Concentration and Foreign Sourcing in the U.S. Retail Sector

Dominic Smith

University of Minnesota

January 29, 2019

Disclaimer: Any opinions and conclusions expressed herein are those of the author and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.

Motivation

Changes in the aggregate structure of retail

- Increasing national concentration
- Growth of Walmart, Target, etc.
- Exit of small firms

Motivation

Changes in the aggregate structure of retail

- Increasing national concentration
- Growth of Walmart, Target, etc.
- Exit of small firms

Retail markets are local

Question

What has happened to local retail concentration? and why has it changed?

- Potential Cause: Globalization
- Increasing foreign sourcing
  - Clothing, electronics, furniture all produced abroad
- Walmart and Target are major direct importers
  - Small retail firms rarely import
- Large retailers have lower costs on foreign goods
  - (Holmes and Singer, 2018; Ganapati, 2018)

Findings

- Aggregate concentration contains no information on local concentration
- New Census data to measure concentration in local product markets
- Change in markets: Exit of small retailers, expansion of large retailers
  - Direct imports by large retailers lead to exit of small stores
  - New data on import exposure of stores at local level
- Trade has limited impact on local concentration
  - Entry of large retailers offsets exit of small stores
  - Dynamic structural model of retailer entry and exit decisions with direct imports

Literature Review

- **Retail Concentration** - Rossi-Hansberg, Sarte, Trachter (2018); Autor, Dorn, Katz, Patterson, Van Reenan (2017), Hortascu and Syverson (2015)
- **Effect of Globalization on the U.S. Economy** - Autor, Dorn, Hanson (2013), Jaravel and Sager (2018), Pierce and Schott (2016); Amiti, Dai, Feenstra, Romalis (2017)
- **Exit of small retailers** - Basker (2006); Jia (2008); Haltiwanger, Jarmin, Krizan (2010), Holmes (2010); Arcidiacono, Bayer, Blevins, Ellickson (2016)

Roadmap

Data

Changing Local Markets

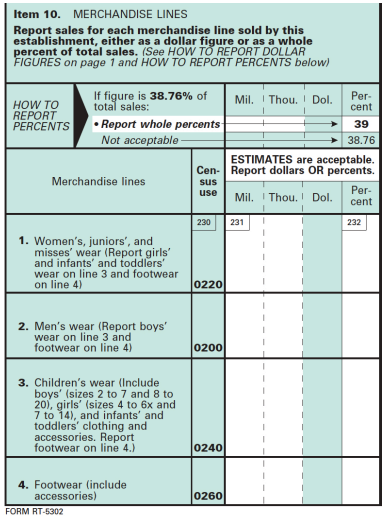
Exit of small firms and trade

Dynamic Structural Entry Model

Store-level Sales Data

- Census of Retail Trade (CRT)
- 1982-2007 - Years ending in 2 and 7
- Location - Zip Code (aggregate to commuting zone)
- Sales by 20 departments (clothing, groceries, etc.)

Constructing Sales by Department



Item 10. MERCHANDISE LINES

Report sales for each merchandise line sold by this establishment, either as a dollar figure or as a whole percent of total sales. *(See HOW TO REPORT DOLLAR FIGURES on page 1 and HOW TO REPORT PERCENTS below)*

HOW TO REPORT PERCENTS	Mil.	Thou.	Dol.	Per-cent
If figure is **38.76%** of total sales:				
• *Report whole percents* →				39
Not acceptable →				38.76

Merchandise lines	Cen-sus use	ESTIMATES are acceptable. Report dollars OR percents. Mil.	Thou.	Dol.	Per-cent
	230	231			232
1. Women's, juniors', and misses' wear (Report girls' and infants' and toddlers' wear on line 3 and footwear on line 4)	0220				
2. Men's wear (Report boys' wear on line 3 and footwear on line 4)	0200				
3. Children's wear (Include boys' (sizes 2 to 7 and 8 to 20), girls' (sizes 4 to 6x and 7 to 14), and infants' and toddlers' clothing and accessories. Report footwear on line 4.)	0240				
4. Footwear (include accessories)	0260				

FORM RT-5302

Data: Census of Retail Trade

- Observe store sales for entire sample
- Sales by product line for 80 percent of sales
- Aggregate lines into departments
- Impute for stores with missing data Details

Use data to define product markets.

Trade Data

- Source: Longitudinal Foreign Trade and Transactions Database
- Value, Product Code (Harmonized System), Source Country, Importing firm
- Match harmonized system codes to departments Details
- Focus on imports from China

Roadmap

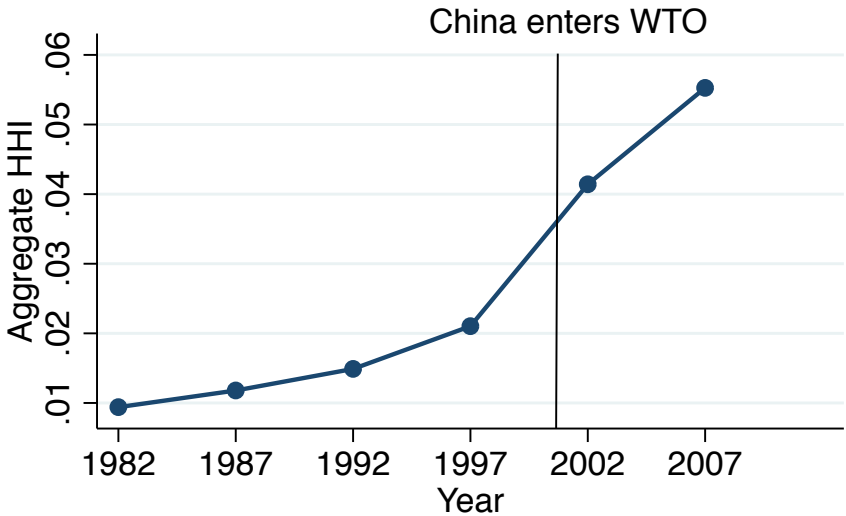
Data

Changing Local Markets

Exit of small firms and trade

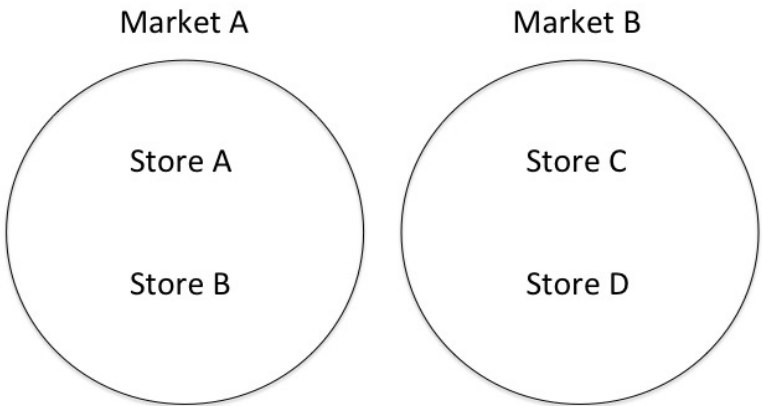
Dynamic Structural Entry Model

National Retail Concentration

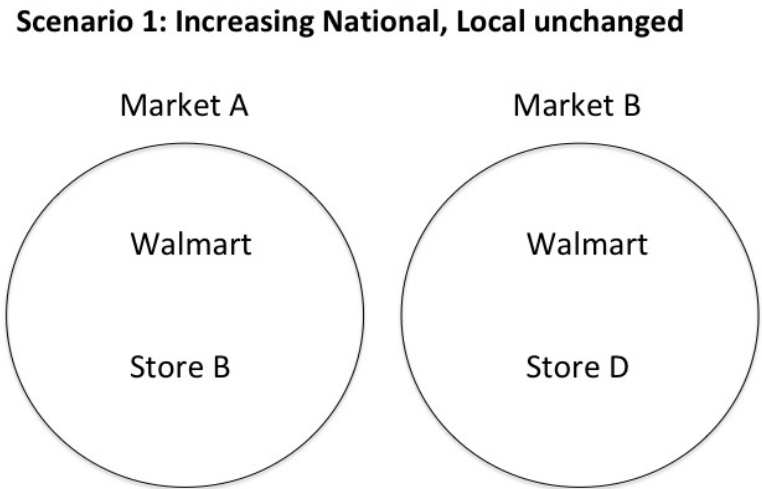


Example: National vs Local Concentration

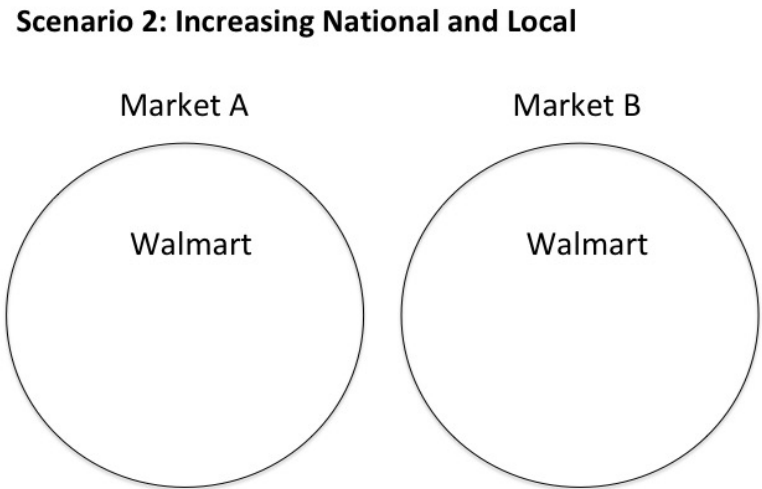
Two Markets, Two firms in each market with equal size



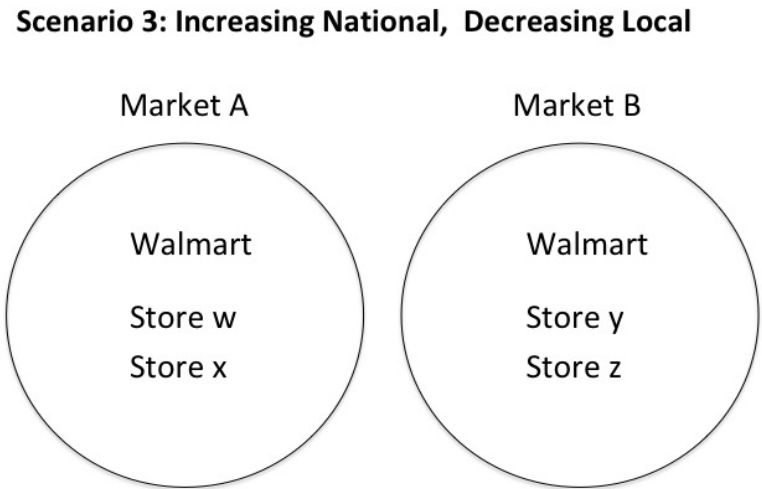
Example: National vs Local Concentration



Example: National vs Local Concentration



Example: National vs Local Concentration



National HHI Driven by Rise of National Firms

Consider two random dollars x and y spent at retailers.
What is the probability they are spent at the same firm?

$$P(i_x = i_y) = \underbrace{P(m_x = m_y)}_{\text{Collocation}} \underbrace{P(i_x = i_y | m_x = m_y)}_{\text{Local HHI}} + (1 - P(m_x = m_y)) \underbrace{P(i_x = i_y | m_x \neq m_y)}_{\text{Cross Market}}$$

- m_x - market of dollar x
- i_x - firm of dollar x

National HHI Driven by Rise of National Firms

Consider two random dollars x and y spent at retailers.
What is the probability they are spent at the same firm?

$$P(i_x = i_y) = \underbrace{.02}_{\text{Collocation}} \underbrace{P(i_x = i_y | m_x = m_y)}_{\text{Local HHI}} + .98 \underbrace{P(i_x = i_y | m_x \neq m_y)}_{\text{Cross Market}}$$

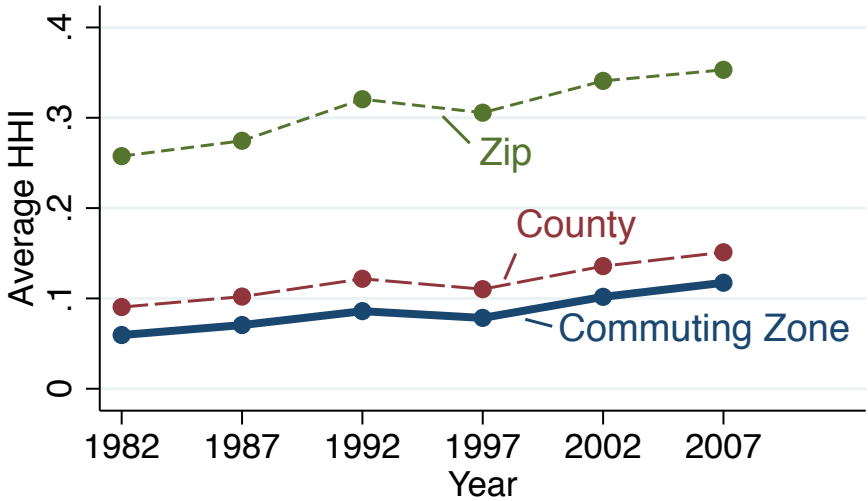
Collocation term is less that 2 percent

- Aggregate index contains little information on local concentration

Increase in national HHI reflect increasing cross market concentration

- **Consumers in different markets shop at the same firms**

Local Concentration



Exit of Small Stores and Expansion of National Firms

Between 1997 and 2007

- Number of small stores decreases by 7 percent
- Number of stores large firms increases by 40k
- Number of large firms constant ($\sim$ 300)
- Markets per large firm increased by 25 percent (114 to 145)

Exit of Small Stores and Expansion of National Firms

Between 1997 and 2007

- Number of small stores decreases by 7 percent
- Number of stores large firms increases by 40k
- Number of large firms constant ($\sim$ 300)
- Markets per large firm increased by 25 percent (114 to 145)

What is the role of direct imports?

Roadmap

Data

Changing Local Markets

Exit of small firms and trade

Dynamic Structural Entry Model

Do Direct Imports Cause the Exit of Small Firms?

- Number of stores by small firms decreasing significantly
- Direct imports from China increasing rapidly after 2002

Fraction of Sales Imported

	1992	1997	2002	2007	2012
All Countries	1.9	2.6	3.3	5.1	6.8
China	0.5	1.0	1.5	2.9	4.4

Notes: LFTTD micro data

Imports and the Exit of Small Firms

$$E_{im}^{2002-2007} = \beta_0 + \beta_1 \Delta d_{im}^{2002-2007} + X_{im}\Gamma' + \varepsilon_{im}$$

- i - store, m - market (commuting zone)
- $E_{im}^{2002-2007}$ - indicator that a store exits before 2007
- $\Delta d_{im}^{2002-2007}$ - change in exposure to direct imports
- X_{im} - controls for store, market, and competitor characteristics
- Separate regression for single-unit and small chains

Measuring Direct Import Exposure

Fraction of competitor's sales that are imported directly

1. Competitors:
   - Stores in the same location selling the same department
   - Includes general merchandisers

2. Sales weighted average of competitor's direct import penetration

$$d_{im}^{t} = \sum_{j=1}^{J} s_j^{imt} \underbrace{\sum_{k=1}^{K}}_{\text{Competitors}} \overbrace{s_k^{imt}}^{\text{Competitor's market share}} \underbrace{\frac{imports_{kjt}}{sales_{kjt}}}_{\text{Competitor's Direct Import Penetration}}$$

Exit Regression

$$E_{im}^{2002-2007} = \beta_0 + \beta_1 \Delta d_{im}^{2002-2007} + \beta_2 d_{im}^{2002} + \beta_3 pct_{im}^{GM,2002} + \beta_4 pct_{im}^{L,2002} + \beta_5 pct_{im}^{C,2002} + D_{im}\Gamma' + \epsilon_{im}$$

- $E_{im}^{2002-2007}$ - indicator that an establishment exited between 2002 and 2007
- D_{im} - Establishment size, age, top department, and market characteristics
- Controls for competition with big firms

$$pct_{im}^{L,2002} = \sum_j s_j^{im,2002} s_L^{im,2002}$$

fraction of competitors that are large

Summary Statistics

	Single-Unit Mean	S.D.
Change in import exposure ($\Delta d_{im}^{2002-2007}$)	0.01	0.015
Import exposure (d_{im}^{2002})	0.01	0.013
Probability of exit SU ($E_{im}^{2002-2007}$)	0.47	0.50
	Small Chain Mean	**S.D.**
Change in import exposure ($\Delta d_{im}^{2002-2007}$)	0.01	0.017
Import exposure (d_{im}^{2002})	0.01	0.014
Probability of exit SC ($E_{im}^{2002-2007}$)	0.36	0.479

Summary Statistics

	Single-Unit	
	Mean	S.D.
Change in import exposure ($\Delta d_{im}^{2002-2007}$)	0.01	0.015
Import exposure (d_{im}^{2002})	0.01	0.013
Probability of exit SU ($E_{im}^{2002-2007}$)	0.47	0.50
	Small Chain	
	Mean	S.D.
Change in import exposure ($\Delta d_{im}^{2002-2007}$)	0.01	0.017
Import exposure (d_{im}^{2002})	0.01	0.014
Probability of exit SC ($E_{im}^{2002-2007}$)	0.36	0.479

Results - Direct Imports associated with Exit

	Single-Unit	Small Chain
$\Delta d_{im}^{2002-2007}$	1.006*	1.006*
	(0.129)	(0.249)
d_{im}^{2002}	0.255	0.989*
	(0.181)	(0.451)
Controls for Competitive Environment	Y	Y
Top Department Fixed Effects	Y	Y
Age Fixed Effects	Y	Y
Market Controls	Y	Y
R2	0.122	0.065
Observations	488,000	87,000

Standard errors clustered at commuting zone-department-level. * indicates 5 percent significance.

Growth Dependent Variable | Robustness | IV

Roadmap

Data

Changing Local Markets

Exit of small firms and trade

Dynamic Structural Entry Model

Model Overview

- Follow Arcidiacono, Bayer, Blevins, and Ellickson (Restud, 2016)
  - Dynamic continuous time model of entry and exit
  - Random move opportunities allow for counterfactuals with large state space
  - Multiple types of stores
  - Local manager assumption
- My Additions
  - Four types of firms: Single-unit, small chain, large, general merchandiser
  - Direct imports as market level state

Timing

- Continuous time
- Stores receive random opportunities to move with rate λ
- Choice set:
  - Incumbents: stay or exit
  - Entrants: enter or stay out

Markets

- Many markets $m \in \{1, 2, \ldots, M\}$
- Population (S)
- Permanent observed type (population growth rate) - c
- Permanent unobserved type - z

State Space

State of a market:

$$x = (N^{SU}, N^{C}, N^{L}, N^{GM}, d, S, c, z)$$

- Number of stores of each type ($N^{SU}, N^{C}, N^{L}, N^{GM}$)
- Direct import penetration (d)
- Population (S)
- Fixed market characteristics (c, z)
- All states are discrete

Direct Imports

- Direct imports are a market (not firm) level state:
  - Fraction of sales in market imported
- Evolution:
  - Flexible function of other states $F(d'|x)$
  - Entry of large stores increases probability state increases

Flow Profits

Flow profits of a firm of type $t \in \{\text{Single-unit, small Chain}\}$

$$\pi(x) = \beta_0 + \beta_S \tilde{N}^S + \beta_C \tilde{N}^C + \beta_L N^L + \beta_{GM} N^{GM} + \beta_d d + \beta_S S + \beta_T \left(\tilde{N}^S\right)^2 + \beta_z z N^S$$

β_0, β_S	Total Market Demand (function of population)
β_{SU}-β_{GM}	Loss in profits due to competitors
β_d	Competition from import exposure
β_T	Returns to scale - small stores can share suppliers
β_z	Effect of own stores varies with unobserved type

Value Function

$$(\lambda+\rho)V(x) = \pi(x) + \underbrace{\sum_{j\in\{d,u\}} q_j(c)(V(I(S,j,k) - V(x))}_{\text{Value if population changes}} + \underbrace{\sum_{d'\in D} F(d'|x)(V(I(d,j,k) - V(x))}_{\text{Value if imports change}}$$

- ρ: Discount rate
- $q_j(c)$: Population moves
- $F(d'|x)$: Imports move
- λ : move arrival rate

Value Function

$$
\begin{aligned}
(\lambda+\rho)V(x) = \pi(x) &+ \sum_{j\in\{d,u\}} q_j(c)(V(I(S,j,k)-V(x)) \\
&+ \sum_{d'\in D} F(d'|x)(V(I(d,j,k)-V(x)) \\
&+ \underbrace{\sum_{h\in\{S,C,L,GM\}} \lambda N^h \sigma^h_{exit}(V(I(h,exit,x)-V(x))}_{\text{Value if competitors enter}} \\
&+ \underbrace{\sum_{h\in\{S,C,L,GM\}} \lambda \mathcal{E}^h \sigma^h_{enter}(V(I(h,enter,x)-V(x))}_{\text{Value if competitors exit}}
\end{aligned}
$$

σ^h_j - probability store type h make decision j, $\mathcal{E}^h$ - potential entrants of type h

Value Function

$$
\begin{aligned}
(\lambda+\rho)V(x) = \pi(x) &+ \sum_{j\in\{d,u\}} q_j(c)(V(I(S,j,k) - V(x)) \\
&+ \sum_{d'\in D} F(d'|x)(V(I(d,j,k) - V(x)) \\
&+ \sum_{h\in\{S,C,L,GM\}} \lambda N^h \sigma^h_{exit}(V(I(h,exit,x) - V(x)) \\
&+ \sum_{h\in\{S,C,L,GM\}} \lambda \mathcal{E}^h \sigma^h_{enter}(V(I(h,enter,x) - V(x)) \\
&+ \underbrace{\lambda E \max\{V(x) + \varepsilon_{stay}, \varepsilon_{exit}\}}_{\text{Value if player } i \text{ moves}}
\end{aligned}
$$

Choice Probabilities

All Firms

- ε_j: Unobserved (to econometrician) profit shock of decision $j \in \{enter, exit, stay\}$

Potential Entrants: Probability a firm enters

$$\sigma^h_{enter}(x) = \frac{\exp(V^h(I(h, enter, x)) - f^h(z))}{\exp(V^h(I(h, enter, x)) - f^h(z)) + 1} \quad h \in \{S, C\}$$

- $f^h(z)$: sunk cost of entry

Incumbents: Probability a firm exits

$$\sigma^h_{exit}(x) = \frac{1}{\exp(V^h(x)) + 1} \quad h \in \{S, C\}$$

(Value of exit is normalized to 0)

Unobserved Heterogeneity - Market Type

Unobservable (to me) characteristics that affect attractiveness

- Unobserved characteristics can interact with type in different ways
- Example: Consumers in a market like GMs

Follow Arcidiacono and Miller (2011)

- $z \in Z$: unobserved market type
- Iterative algorithm in estimation
  - Estimate unobserved type of market
  - Estimate model parameters treating z as observed

Solution Method - Conditional Choice Probabilities

- Estimate choice probabilities for all types of stores and direct imports
- Flexible functional form of current state (parameters α^h)

$$\tilde{\sigma}^h(x, \alpha^h) = \frac{\exp(\phi_j(x, \alpha^h))}{\sum_{j'} \exp(\phi_{j'}(x, \alpha^h))}$$

  States, square of states, interaction with population

- CCPs to recover structural parameters (β) for single-units and small chains
- Parameters estimated using maximum likelihood

More Details

Data

- Longitudinal Business Database
  - Yearly data on industry and employment for all stores
  - 1997 to 2007
  - Stores with more than 5 employees
    - $>$ 90% of sales
    - Two-thirds of stores
    - Much smaller state space
- Yearly imports assigned to a market
- Markets with population under 100k (219 markets)
  - One store per firm
- Focus on clothing and electronics (Clothing results today)

Summary Statistics

	1997	2007
Single-Unit	2.74	1.96
Small Chains	1.04	0.69
Large Firms	2.68	2.99
General Merchandisers	6.45	8.08
Imports	1.07	3.45

- Number of stores of small firms decreses by 30 percent
- Increase in imports corresponds to a 3 percent increase in direct import penetration

Results - Structural Profit Parameters (Clothing)

	SU	C
Constant (β_0)	-16.870	-13.440
Number of Single-Unit Stores (β_{SU})	1.008	-0.186
Number of Small-Chain Stores (β_C)	-0.254	1.967
Number of Large Stores (β_L)	0.022	-0.185
Number of GM Stores (β_{GM})	-0.276	-0.064
Direct Import Penetration (β_d)	-0.570	-0.080
Population (β_S)	0.528	0.079
Number of own type squared (β_T)	-0.070	-0.143
Unobserved state $\times$ number of own type (β_z)	-0.119	-0.231
Entry cost (f)	2.010	6.434
Entry cost $\times$ unobserved state	0.063	-2.964

No Unobserved Heterogeneity

Counterfactual - Local Markets without Direct Imports

Shutdown direct effect on small stores ($\beta_d = 0$)

- Higher profits for small stores
- Less entry from large stores (more competition from small stores)

Simulate markets for 10 years

- Number of stores of each type
- Local concentration - average sales of each type of store

Behavior of Large Stores

Lower bound on the effect of direct imports on exit of small stores

- Keep entry behavior of large firms unchanged
- Focus on competitive effect of imports on small stores
- Retain competition from large firms

Counterfactual doesn't capture

- Response of large firms to higher entry probability of small firms
- Response of large firms to no direct imports

Counterfactual Results

	No Unobserved Heterogeneity					
	Single Unit	Small Chain	Large	GM	Average HHI	Share Large
Trade	3.2	2.6	9.5	6.1	0.08	0.73
No Trade	3.5	2.7	8.9	5.8	0.08	0.71

Results

- Number of small stores decreases by 4 percent
- Imports account for at least 14 percent of the exit of small firms
- No effect on concentration (preliminary)
- Fit - too many S, C, and Large
  - Structural parameters not an equilibrium with CCPs

Conclusion

- New data on retail competition
- Local retail concentration increasing
- Direct imports important explanation of exit of small firms
- Preliminary: Don't increase local concentration
- Suggest direct imports benefit consumers

Roadmap

Appendix

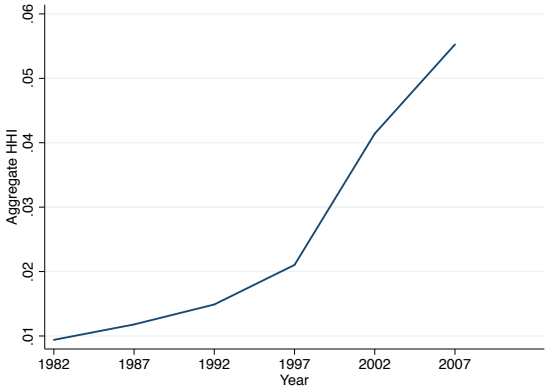
- Intro Backup
- Data Appendix
- Reduced Form Backup
- Estimation Backup

Intro Backup

1. National Concentration
2. Decomposition
3. Local Concentration
4. Change Distribution
5. Top 4
6. RST Comparison

Back

National Concentration Increasing



National Concentration: Autor, Dorn, Katz, Patterson, and Van Reenen (2017); Foster, Haltiwanger, Klimek, Krizan, Ohlmacher (2015); Hortacsu and Syverson (2015); Basker, Klimek, and Van (2012)

Back

National HHI Driven by Rise of National Firms

Consider two random dollars x and y spent at retailers.
What is the probability they are spent at the same firm?

$$P(i_x = i_y) = \underbrace{P(m_x = m_y)}_{\text{Collocation}} \underbrace{P(i_x = i_y | m_x = m_y)}_{\text{Local HHI}} + (1 - P(m_x = m_y)) \underbrace{P(i_x = i_y | m_x \neq m_y)}_{\text{Cross Market}}$$

- m_x - market of dollar x
- i_x - firm of dollar x

Back

National HHI Driven by Rise of National Firms

Consider two random dollars x and y spent at retailers.
What is the probability they are spent at the same firm?

$$P(i_x = i_y) = \underbrace{.02}_{\text{Collocation}} \underbrace{P(i_x = i_y | m_x = m_y)}_{\text{Local HHI}} + .98 \underbrace{P(i_x = i_y | m_x \neq m_y)}_{\text{Cross Market}}$$

Collocation term is less that 2 percent

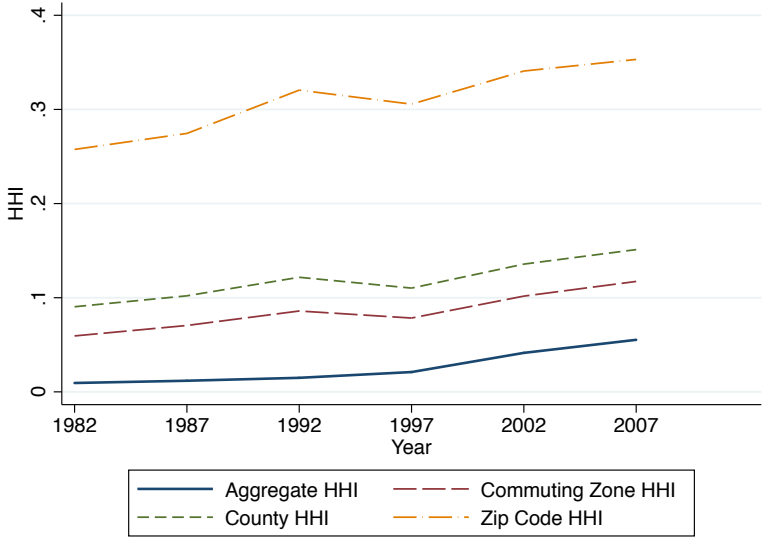
- Aggregate index contains little information on local concentration

Increase in national HHI reflect increasing cross market concentration

- **Consumers in different markets shop at the same firms**

Back

Local Concentration



Local Concentration Changes

Back

Top 4 Share

Back

Comparison to RST

Zip Concentration - RST Methodology				
	Level	Change from 1992		
RST	N/A	-0.070	-0.100	-0.140
All NAICS	0.507	0.024	-0.018	-0.019
Sample NAICS	0.552	-0.021	-0.018	-0.015
Department	N/A	N/A	N/A	N/A

Zip Concentration - Current Period Shares				
	Level	Change from 1992		
RST	N/A	N/A	N/A	N/A
All NAICS	0.507	0.022	0.057	0.072
Sample NAICS	0.552	0.026	0.067	0.083
Department	0.321	-0.015	0.020	0.033

Data Appendix

1. List of Departments
2. Commuting Zone Map
3. Imputing Missing Data
4. HS to Department
5. E-Commerce

List of Departments

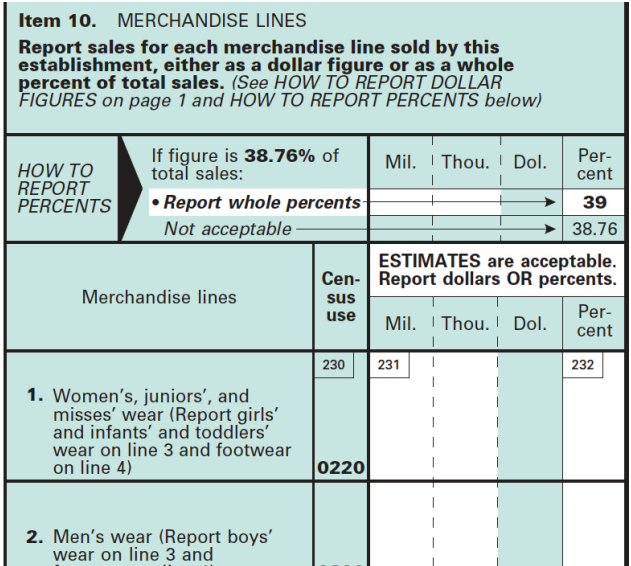
Main Departments	Other Departments
Clothing	Automotive Goods
Electronics and Appliances	Services
Furniture	Other Retail Goods
Groceries	Fuel
Health Products	Paper Products
Sporting Goods	Jewelry
Toys	Luggage
Home & Garden	Optical Goods
	Luggage
	Optical Goods
	Non-retail Goods
	Books

Map of Commuting Zones

Back

Imputing Data

1. Collection with Census of Retail Trade (every 5 years)



Item 10. MERCHANDISE LINES

Report sales for each merchandise line sold by this establishment, either as a dollar figure or as a whole percent of total sales. *(See HOW TO REPORT DOLLAR FIGURES on page 1 and HOW TO REPORT PERCENTS below)*

HOW TO REPORT PERCENTS	If figure is **38.76%** of total sales:	Mil.	Thou.	Dol.	Per-cent
	• ***Report whole percents***				**39**
	Not acceptable				38.76

Merchandise lines	Cen-sus use	**ESTIMATES are acceptable. Report dollars OR percents.** Mil.	Thou.	Dol.	Per-cent
1. Women's, juniors', and misses' wear (Report girls' and infants' and toddlers' wear on line 3 and footwear on line 4)	230 **0220**	231			232
2. Men's wear (Report boys' wear on line 3 and					

Imputing Data

1. Collection with Census of Retail Trade (every 5 years)
2. Aggregation to departments
    - Goal: Aggregate so industries primarily sell one department

Broad Line	Department
Footwear	Clothing
Curtains	Clothing
Sewing	Clothing
Drugs, health aids, etc	Health
Optical goods	Optical Goods

Imputing Data

1. Collection with Census of Retail Trade (every 5 years)
2. Aggregation to departments
3. Imputation - depending on data availability use
   - Sales of other stores of the same firms
   - Sales of the store in other years
   - Industry, kind of business, and multi-unit status

Back

HS to Department

- State with Basker and Van (2010)
- Identify retailers that sell and import different departments
- Correct HS classifications by hand for top 50
- Assign remainder to plurality department

Back

E-Commerce

Bil USD	2002	2008
E-commerce	44.93	141.89
Offline	3089.40	3817.27
Fraction E-commerce	0.014	0.036

Notes: US Census E-commerce reports.

Back

Sample Details

- Firms with at least half employment in retail
  - Dropped stores less than 10 percent of sales
  - Avoids manufacturers/wholesalers with a few retail stores
  - Can't calculate direct import penetration for these stores
- Drop auto dealers, gas stations, and non-store retailers
- Type depending on size of firm:
  - **Single-unit:** firm has one retail store
  - **Small chain:** firm has 2-99 retail stores
  - Large: firm has more than 100 retail stores

Measuring Concentration

Herfindahl-Hirschman Index

$$HHI^j = \sum_{k=1}^{K} \left(s_k^j\right)^2 \qquad s_k^j : \text{ Sales share of firm } k \text{ in department } j$$

What does the HHI mean?

- Probability two random dollars are spent at the same store

Back

Measuring Import Exposure

- Source: Longitudinal Foreign Trade and Transactions Database
- Value, Product Code (Harmonized System), Source Country, Importing firm
- Match HS codes to Departments Details

Result: Firm-department-level direct import penetration

$$dimpen_{kj}^{t} = \frac{imports_{kj}^{t}}{sales_{kj}^{t}}$$

firm k in department j in year t

Market-level Exposure to Direct Imports

Weighted average of direct import penetration:

$$dimpen^{t}_{mj} = \sum_{k} s^{jmt}_{k} dimpen^{t}_{kj}$$

- s^{jmt}_{k}: share of firm k in department j in market m in year t

Store-level Exposure to Direct Imports

Import exposure of store i in department j in market m:

$$d_{imt} = \sum_{j=1}^{J} s_j^{imt} dimpen_{jm}^{t,-k(i)}$$

- Weighted average of department-market-level direct import penetration
- $dimpen_{jm}^{t,-k(i)}$: Department-market-level direct import penetration
  - Exclude the firm of i
- s_j^{imt}: Sales share of department j in the store's sales

$$\Delta d_{im}^{2002-2007} = d_{im}^{2007} - d_{im}^{2002}$$

Identification

$$E_{im}^{2002-2007} = \beta_0 + \beta_1 \Delta d_{im}^{2002-2007} + X_{im}\Gamma' + \varepsilon_{im}$$

- Goal: Causal impact of direct import exposure on probability of exit
- Problems:
  - Firms that import (Walmart, Target, etc) are more efficient for other reasons
  - Importers mayenter markets with worse small stores
- OLS overstates the effect of direct imports
- Ideal data: Exogenous increase in competitors' imports

Instrument

Idea:

- Initial sourcing networks
- Exploit variation in which products retailers imported in 2002
- Variation across products in terms of China's increase in exports

Example:

- Store A has competitors that import shirts
- Store B has competitors that import pants
- China's exports of shirts grow
- Store A's competitors ready to take advantage of China's growth
- Store A more exposed to imports than store B

Instrument

Idea:

- Initial sourcing networks
- Exploit variation in which products retailers imported in 2002
- Variation across products in terms of China's increase in exports

Construction:

- Each store's change in import exposure if their competitors' imports in each 6-digit HS code grew at the rate of China's exports to other high-income countries
- Fix competitors in 2002 (no entry)

Threat:

- More efficient retailers disproportionately importing products in which China's exports grew

Details

Instrument Definition

Predicted 2007 import exposure:

$$Z_{im}^{2007} = \sum_j s_j^{i2002} \sum_{k \neq k(i)} s_k^{jm2002,-k(i)} \underbrace{\frac{\sum_{h \in H_j} imports_{kh2002} \left(1 + g_h^{CN \to HI, 2002-2007}\right)}{sales_{kj2002} \left(1 + g_j^{US, 2002-2007}\right)}}_{\text{Firm-department import penetration}}$$

Change in import exposure

$$\Delta Z_{im}^{2002-2007} = Z_{im}^{2007} - d_{im}^{2002}$$

- h: 6-digit HS code
- $g_h^{CH \to HI, 2002-2007}$: growth rate of product level exports
- Competitor's shares from 2002 - no entry

Back

Full Table

	Single-Unit		Small Chain	
	OLS	IV	OLS	IV
$\Delta d_{im}^{2002-2007}$	1.006*	0.775*	1.006*	1.728*
	(0.129)	(0.325)	(0.249)	(0.805)
d_{im}^{2002}	0.255	0.488*	0.989*	1.224*
	(0.181)	(0.232)	(0.451)	(0.464)
pct_{im}^{L}	0.066***	0.125***	0.042	0.105***
	(0.019)	(0.011)	(0.029)	(0.027)
pct_{im}^{GM}	0.011	-0.109***	-0.056	-0.163***
	(0.020)	(0.018)	(0.038)	(0.038)
pct_{im}^{C}	0.068***	0.104***	0.004	0.014
	(0.019)	(0.017)	(0.035)	0.037)
Log Sales	-0.101***	-0.101***	-0.082***	-0.081***
	(0.001)	(0.001)	(0.002)	(0.002)

First Stage

	Single-Unit	Small Chain
$\Delta Z_{im}^{2002-2007}$	0.175***	0.173***
	(0.008)	(0.014)
d_{im}^{2002}	-0.450***	-0.091*
	(0.037)	(0.047)
Controls for Competitive Environment	Y	Y
Top Department Fixed Effects	Y	Y
Age Fixed Effects	Y	Y
Market Controls	Y	Y
R2	0.64	0.66
Observations	488,000	87,000

Results - Direct Imports cause Exit

	Single-Unit		Small Chain	
	OLS	IV	OLS	IV
$\Delta d_{im}^{2002-2007}$	1.006*	0.775*	1.006*	1.728*
	(0.129)	(0.325)	(0.249)	(0.805)
d_{im}^{2002}	0.255	0.488*	0.989*	1.224*
	(0.181)	(0.232)	(0.451)	(0.464)
Controls for Competitive Environment	Y	Y	Y	Y
Top Department Fixed Effects	Y	Y	Y	Y
Age Fixed Effects	Y	Y	Y	Y
Market Controls	Y	Y	Y	Y
R2	0.122	0.121	0.065	0.064
Observations	488,000	488,000	87,000	87,000

Standard errors clustered at commuting zone-department-level. * indicates 5 percent significance.

Growth Dependent Variable Robustness

Growth Dependent Variable

	Single-Unit		Small Chain	
	All	Continuers	All	Continuers
$\Delta d_{im}^{2002-2007}$	-1.268*	1.607*	-5.257***	-2.491
	(0.688)	(0.861)	(1.813)	(-1.965)
d_{im}^{2002}	-0.752	1.236***	-1.878*	0.803
	(0.472)	(0.457)	(0.965)	(1.418)
Competitive Environment	Y	Y	Y	Y
Top Department Fixed Effects	Y	Y	Y	Y
Age Fixed Effects	Y	Y	Y	Y
Market Controls	Y	Y	Y	Y
R2	0.073	0.094	0.043	0.049
Observations	488,000	259,000	87,000	56,000

Back

Robustness

- Results similar with fewer controls (bigger effect), controlling for import status
- Results smaller with county-level regression, 1997 instead of 2002
- Market cluster still significant
- Department cluster loses significance

Back

Simulating Moves

Likelihood of a single observation

$$\tilde{L}_{mn}(h(\alpha); z) = \frac{1}{R} \sum_{r=1}^{R} \prod_{w=1}^{W} \left(\sum_{j \in \{-1,1\}} l_w^{(r)}(0, j) q_j + \sum_i \lambda \sum_{j \neq 0} l_w^{(r)}(i, j) \tilde{\sigma}_{ij} \left(k_w^{(r)}, z, \alpha \right) \right)$$
$$\times \exp \left[- \left(\sum_{j \in \{-1,1\}} q_j + \sum_i \lambda \sum_{j \neq 0} \tilde{\sigma}(k_w^{(r)}, z, \alpha) \right) \tau_w^{(r)} \right] \tag{1}$$
$$\times \exp \left[- \left(\sum_{j \in \{-1,1\}} q_j + \sum_i \lambda \sum_{j \neq 0} \tilde{\sigma}_{ij}(k_{W+1}^{(r)}, z, \alpha) \right) \left(1 - t_W^{(r)} \right) \right].$$

Back

Objective Function

$$(\tilde{\alpha}, \tilde{P}) = \arg\max_{(\alpha,P)} \sum_{m=1}^{M} \ln \left(\sum_{z} P(z, k_{m1}) \prod_{n=1}^{T} \tilde{L}_{mn}(h(\alpha); z) \right). \tag{2}$$

- k_{m1} - initial state of the market
- $h(\alpha)$ - parameters of CCPs

Continuation Values

$$\begin{aligned}\rho V_{jk} = {} & \pi_{ik} + \lambda \Gamma^2(0, \sigma_{ik}) \\ & + \lambda \sum_{m \neq i} \sigma_{m,-1,k} [\Gamma^1(0, -1, \sigma_{i,\ell^\star(i,l(m,-1,k))}) - \Gamma^1(0, -1, \sigma_{i,l^\star(i,k)}))] \\ & + \lambda \sum_{m \neq i} \sigma_{m,1,k} [\Gamma^1(0, -1, \sigma_{i,\ell^\star(i,l(m,1,k))}) - \Gamma^1(0, -1, \sigma_{i,l^\star(i,k)}))]\end{aligned}$$

Estimation Steps

1. Estimate $\tilde{\sigma}^h(x, \alpha^h)$ for all types
2. Estimate π^h for small stores
3. Change policy
4. VFI using $\pi^S, \pi^C, \tilde{\sigma}^L, \tilde{\sigma}^{GM}$ for σ^S, σ^C

Results - No Unobserved Heterogeneity

	SU	C
Constant (β_0)	−20.370	−22.370
Number of Single-Unit Stores (β_{SU})	1.501	−0.095
Number of Small-Chain Stores (β_C)	−0.159	2.482
Number of Large Stores (β_L)	−0.318	−0.192
Number of GM Stores (β_{GM})	−0.582	−0.230
Import Penetration (β_d)	−0.625	−0.401
Population (β_S)	0.661	1.156
Number of own type squared (β_T)	−0.174	−0.305
Unobserved state × number of own type (β_z)		
Entry cost (f)	−1.780	−3.639

Back