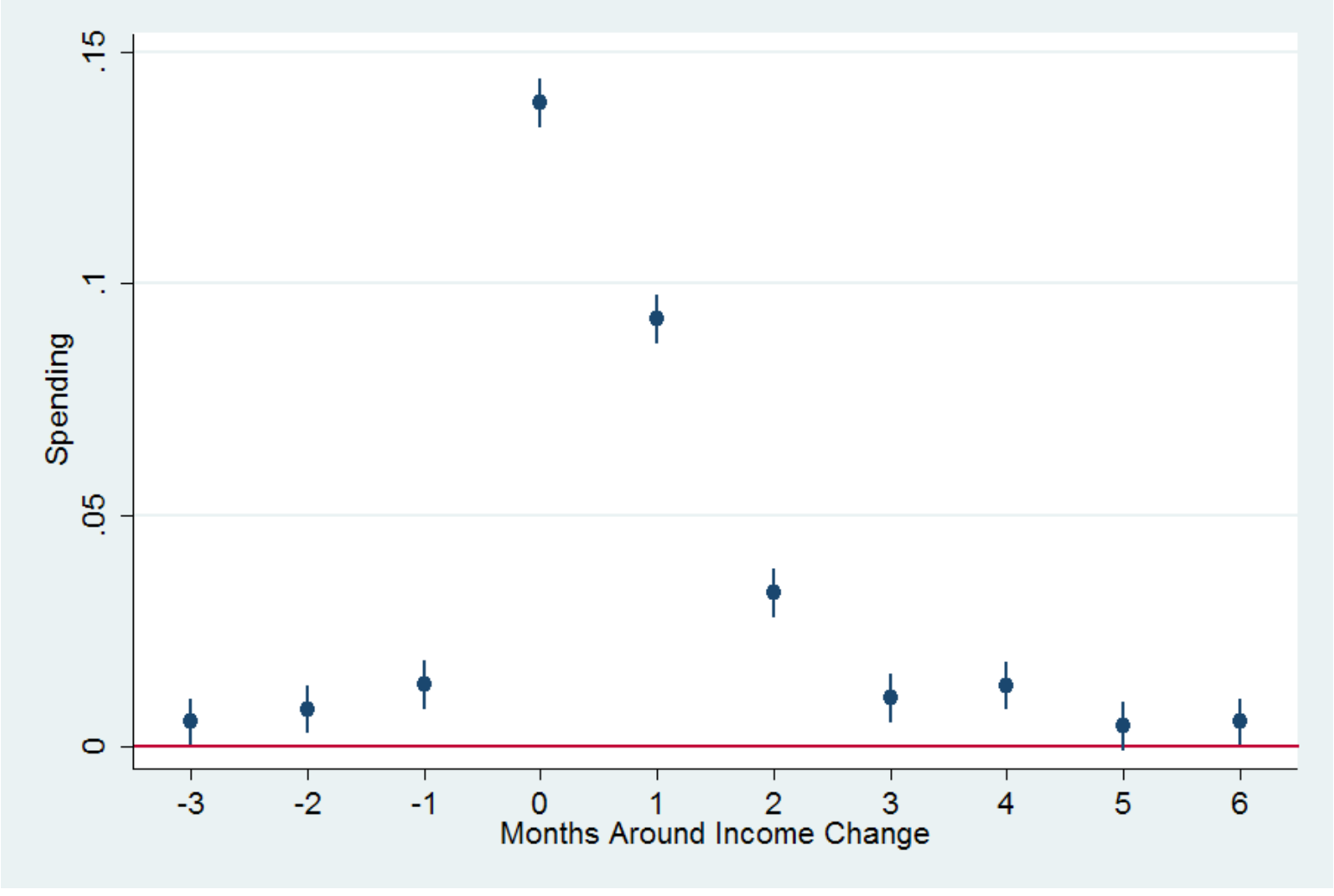
New dimension of much-studied 'consumption inequality'

Elasticity of Household Retailer Choice

- Cross-sectional differences can be driven by household demographics, idiosyncratic preferences, or geographical location
- Data allows us to observe changes in retailer choice *within* an individual household
- Do households adjust retailer choice in response to changes in household income?

Retail Responses Consistent with 'Typical' MPCs

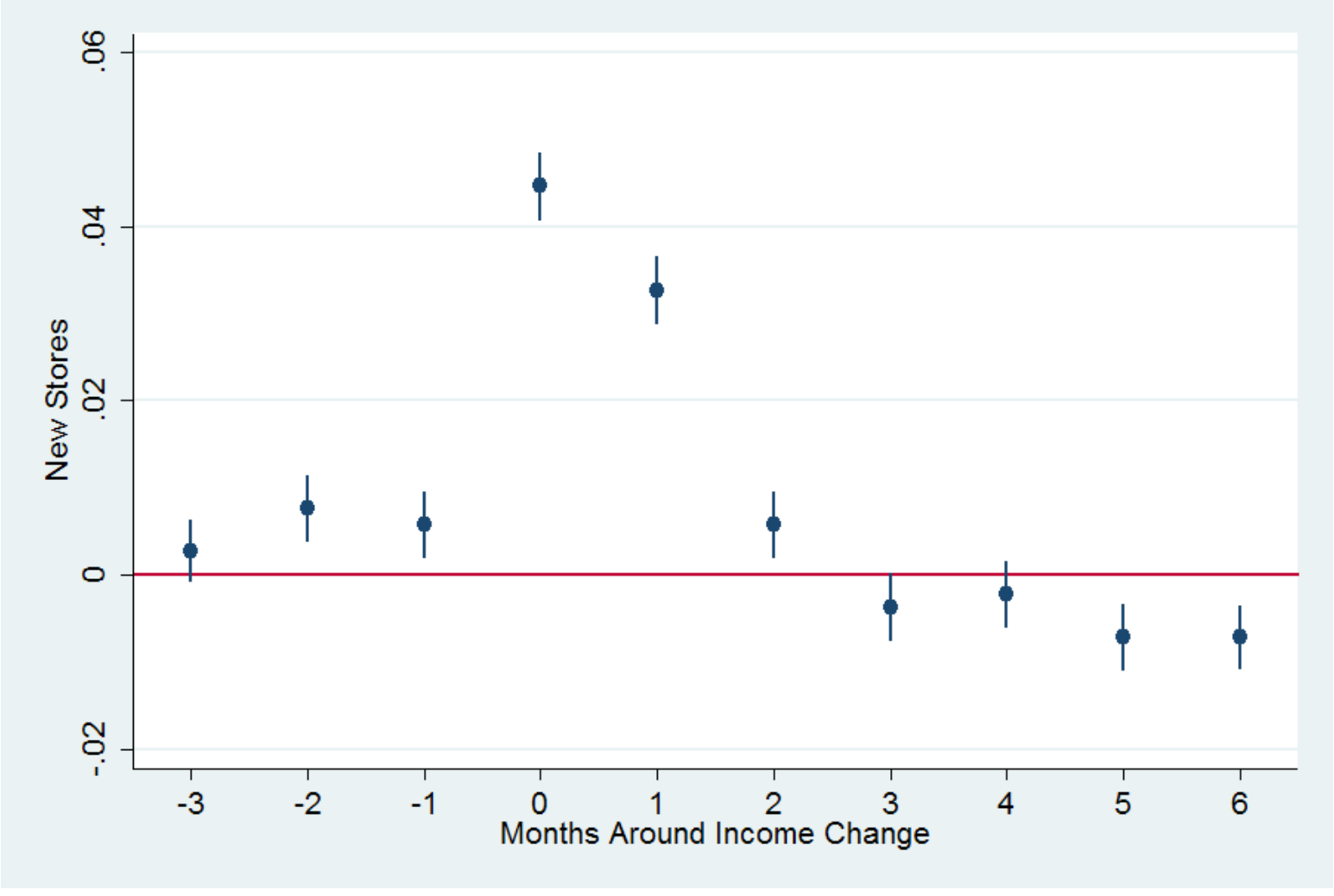
$$\ln(\text{spending})_{it} = \sum_s \beta_s \ln(\text{income})_{i,t-s} + \alpha_i + \gamma_t + \epsilon_{it}$$



Similar short-run elasticities as in previous work: 30% within quarter

Can Measure Experimentation with New Retailers

$$\ln(\text{spending at new stores})_{it} = \sum_s \beta_s \ln(\text{income})_{i,t-s} + \alpha_i + \gamma_t + \epsilon_{it}$$



Fraction spent at new retailers is approximately 25% of marginal spending

Store Choice Broadens After Income Increases

Unique Stores Response by Category

VARIABLES	(1) Rest	(2) Groceries	(3) Gen Merch	(4) Clothes
ln(Income)	0.0903***	0.0365***	0.0600***	0.0326***
	(0.000995)	(0.000806)	(0.000847)	(0.00103)
Observations	1,147,533	1,033,315	1,117,286	672,918
R^2	0.582	0.448	0.443	0.258
Year-Month FE	YES	YES	YES	YES
Household FE	YES	YES	YES	YES

Households widen the set of retailers they visit as their income increases

Implications of Household Retailer Choice

Why should we care about retailer choice?

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- Retailers are not indistinguishable!
- Each retailer is a bundle of attributes:
  - Ownership structure (private/public)
  - Profitability
  - R&D intensity
  - Labor intensity
  - Import intensity
  - Leverage
  - etc.

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  - Leverage
  - etc.
- Other financial market implications

Does Retailer Choice Align With Firm Attributes?

Supposing that:

1. Shifts in retailer choice occurs along a consistent gradient (eg. firm quality)
2. Retailer attributes vary systematically along that gradient

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Aggregate shifts in HH income $\rightarrow$ Amplify or diminish macro trends

Retailer Choice Varies with Firm Attributes

Panel A: **Fraction Public**					
	Agg	Rest	Groceries	Gen Merch	Clothes
ln(Income)	0.00505***	-0.0506***	-0.00830***	-0.0333***	-0.0259***
	(0.000899)	(0.00117)	(0.000990)	(0.00101)	(0.00173)
R^2	0.445	0.297	0.682	0.226	0.461
Panel B: **Profitability**					
	Agg	Rest	Groceries	Gen Merch	Clothes
ln(Income)	0.0282***	0.0192***	0.00861***	0.00122	-0.000796
	(0.000956)	(0.00125)	(0.00114)	(0.00101)	(0.00186)
R^2	0.288	0.272	0.656	0.282	0.279
Panel C: **R&D Intensity**					
	Agg	Rest	Groceries	Gen Merch	Clothes
ln(Income)	0.0334***	0.00960***	-0.00428***	0.0313***	0.00239
	(0.000933)	(0.00129)	(0.00163)	(0.000965)	(0.00206)
R^2	0.344	0.253	0.439	0.369	0.157
Panel D: **Advertising Intensity**					
	Agg	Rest	Groceries	Gen Merch	Clothes
ln(Income)	0.0315***	0.00933***	-0.00321***	0.0380***	0.00547***
	(0.000967)	(0.00127)	(0.00117)	(0.000980)	(0.00181)
R^2	0.294	0.270	0.673	0.336	0.346
Panel E: **Betas**					
	Agg	Rest	Groceries	Gen Merch	Clothes
ln(Income)	0.0143***	0.0168***	0.0106***	0.0263***	0.0198***
	(0.000875)	(0.00125)	(0.00115)	(0.000894)	(0.00182)
R^2	0.423	0.251	0.688	0.444	0.374
Observations	4,623,454	3,085,676	2,682,893	4,325,129	2,439,531
Year-Month FE	YES	YES	YES	YES	YES
Household FE	YES	YES	YES	YES	YES

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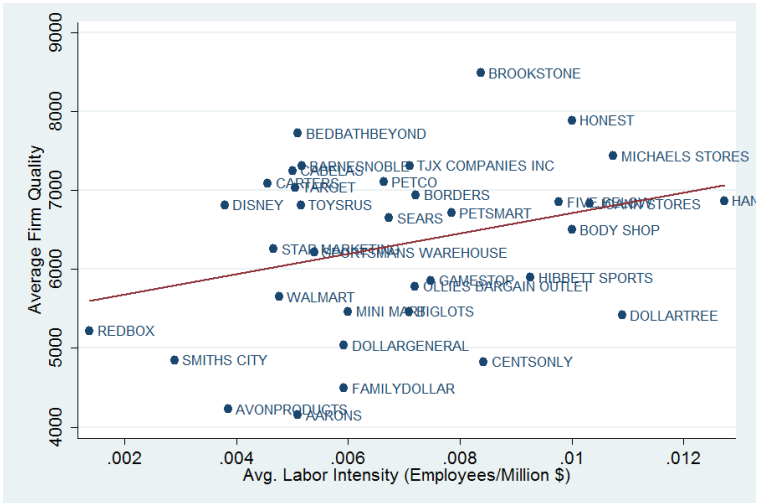
Macroeconomic Effects? Example: Labor Intensity

VARIABLES	(1) ln(LI) - Agg	(2) ln(LI) - Groc	(3) ln(LI) - Rest	(4) ln(LI) - General	(5) ln(LI) - Clothes
ln(Income)	-0.0298***	0.00603***	0.0194***	0.0197***	-0.00606***
	(0.000998)	(0.00102)	(0.00132)	(0.00104)	(0.00200)
Observations	2,551,481	1,439,880	1,726,420	2,323,468	886,026
R^2	0.346	0.666	0.281	0.373	0.270
Year-Month FE	YES	YES	YES	YES	YES
Household FE	YES	YES	YES	YES	YES

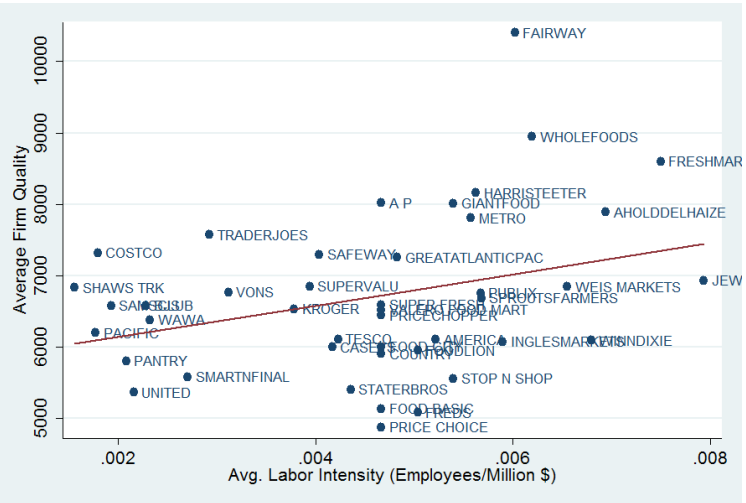
As income increases, households tend to shift to more labor intensive retailers in most categories, with effects growing over time

Mechanism: Firm Quality?

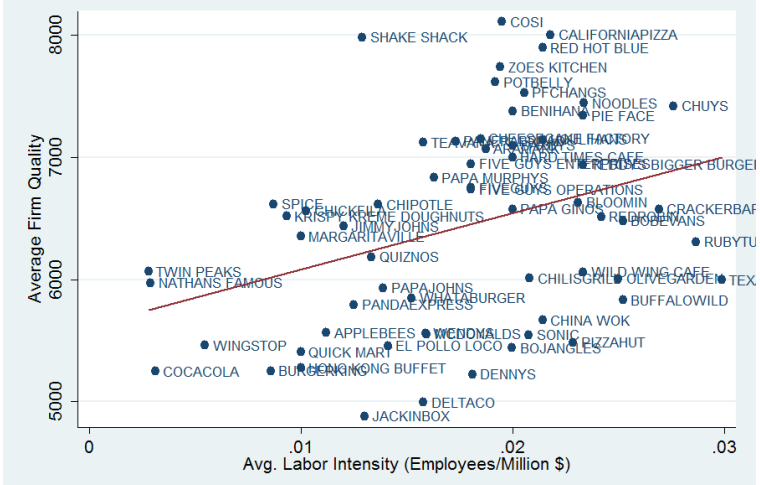
General Merch



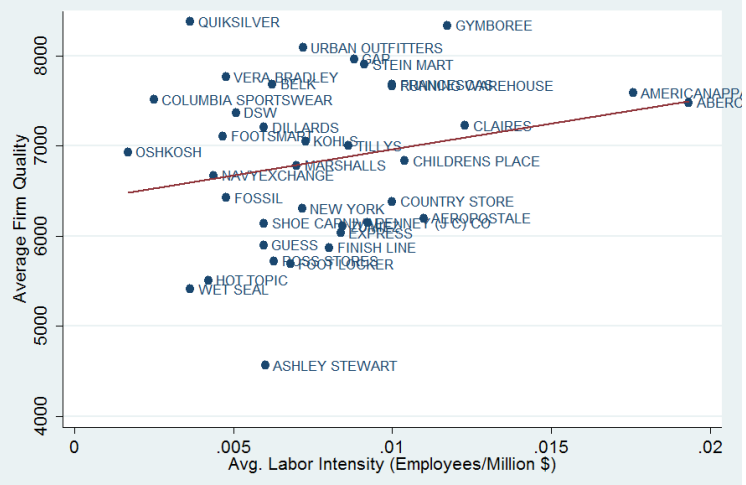
Groceries



Restaurants



Clothing



Higher quality retailers tend to be more labor intensive

Aggregate Labor Intensity

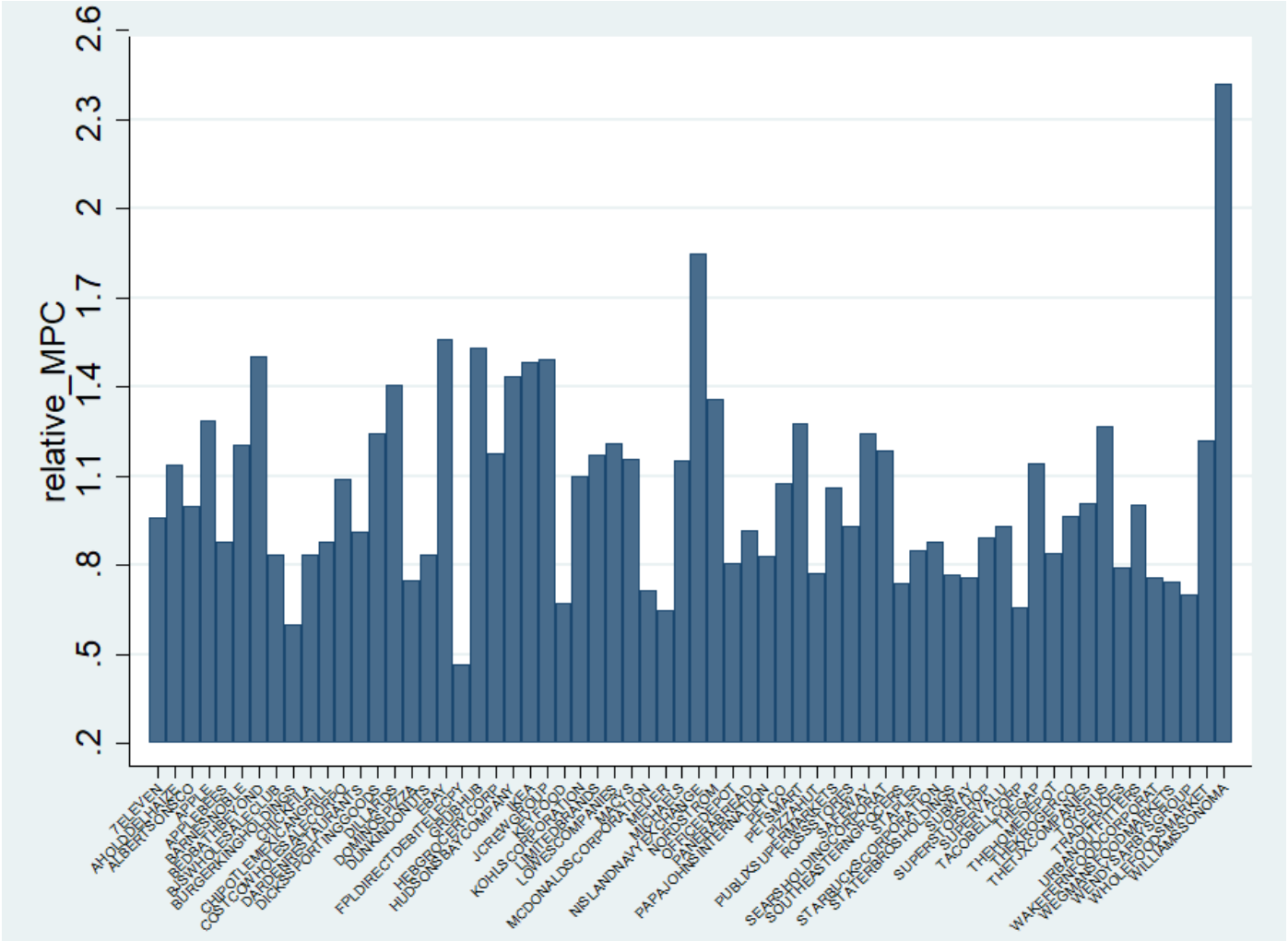
How big is this effect?

Aggregate Labor Intensity

How big is this effect?

- If household income doubles, one year later labor intensity has:
  - *increased* by 13% for restaurants
  - *increased* by 6% for general merchandise
  - *increased* by 0.5% for groceries
  - *decreased* by 8% for clothing

Explaining Firms' Revenue Volatility



Some Firms Systematically Better at Retaining Customer Dollars: Persistent firm-specific factors explain much of firms' revenue volatility

Firm-Specific MPCs for Public and Private Firms

VARIABLES	(1) MPC	(2) MPC	(3) MPC	(4) Beta	(5) Beta	(6) Beta
Public	-0.173***	-0.169***	-0.0174	-0.116***	-0.138***	-0.0209
	(0.0648)	(0.0649)	(0.0715)	(0.0255)	(0.0239)	(0.0227)
ln(Revenue)			-0.0371			-0.0785***
			(0.0269)			(0.00868)
Firm Quality			0.725***			0.641***
			(0.113)			(0.0344)
Observations	918	918	918	890	890	890
R^2	0.008	0.034	0.163	0.023	0.167	0.439
Category FE	NO	YES	YES	NO	YES	YES

Conditional on firm size and quality, household elasticity of private retailer spending is similar to that of public firms

Retailer Choice and Firm-Level Risk

- These results support the idea that much of firm-level risk is driven by demand-side factors
- Firm-specific revenue volatility largely driven by retailer choice; not income shocks to particular segments of the population
- Some firms' revenue is particularly sensitive to disruption
- Both public and private firms display a substantial amount of variation on this metric

Conclusion

- Transactional data can give new insights on retailer choice:
  - Corporate Finance
  - Entrepreneurship
  - Macroeconomics
  - Marketing
- We document degree of retailer heterogeneity across households
- We show that income predicts shifts towards greater quality and diversity of retailers within a household
- Given the correlation between retailer choice and retailer attributes, retailer choice can impact financial and economic cycles

THANK YOU!

APPENDIX

Measuring 'Revealed' Firm Quality

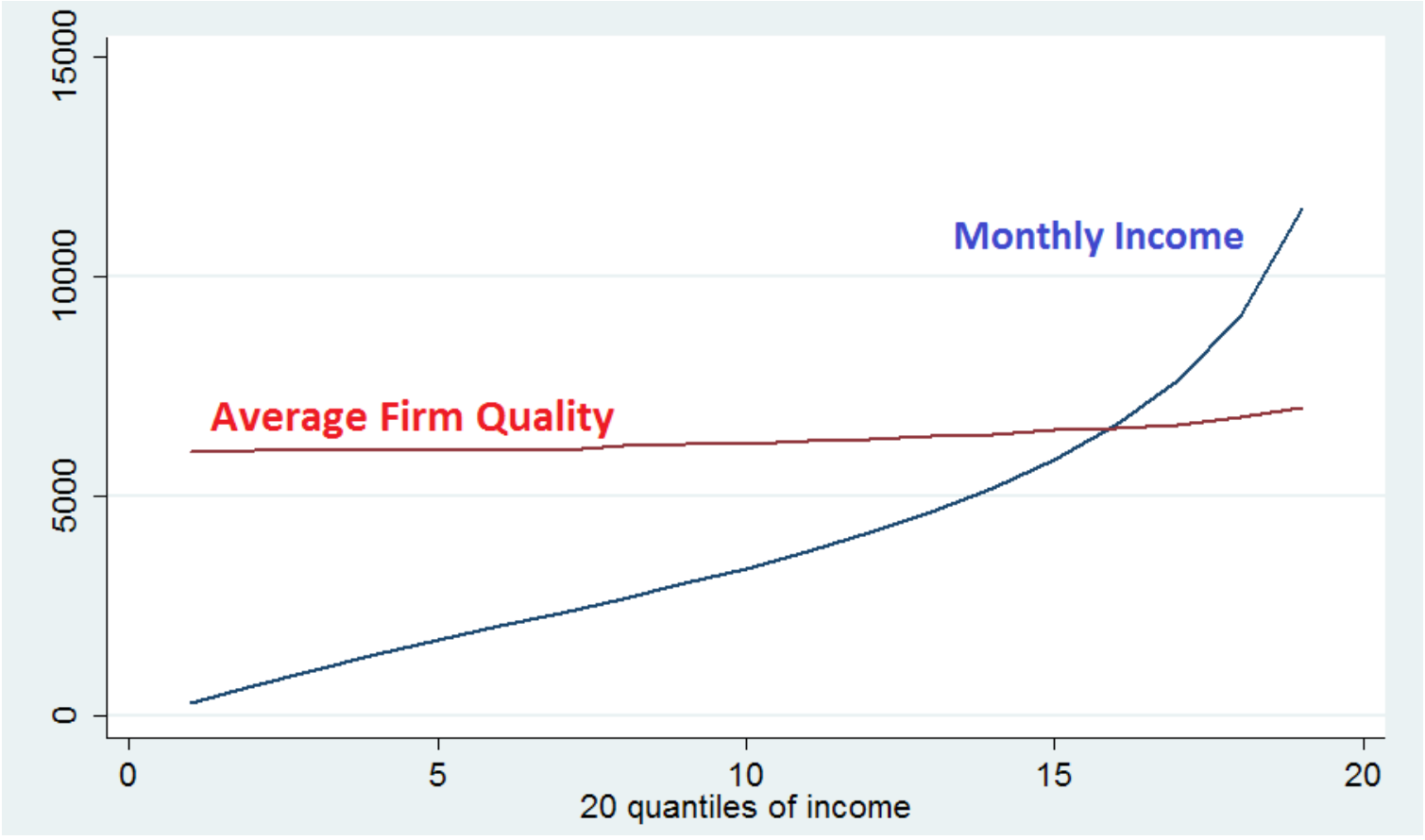
- Use an index of 'revealed' firm quality
- Income of the average (dollar-weighted) customer i at retailer j

$$Q_j = \sum_{i=1}^{N} \omega_{ij} \times Income_i$$

with expenditure weight $\omega_{ij} = \frac{Spending_{ij}}{\sum_{i=1}^{N} Spending_{ij}}$

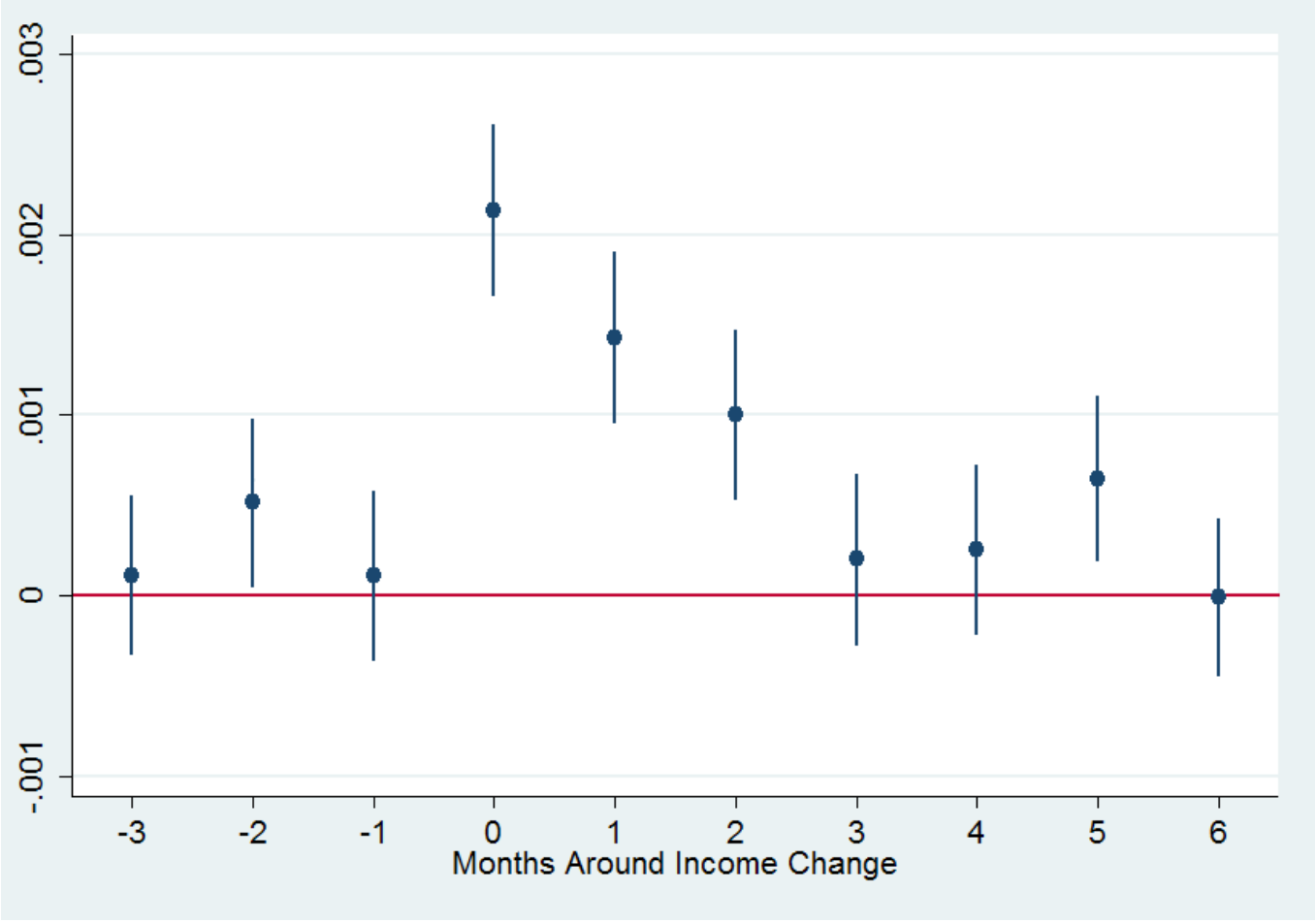
- Benefits of revealed quality approach:
  - Does not rely on matched database (eg. Compustat)
  - Obtainable for all retailers/transactions in our sample
  - Correlates strongly to observable prices

Income Cross Section - Firm Quality



Monotonic, but weak, relationship between revealed firm quality and income

Firm Quality Responds Immediately



- Households tend to 'trade up' following increases in income
- Quantitatively small relative to cross-sectional variation in quality

One Test: Revealed Quality vs. Yelp Prices

Dep. Var = Quality	(1) All Stores	(2) Groceries	(3) Restaurants	(4) General Merch.	(5) Clothing
Yelp - $$	753.1***	250.0	761.8***	505.9***	1,412***
	(232.6)	(190.6)	(204.2)	(177.0)	(366.2)
Yelp - $$$-$$$$	2,565***	2,033***	1,425***	2,925***	2,896***
	(318.7)	(314.3)	(479.3)	(573.0)	(1,023)
Observations	253	46	63	87	41
R^2	0.409	0.384	0.238	0.428	0.277

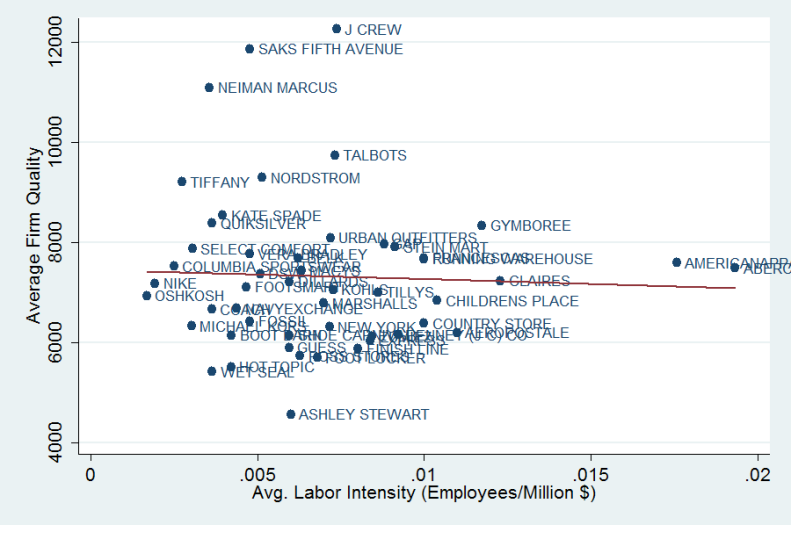
Retailers with higher prices tend to have more affluent customers

Variation in Retailer Quality and Labor Intensity

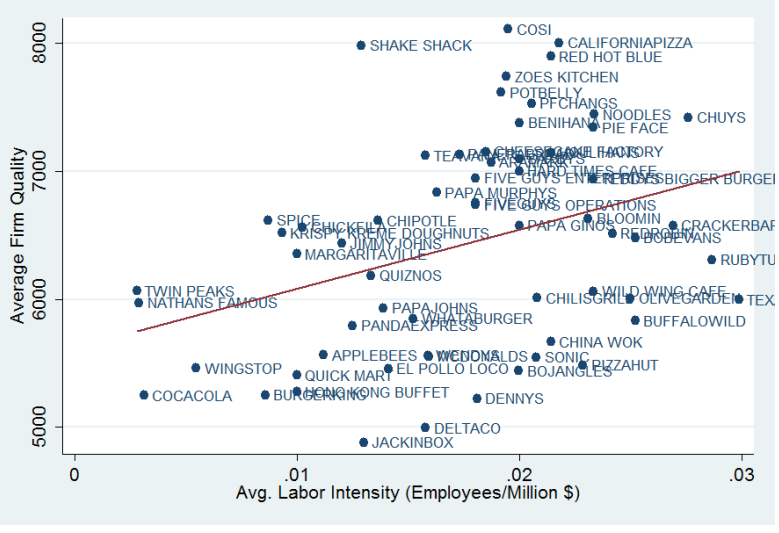
	Quality (Inc./Month)	Labor Intensity (Payroll/Sales)
Groceries		
Smart N Final	\$5,582	0.0027
Whole Foods	\$8,948	0.0062
Restaurants		
Burger King	\$5,251	0.0086
California Pizza Kitchen	\$8,001	0.0218
General Merchandise		
Family Dollar	\$4,491	0.0051
Brookstone	\$8,490	0.0084
Clothing		
K-mart	\$5,249	0.0063
Gap	\$7,961	0.0088

Firm Quality → Higher Labor Intensity

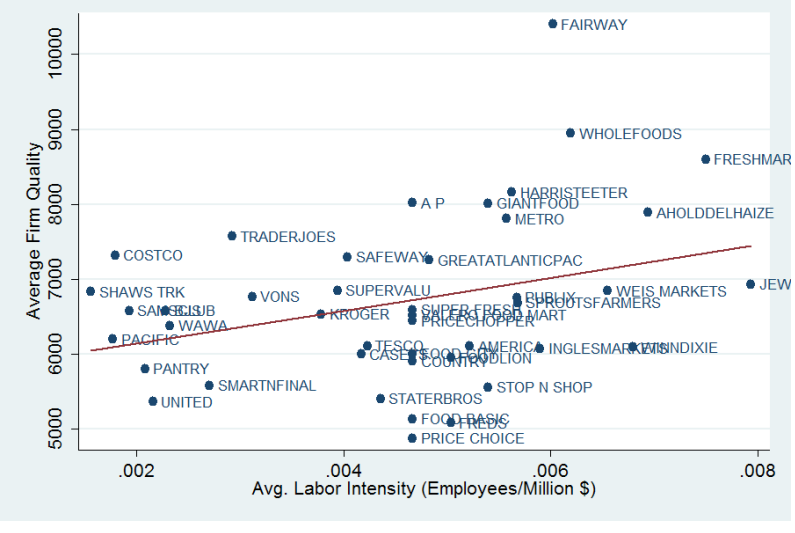
Clothing



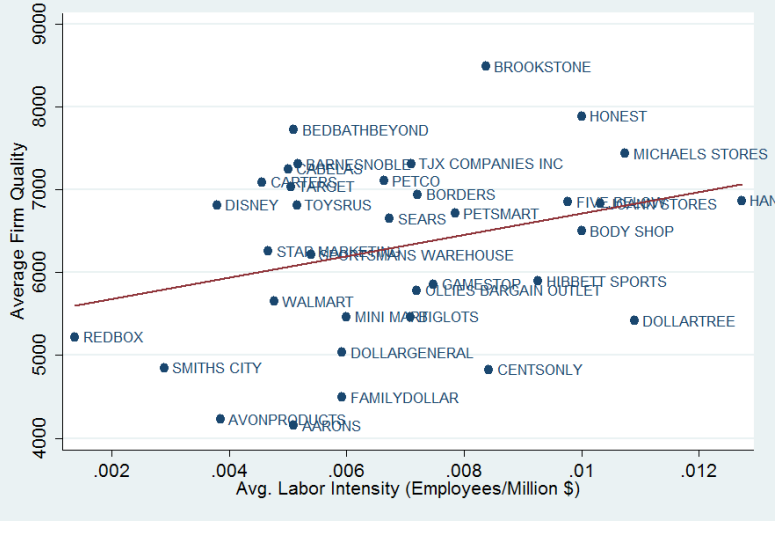
Restaurants



Groceries



General Merch



Retailer-Specific Customer Base

- Cross-sectional variation in retailer choice is substantial
  - If two households move one decile apart, their probability of shopping in overlapping retailers declines by 10-15%
- Many of this variation takes significant amounts of time; much segregation is driven by location and habits; so short run effects are smaller
- But strong sorting into smaller retailers, higher quality, more variety, as income increases

Customer Base Overlap - National and Within-State

	1	2	3	4	5	6	7	8	9
1	-	-	-	-	-	-	-	-	-
2	0.508	-	-	-	-	-	-	-	-
3	0.460	0.532	-	-	-	-	-	-	-
4	0.465	0.519	0.53	-	-	-	-	-	-
5	0.434	0.482	0.48	0.507	-	-	-	-	-
6	0.418	0.451	0.458	0.494	0.505	-	-	-	-
7	0.410	0.429	0.457	0.472	0.492	0.514	-	-	-
8	0.371	0.381	0.412	0.444	0.454	0.487	0.523	-	-
9	0.341	0.336	0.348	0.406	0.401	0.425	0.458	0.516	-
10	0.247	0.222	0.213	0.29	0.264	0.313	0.322	0.381	0.43

	1	2	3	4	5	6	7	8	9
1	-	-	-	-	-	-	-	-	-
2	0.579	-	-	-	-	-	-	-	-
3	0.559	0.615	-	-	-	-	-	-	-
4	0.544	0.584	0.635	-	-	-	-	-	-
5	0.536	0.567	0.619	0.639	-	-	-	-	-
6	0.525	0.561	0.6	0.624	0.652	-	-	-	-
7	0.498	0.534	0.579	0.595	0.62	0.654	-	-	-
8	0.505	0.544	0.569	0.585	0.612	0.638	0.667	-	-
9	0.482	0.501	0.524	0.532	0.551	0.585	0.612	0.661	-
10	0.432	0.443	0.456	0.444	0.465	0.485	0.511	0.547	0.61

Large increases in retailer similarity as household incomes converge

$\rightarrow$ True both across country and within state

B. Customer Base Overlap - National and Within-State

	1	2	3	4	5	6	7	8	9
1	-	-	-	-	-	-	-	-	-
2	0.508	-	-	-	-	-	-	-	-
3	0.460	0.532	-	-	-	-	-	-	-
4	0.465	0.519	0.53	-	-	-	-	-	-
5	0.434	0.482	0.48	0.507	-	-	-	-	-
6	0.418	0.451	0.458	0.494	0.505	-	-	-	-
7	0.410	0.429	0.457	0.472	0.492	0.514	-	-	-
8	0.371	0.381	0.412	0.444	0.454	0.487	0.523	-	-
9	0.341	0.336	0.348	0.406	0.401	0.425	0.458	0.516	-
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	1	2	3	4	5	6	7	8	9
1	-	-	-	-	-	-	-	-	-
2	0.579	-	-	-	-	-	-	-	-
3	0.559	0.615	-	-	-	-	-	-	-
4	0.544	0.584	0.635	-	-	-	-	-	-
5	0.536	0.567	0.619	0.639	-	-	-	-	-
6	0.525	0.561	0.6	0.624	0.652	-	-	-	-
7	0.498	0.534	0.579	0.595	0.62	0.654	-	-	-
8	0.505	0.544	0.569	0.585	0.612	0.638	0.667	-	-
9	0.482	0.501	0.524	0.532	0.551	0.585	0.612	0.661	-
10	0.432	0.443	0.456	0.444	0.465	0.485	0.511	0.547	0.61

Comparing a 1st and 10th decile household in different states...

Customer Base Overlap - National and Within-State

	1	2	3	4	5	6	7	8	9
1	-	-	-	-	-	-	-	-	-
2	0.508	-	-	-	-	-	-	-	-
3	0.460	0.532	-	-	-	-	-	-	-
4	0.465	0.519	0.53	-	-	-	-	-	-
5	0.434	0.482	0.48	0.507	-	-	-	-	-
6	0.418	0.451	0.458	0.494	0.505	-	-	-	-
7	0.410	0.429	0.457	0.472	0.492	0.514	-	-	-
8	0.371	0.381	0.412	0.444	0.454	0.487	0.523	-	-
9	0.341	0.336	0.348	0.406	0.401	0.425	0.458	0.516	-
10	0.247	0.222	0.213	0.29	0.264	0.313	0.322	0.381	0.43

	1	2	3	4	5	6	7	8	9
1	-	-	-	-	-	-	-	-	-
2	0.579	-	-	-	-	-	-	-	-
3	0.559	0.615	-	-	-	-	-	-	-
4	0.544	0.584	0.635	-	-	-	-	-	-
5	0.536	0.567	0.619	0.639	-	-	-	-	-
6	0.525	0.561	0.6	0.624	0.652	-	-	-	-
7	0.498	0.534	0.579	0.595	0.62	0.654	-	-	-
8	0.505	0.544	0.569	0.585	0.612	0.638	0.667	-	-
9	0.482	0.501	0.524	0.532	0.551	0.585	0.612	0.661	-
10	0.432	0.443	0.456	0.444	0.465	0.485	0.511	0.547	0.61

Similar increase in retailer overlap from the poorer household...

→ ...increasing from the 10th to 5th decile of income

→ ...moving to the same state as the richer household