Diverging Trends in National and Local Concentration*
Online Appendix

Esteban Rossi-Hansberg   Pierre-Daniel Sarte

Princeton University   Federal Reserve Bank of Richmond

Nicholas Trachter

Federal Reserve Bank of Richmond

September 12, 2018

Contents

1

1 Data Description

1.1 NETS

The National Establishment Time Series (NETS) is made available through Walls & Associates, which relies on data compiled by Dun & Bradstreet (D&B). D&B provides each business establishment, corresponding to a distinct business activity by an enterprise at a specific location, a unique 9-digit Data Universal Numbering System (DUNS) number, which remains with that establishment even in the case of broader corporate-level changes, name changes, and relocations.[1] Each year, D&B compiles data for its Duns Marketing Information file on business characteristics of every establishment, including its sales, employment, location, primary industry, and the DUNS number of the establishment to which it reports (i.e. its parent company).[2] As described by Neumark, Zhang, and Wall (2006), as well as Barnatchez, Crane, and Decker (2017), D&B makes an exhaustive effort to ensure that the file accurately covers the entire universe of business establishments, relying on many sources of information including direct phone calls, Yellow Pages, newspapers, and multiple government agencies. Furthermore, D&B and the establishments from which they gather information both have incentives to ensure information is accurate.

While D&B compiles annual cross-sections of establishment characteristics, Walls & Associates aggregates these files into a longitudinal database that makes it possible to track the birth and death of establishments. Neumark et al. (2006) note that this process requires imputation of sales and employment to many establishment-year pairings.

We use the NETS database to gather data on employment, sales, and the primary industry (8-digit SIC code) for each establishment for each year from 1990 through 2014, as well as the DUNS number of the establishment's headquarters in each year (HQ or enterprise number). In each year, an enterprise is then defined as a collection of all the establishments with a given HQ number. We additionally collect the establishment's county, ZIP code, and legal status, as well as the most recent HQ number of the establishment.[3] The data is provided in wide form, with one observation per establishment and separate variables for establishment characteristics in each year, but we reshape the data into long form with one observation per establishment-year. We then drop any observations that have missing employment, sales, industry, or HQ numbers, and consider an establishment to "exist" in a given year if it has an observation associated with it (i.e. it has non-missing employment, sales, industry, and

---

[1]If an establishment goes out of business, its DUNS number will not be re-used.

[2]This file contains data on many other establishment characteristics that we do not consider in this paper.

[3]The NETS database additionally has a variable for the business name, allowing us to identify the firms associated with specific HQ numbers.

HQ numbers). We can then see the first year in which each establishment exists (its entry year) and the last year (its exit year).[4]

Among these remaining establishment-year pairs, we identify the industry corresponding to the headquarters for each enterprise, and drop any establishments belonging to an enterprise whose headquarters has an SIC 8 industry code corresponding to the Public Administration division. We then drop any establishments which have an SIC 8 code either equal to 73899999 (Business Activities at Non-Commercial Sites), falling under Public Administration (even if their enterprise headquarters do not), the Educational Services 2-digit SIC sector (SIC 2 82), the Health Services 2-digit SIC sector (SIC 2 80), or the SIC 3-digit code 601, Central Reserve Depository. Additionally, we drop any establishments whose HQ number corresponds to the United States Postal Services (USPS), whose legal status identifies them as a non-profit organization, or which are in counties located outside of the 50 U.S. states and the District of Columbia. Among remaining establishments, we keep only those whose primary industry falls into one of the following five divisions: Manufacturing; Wholesale Trade; Retail Trade; Finance, Insurance, and Real Estate (FIRE); and Services.

In the remaining dataset, we have roughly 38 million unique establishments spread across approximately 290 million establishment-year pairs. Figure (1a) shows the number of establishments in our sample in each year, while Figure (1b) shows total employment. Employment increases steadily in the first 10 years of the sample but has largely flattened out since 2000. The number of establishments, on the other hand, continues to increase considerably through 2009.

Figure 1: Employment and Establishment Counts in NETS Database, 1990-2014

---
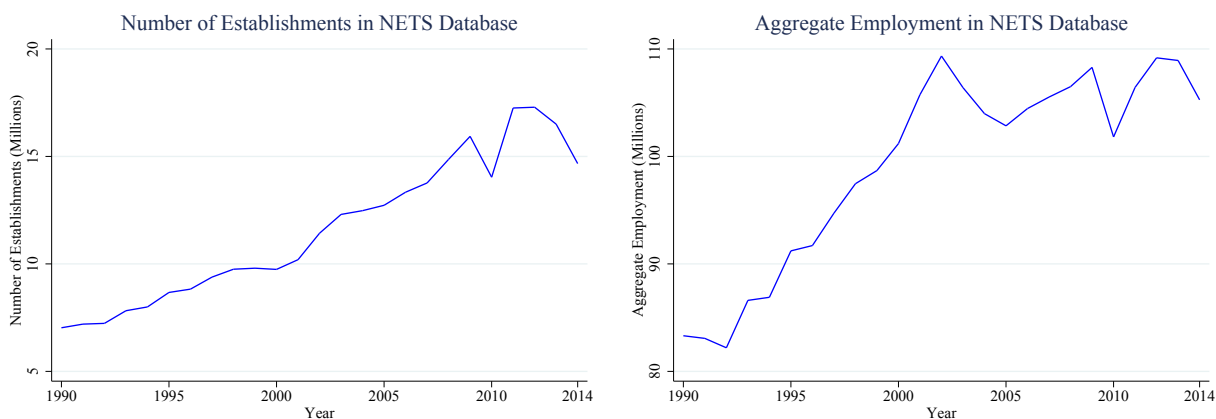
[4]Establishments that exist in 1990 are assigned 1990 as their entry year, as we have no data on them prior to this year. Likewise, establishments which exist in 2014 have that as their exit year.

1.1.1 Data Quality

A number of researchers have attempted to compare the scope and accuracy of the NETS database to official sources such as the County Business Patterns (CBP), the Quarterly Census of Employment and Wages (QCEW), the Longitudinal Business Database (LBD), and Census Nonemployer Statistics (CES). Neumark et al. (2006); Neumark, Wall, and Zhang (2011); and Barnatchez et al. (2017) find that NETS reports substantially higher aggregate employment than these sources. This discrepancy seems to arise primarily from the inclusion of nonemployer establishments, which consist only of business owners and have no paid employees, in the NETS data; such establishments are generally not counted in government employment data. Since nonemployer establishments tend to have very small employment numbers, NETS vastly overstates the number of establishments in the 1-4 employee bin compared to Census counts of establishments with employment in this range, as noted by Neumark et al. (2006) and Barnatchez et al. (2017). Using an extract of the NETS data covering Georgia, Choi, Robertson, and Rupasingha (2013) find that, compared to the QCEW, NETS has nearly 75% more establishments in the state in 2000 and roughly three times as many in 2009.

In the main text, we include these nonemployer establishments because they do report positive sales. Following the advice of Barnatchez et al. (2017), however, we show later in this appendix that the results hold when modifying the data to attempt to remove such establishments. While Neumark et al. (2006) argue that subtracting one from establishments' employment counts to remove business owners makes the NETS universe comparable to that of official sources and eliminates most nonemployer establishments, Barnatchez et al. (2017) instead propose subtracting one from employment counts at the headquarters of each enterprise, because enterprise owners will generally only be counted at their headquarters. Along those lines, we present an alternative specification in which, for each year, we exclude sales and employment from all enterprises that report only one employee.

However, there is some evidence that dropping single-employee enterprises may not remove the entire set of nonemployers. While over one-quarter of establishment-year pairs in our dataset have only one employee, nearly as many report two employees. Furthermore, because the CBP and LBD report establishment counts in employment bins, we can only compare the number of establishments with *between* 1 and 4 employees in NETS and these other sources. In fact, Barnatchez et al. (2017) find that NETS still overcounts the number of establishments in this range even after dropping single-employee enterprises. Consequently, we explore a second specification in which we exclude sales and employment from

all enterprise-year pairs reporting four or fewer employees.[5] Surely there are many employer establishments falling into this size range, so this specification should be interpreted as a very conservative attempt to remove the influence of nonemployer establishments in the database. Figure (2) supports this notion by showing that single-employee enterprises contain an immaterial percentage of aggregate sales and employment but dropping enterprises with fewer than 5 employees removes shares well over four times as large. Additionally, it is worth noting that while Neumark et al. (2006) and Barnatchez et al. (2017) note a high rate of imputation in establishments' reported employment and sales numbers, such imputation is mostly prevalent among smaller establishments, and so dropping small enterprises should eliminate the main share of imputed values.

Figure 2: Percent of Employment and Sales in Small Enterprises, 1990-2014
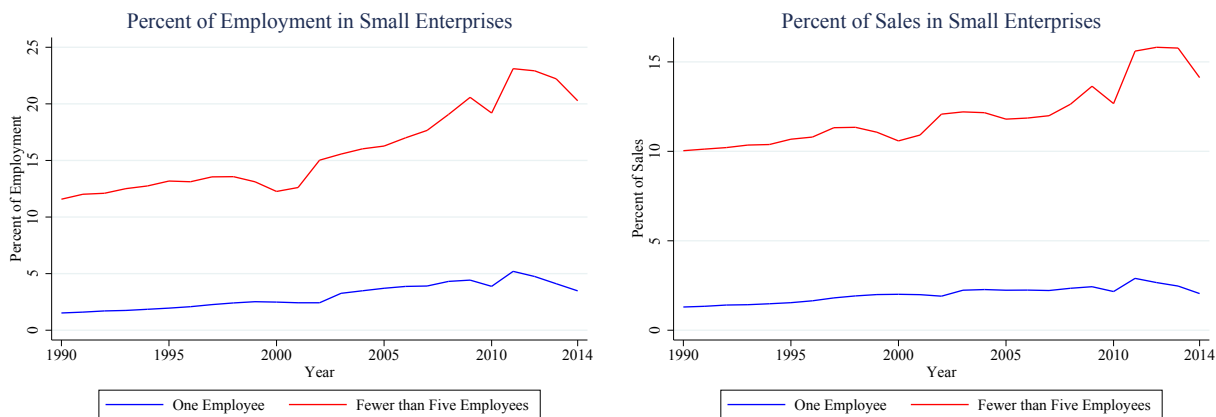
There are two other potential issues regarding the NETS database to be addressed. First, Neumark et al. (2006) observe that NETS can be slow to report the birth and death of establishments, often operating on a two-to-three year lag in such cases. Second, the NETS data reported for each year are collected primarily in the prior year, and unlike official government sources NETS data are collected throughout the year, with establishments potentially reporting data at different months in different years.[6] Because our dataset encompasses a 25-year period, such lags and inconsistencies in data collection timing should not affect the long-term trends we observe in the main text.

---

[5]Since the vast majority of enterprises only have one establishment, results removing establishments based on establishment size rather than enterprise size should be roughly equivalent.

[6]Some researchers roll back NETS data one year, but Barnatchez et al. (2017) find more favorable comparisons with government sources leaving years unchanged.

1.2 SIC 8 Codes

Our benchmark definition of an industry is an 8-digit Standard Industrial Classification (SIC) code. The first four digits of each SIC 8 code (SIC 4 codes) are created and determined by U.S. government agencies and assigned to business establishments. D&B supplements these codes with an additional four digits, providing a much finer level of detail regarding establishments' primary activities; there are over 18,000 unique 8-digit SIC codes compared to only about 1,000 unique SIC codes at the 4-digit level and 84 at the 2-digit level. Each SIC code is also assigned to one of 11 divisions, five of which we consider in this paper.[7]

To better illustrate this "hierarchy" of SIC codes, consider the case of Walmart. As mentioned in the main text, the large majority of Walmart's establishments in 2014 have SIC 8 53119901, Discount Department Stores, as their primary industry. This SIC 8 is a subset of SIC 4 5311, Department Stores, which also contains three other industries including SIC 8 53119902, Non-discount Department Stores. This SIC 4 code is further contained within the General Merchandise sector, SIC 2 53, which encompasses other industries corresponding to, for instance, Warehouse Club Stores and Miscellaneous General Merchandise. Finally, the Retail Trade division contains these industries and others as diverse as Grocery Stores, Optical Goods Stores, Eating Places, and Hardware Stores.

Individual SIC 8 codes vary widely in their sizes as measured by employment, sales, and the number of establishments. For instance, among the 15,102 SIC 8 codes considered in the main text, over one-quarter of these have reported 2014 employment of fewer than 100 employees across all establishments with that primary industry.[8] On the other hand, there are 182 industries with greater than 100,000 reported employees, with the Discount Department Stores industry having over 1.8 million. Overall, industries in Retail Trade, FIRE, and Services have much higher employment on average than industries in Manufacturing and Wholesale Trade.

To get a better sense of this heterogeneity across industries, Table (1) shows total employment and the number of SIC 8 industries within each of our 50 SIC 2 sectors in 2014, as well as the division into which each SIC 2 code falls. Even at the sector level, there are

---

[7]In addition to the primary 8-digit SIC code of each establishment, the NETS database reports the establishment's primary North American Industry Classification System (NAICS) code. While government agencies developed the SIC system in the early 1900s, the Office of Management and Budget developed the NAICS system in 1992 to better reflect changes in the structure of the economy. Although the NAICS system contains a higher share of codes in more service-oriented industries, the most detailed NAICS code level only contains roughly 1,100 industries, a level of aggregation much more comparable to the 4-digit than the 8-digit SIC code. Consequently, we use SIC 8 codes as they offer by far the most granular available definition of an industry.

[8]Approximately 90% of these industries are in the Manufacturing division.

huge differences in these variables. Over 10 million employees work in the Business Services sector, while many sectors in the Manufacturing division have only a few hundred thousand employees. Sectors in Retail Trade, FIRE, and Services tend to have higher employment than sectors in Manufacturing and Wholesale Trade, while the latter two divisions encompass over three-quarters of all SIC 8 codes.

SIC 2 Code	SIC 2 Description	Division	Employment in 2014 (Thousands)	Number of SIC 8 codes in 2014	Mean SIC 8 employment in 2014 (Thousands)
20	Food and Kindred Products	Manufacturing	1637	805	2
21	Tobacco Products	Manufacturing	25	11	2
22	Textile Mill Products	Manufacturing	343	587	1
23	Apparel, Finished Products from Fabrics and Similar Materials	Manufacturing	386	385	1
24	Lumber and Wood Products, Except Furniture	Manufacturing	699	371	2
25	Furniture and Fixtures	Manufacturing	429	262	2
26	Paper and Allied Products	Manufacturing	680	328	2
27	Printing, Publishing and Allied Industries	Manufacturing	1472	299	5
28	Chemicals and Allied Products	Manufacturing	1345	643	2
29	Petroleum Refining and Related Industries	Manufacturing	189	75	3
30	Rubber and Miscellaneous Plastic Products	Manufacturing	895	334	3
31	Leather and Leather Products	Manufacturing	101	162	1
32	Stone, Clay, Glass, and Concrete Products	Manufacturing	576	516	1
33	Primary Metal Industries	Manufacturing	610	345	2
34	Fabricated Metal Products	Manufacturing	1488	736	2
35	Industrial and Commercial Machinery and Computer Equipment	Manufacturing	2144	1123	2
36	Electronic and Other Electrical Equipment and Components	Manufacturing	1967	694	3
37	Transportation Equipment	Manufacturing	1802	373	5
38	Measuring, Photographic, Medical, and Optical Goods, and Clocks	Manufacturing	1401	784	2
39	Miscellaneous Manufacturing Industries	Manufacturing	570	627	1
50	Wholesale Trade - Durable Goods	Wholesale Trade	4527	1104	4
51	Wholesale Trade - Nondurable Goods	Wholesale Trade	2966	653	5
52	Building Materials, Hardware, Garden Supplies and Mobile Homes	Retail Trade	1400	77	18
53	General Merchandise Stores	Retail Trade	3346	11	304
54	Food Stores	Retail Trade	3935	61	65

55	Automotive Dealers and Gasoline Service Stations	Retail Trade	2783	68	41
56	Apparel and Accessory Stores	Retail Trade	1462	78	19
57	Home Furniture, Furnishings and Equipment Stores	Retail Trade	1279	125	10
58	Eating and Drinking Places	Retail Trade	10446	81	129
59	Miscellaneous Retail	Retail Trade	4446	358	12
61	Nondepository Credit Institutions	FIRE	749	65	12
62	Security and Commodity Brokers, Dealers, Exchanges and Services	FIRE	901	56	16
63	Insurance Carriers	FIRE	1191	77	15
64	Insurance Agents, Brokers and Service	FIRE	1373	27	51
65	Real Estate	FIRE	4217	63	67
67	Holding and Other Investment Offices	FIRE	1679	48	35
70	Hotels, Rooming Houses, Camps, and Other Lodging Places	Services	2736	49	56
72	Personal Services	Services	2501	168	15
73	Business Services	Services	10524	487	22
75	Automotive Repair, Services and Parking	Services	1822	106	17
76	Miscellaneous Repair Services	Services	928	227	4
78	Motion Pictures	Services	535	67	8
79	Amusement and Recreation Services	Services	2357	306	8
81	Legal Services	Services	1869	25	75
83	Social Services	Services	2755	109	25
84	Museums, Art Galleries and Botanical and Zoological Gardens	Services	125	15	8
86	Membership Organizations	Services	3025	125	24
87	Engineering, Accounting, Research, and Management Services	Services	7927	198	40
89	Services, Not Elsewhere Classified	Services	734	46	16

Table 1: Employment and Number of SIC 8 Codes in Each SIC 2 Sector in 2014

1.2.1 Percent of Sector-Level Employment in Industries with Diverging Trends

Table (2) provides more detail for Figure (2) in the main text and further highlights this degree of heterogeneity by displaying the exact percentages of employment in each sector and division across industries with diverging trends. In the column headings, α_n and α_z refer to the coefficients obtained from regressing the weighted average change in the HHI in each industry on the year with a constant at the national and ZIP code levels, respectively. The first three columns to the right of the sector and division descriptions show the percentage of employment in industries that have a positive national trend and positive, negative, and flat ZIP code trends, respectively. The last column displays the percentage of employment

9

in industries with positive national trends located in industries that also have negative local trends. In all five divisions, over half of employment in industries with positive national trends is also located in industries that have declining concentration over time at the ZIP code level.

Division	SIC2	Description	Pct. Emp $\alpha_n > 0, \alpha_z > 0$	Pct. Emp $\alpha_n > 0, \alpha_z < 0$	Pct. Emp $\alpha_n > 0, \alpha_z = 0$	Pct. Emp $\alpha_z < 0 | \alpha_n > 0$
D		Manufacturing	27.44	33.82	2.78	52.82
D	20	Food and Kindred Prod.	36.94	29.6	3.66	42.16
D	21	Tobacoo Prod.	17.18	0	3.79	0
D	22	Textile Mill Prod.	43.54	29.4	5.14	37.65
D	23	Apparel, Finished Prod. from Fabrics	52.12	23.91	1.8	30.72
D	24	Lumber and Wood Prod., Exc. Furn.	26.47	33.53	1.28	54.71
D	25	Furniture and Fixtures	52.83	18.31	2.51	24.86
D	26	Paper and Allied Prod.	22.74	50.72	5.67	64.1
D	27	Printing and Publishing	45.8	31.69	.46	40.65
D	28	Chemicals and Allied Prod.	16.81	30.4	2.78	60.81
D	29	Petroleum Refining	72.23	11.37	.85	13.46
D	30	Rubber and Misc. Plastic Prod.	22.11	49.7	2.95	66.48
D	31	Leather and Leather Prod.	52.53	26.01	4.4	31.36
D	32	Stone Clay, Glass, and Concrete Prod.	18.33	39.32	4.07	63.7
D	33	Primary Metal Ind.	22.1	34.83	3.92	57.24
D	34	Fabricated Metal Prod.	23.39	32.32	2.57	55.46
D	35	Ind. and Comm. Machinery and Comp. Equip.	24.94	31.52	2.61	53.36
D	36	Electronic and Electric Equip.	14.41	39.46	2.26	70.31
D	37	Transport. Equip.	13.73	33.97	2.94	67.09
D	38	Instruments and Related Products	21.72	43.76	3.72	63.24
D	39	Misc. Manufact. Ind.	27.57	25.11	2.71	45.33
F		Wholesale Trade	34.17	39.01	.18	53.17
F	50	Wholesale- Durable Goods	31.65	39.71	.19	55.5
F	51	Wholesale- Nondurable Goods	38.18	37.89	.16	49.7

G		Retail Trade	14.57	52.71	.01	78.33
G	52	Bldg. Materials and Garden. Supp.	47.91	31.25	.06	39.45
G	53	Gen. Merch. Stores	1.83	96.38	0	98.14
G	54	Food Stores	21.69	70.27	0	76.41
G	55	Auto. Dealers and Service Stations	7.27	77.5	.01	91.41
G	56	Apparel and Access. Stores	6.42	77.24	0	92.33
G	57	Furn. and Homefurn. Stores	20.92	55.51	.02	72.6
G	58	Eating and Drinking Places	4.66	26.43	.01	85
G	59	Misc. Retail	30.94	42.54	0	57.89
H		Finance, Insurance, and Real Estate	14.26	46.17	.04	76.35
H	60	Depository Inst.	12.23	75.44	.01	86.04
H	61	Nondepository Inst.	11.27	38.33	.06	77.19
H	62	Security and Commod. Brokers	15.37	13.58	.03	46.86
H	63	Insurance Carr.	42.88	17.58	.23	28.97
H	64	Ins. Agents, Brokers, and Service	7.01	12.78	0	64.6
H	65	Real Estate	6.77	69.86	.01	91.16
H	67	Holding and Oth. Invest. Offices	19.81	27.48	.04	58.06
I		Services	10.14	41.02	.02	80.15
I	70	Hotels and Lodging Places	13.51	40.79	0	75.12
I	72	Personal Serv.	5.11	53.34	.15	91.03
I	73	Business Serv.	20.89	34.85	.01	62.5
I	75	Auto Repair, Serv., and Park.	8.29	43.55	.01	84
I	76	Misc. Repair Serv.	18.42	40.68	.04	68.78
I	78	Motion Pict.	37.54	47.23	.05	55.68
I	79	Amusement and Rec. Serv.	5.12	36.38	.06	87.52
I	81	Legal Services	.11	26.45	0	99.59
I	83	Social Services	.66	70.49	0	99.07
I	84	Museums, Art Gall., Zoos	2.95	3.99	.18	56.1
I	86	Membership Org.	.67	54.62	0	98.78
I	87	Engineering and Mgmt. Services	4.77	35.14	0	88.04
I	88	Private Households	3.76	65.14	23.72	70.33
I	89	Misc. Serv.	1.09	17.75	0	94.22

Table 2: Percent of Sector Employment in Industries with Diverging Trends

2   Robustness

In the remainder of this appendix, we show that the benchmark results in the main text are robust to both different measures of market concentration, and to various modifications of the NETS database.

2.1   Different Measures of Concentration

While the figures in the main text all rely on the Herfindahl-Hirschman Index (HHI), here we replicate them for alternative measures of concentration. In particular, we look at the adjusted HHI, which modifies the HHI for the number of enterprises in a market, as well as the share of the top enterprise, as measured by sales, for each geography-industry-year grouping. For reasons discussed in more detail below, we believe the HHI used in the main text remains the best measure of concentration; however, the results in this section show that all the findings in the main text still hold using these alternative measures.

2.1.1   Adjusted HHI

Let $C_{i,g,t}$ denote the HHI for industry i in geography g in year t, and let $N_{i,g,t}$ denote the number of enterprises in this industry-geography-year grouping. Then $C_{i,g,t} \in [1/N_{i,g,t}, 1]$. Because $C_{i,g,t}$ is bounded below by the inverse of the number of enterprises, comparisons of the HHI between groupings with different numbers of enterprises can be somewhat difficult. A grouping with only a handful of enterprises will tend to have a much higher HHI than a grouping with dozens of enterprises (or alternatively, the HHI in an industry-geography pair will tend to decrease over time if the number of enterprises in that pair increases).

In contrast, the adjusted Herfindahl-Hirschman Index for any pair with more than 1 enterprise can take on any value between 0 and 1, inclusive. In particular, the adjusted HHI of industry i in geography g in year t, $C_{i,g,t}^*$, can be defined as

$$C_{i,g,t}^* = \begin{cases} \frac{C_{i,g,t} - \frac{1}{N_{i,g,t}}}{1 - \frac{1}{N_{i,g,t}}} & N_{i,g,t} > 1 \\ 1 & N_{i,g,t} = 1 \end{cases}. \tag{1}$$

For groupings with a very large numbers of enterprises (for example, most groupings with a geography defined at the national level), the adjusted and unadjusted HHIs will be very close. However, groupings defined at the ZIP code level typically have a small number of enterprises, leading to potentially large differences between the adjusted and unadjusted measures. In such cases, the unadjusted HHI is preferable because, in some sense, the number of an enterprises in a market itself partly determines concentration. That is, a market with,

say, 3 enterprises is arguably more concentrated than a market with 10, even if all enterprises have equal sales in both markets.

The 5 figures below replicate the figures in the main text using the adjusted HHI. Overall, these results are remarkably similar to the corresponding figures in the main text. The lines corresponding to concentration measured at the national level in Figures (3) and (5) are not discernibly different from the corresponding lines calculated using the unadjusted HHI in Figures (1) and (3), respectively, in the main text. This observation is unsurprising given that most SIC 8 codes have a large number of enterprises at the national level. On the other hand, when concentration is measured at the ZIP code level, these figures show that concentration actually falls slightly more when using the adjusted HHI. Given that over 70% of ZIP code-SIC 8 pairs have only one enterprise in their first year in the NETS dataset (i.e. have an adjusted and unadjusted HHI of 1), this trend reflects the fact that as more firms enter ZIP code-industry pairs, the adjusted HHI will tend to fall more than its unadjusted counterpart, because its lower bound is 0 regardless of the number of firms. In Figure (7), the average fall in the adjusted HHI when Walmart enters a ZIP code within its primary industry is over 0.1 more than the fall in the HHI shown in Figure (5) of the main text.

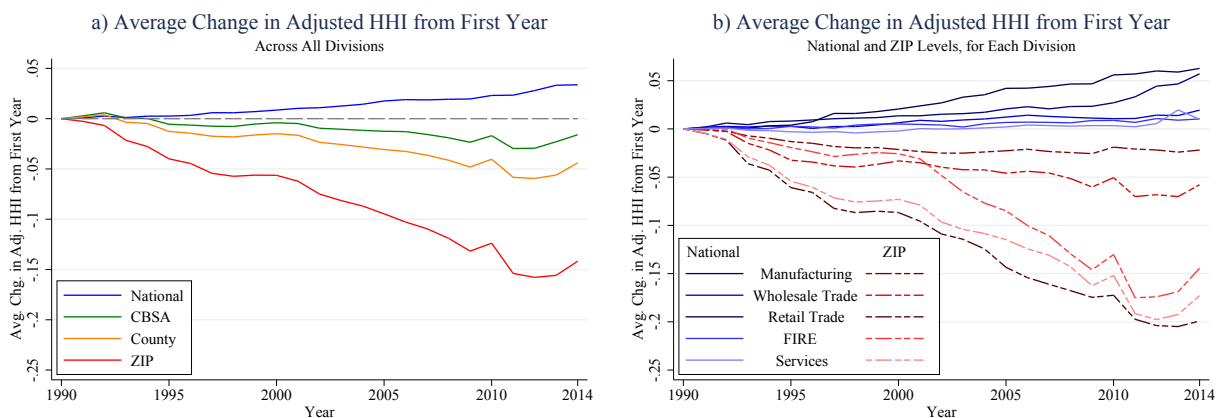Figure 3: Adjusted HHI: Diverging national and local concentration trends

13

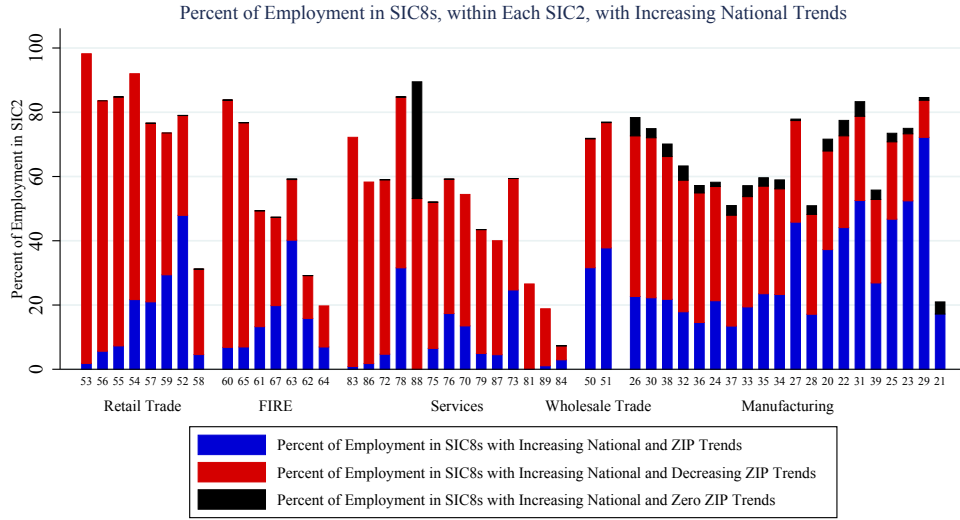Figure 4: Adjusted HHI: Pervasive diverging trends across 2-digit sectors

Percent of Employment in SIC8s, within Each SIC2, with Increasing National Trends

Figure 5: Adjusted HHI: The role of top firms in national and local concentration trends

a) Average Change in Adjusted HHI from First Year
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in Adjusted HHI from First Year
Across SIC8s with Positive National and Positive ZIP Trends
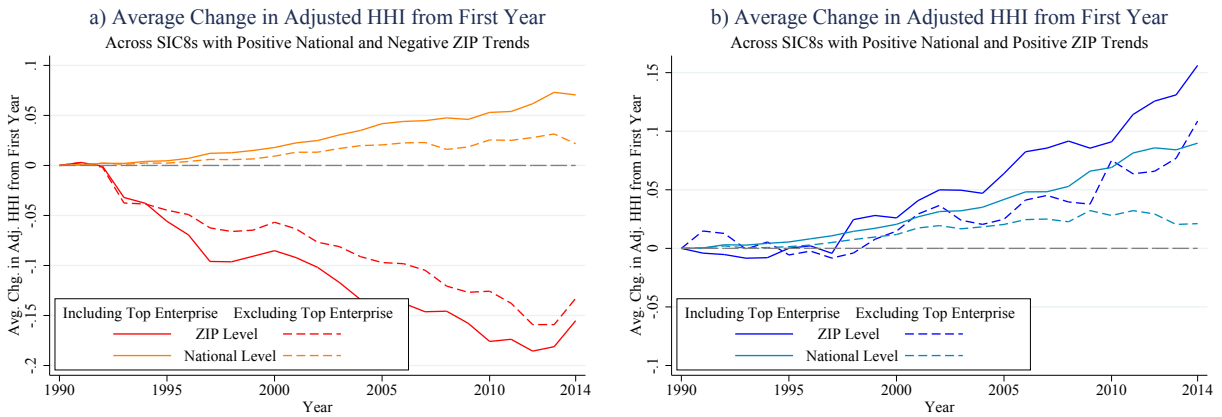
Figure 6: Adjusted HHI: Effect on concentration when a top firm enters a local market

a) Avg. Chg. in Adj. HHI after Top Enterprise Opening
Across SIC8s with Positive National and Negative ZIP Trends

b) Avg. Chg. in Adj. HHI after Top Enterprise Opening
Across SIC8s with Positive National and Positive ZIP Trends

14
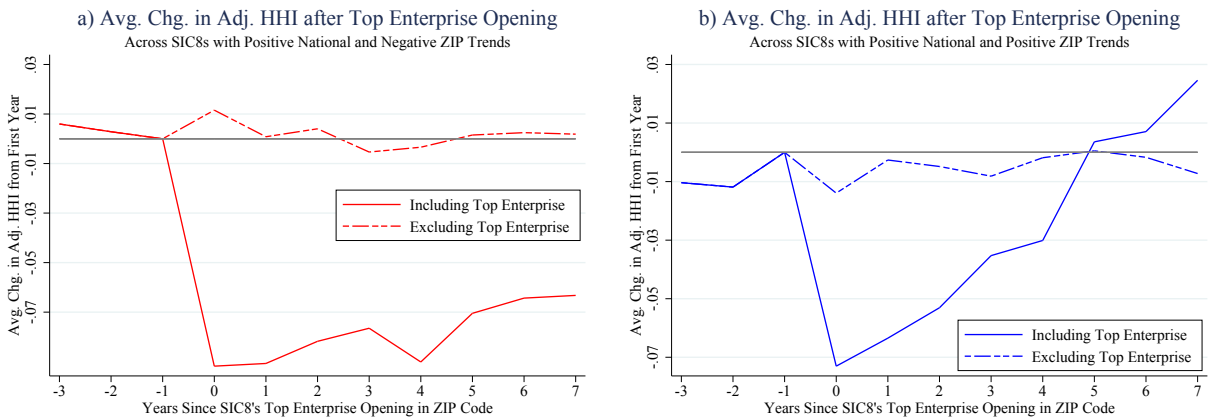
Figure 7: Adjusted HHI: Effect on concentration when Walmart enters a local market

a) Avg. Change in Adj. HHI Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores
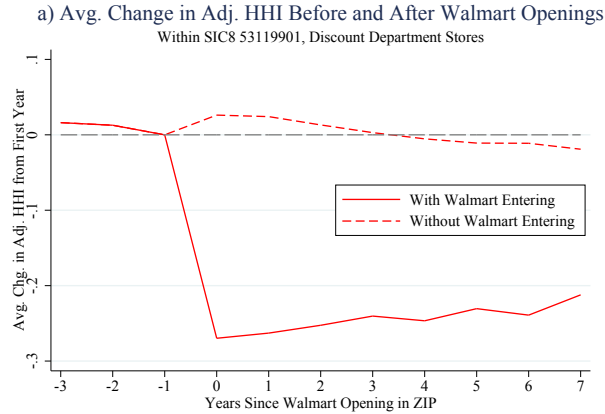
2.1.2 Share of Top Enterprise

Another common measure of market concentration is the concentration ratio, which looks at the total market share accounted for by a certain number of top firms in a market. Here, we measure concentration in a geography-industry-year grouping as that pair's share of total sales in the top enterprise measured by sales. This share will obviously equal 1 for any geography-industry-year groupings with only one enterprise.

We prefer the HHI as a measure of concentration because the HHI captures in a more precise way the entire distribution of market shares. The share of the top enterprise fails to capture any variation in the structure of market shares among enterprises beyond the top enterprise. For instance, this measure would conclude that among two markets in which the top enterprises control 60% of total sales, a market in which there is only one other enterprise comprising the remaining 40% of sales is just as concentrated as one in which ten enterprises each have 4% of sales. In contrast, the HHI would indicate considerably more concentration in the first market.

Nevertheless, as shown in the 5 figures below, using the share of the top enterprise leaves our key results in the main text unchanged. In Figures (8) and (10), we can see that the decline in concentration at the ZIP code level is slightly less pronounced using this measure, while concentration generally increases slightly more as measured at the national level. The overall movements and trends of concentration are the same here as in the main text. As shown in Figure (9), it is also still the case that a substantial portion of employment (approximately 42%) resides in industries with increasing concentration at the national level and decreasing concentration at the local level. Compared to Figure (2) in the main text, some SIC 2 sectors, such as SIC 2 87 (Engineering & Management Services), have a slightly lower share of employment in industries with such diverging trends. Furthermore, Figure

(11a) shows that in industries with diverging trends, the share of the top enterprise in each industry-ZIP code pair also falls upon entry of that industry's top enterprise.

Figure 8: Share of Top Enterprise: Diverging national and local concentration trends
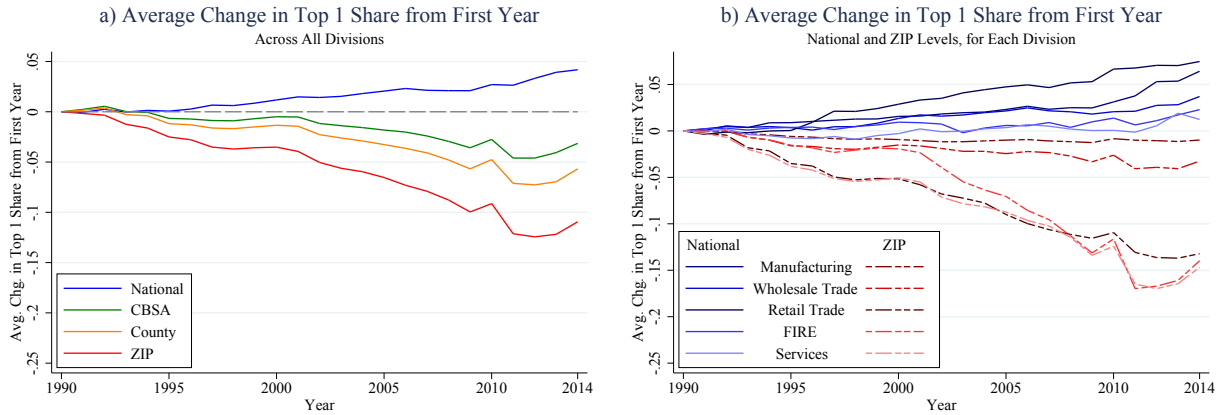

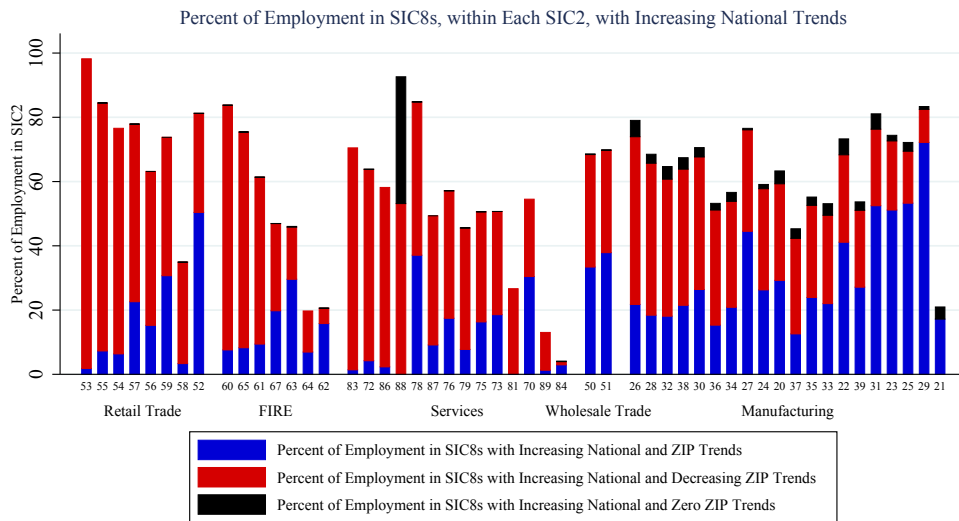Figure 9: Share of Top Enterprise: Pervasive diverging trends across 2-digit sectors

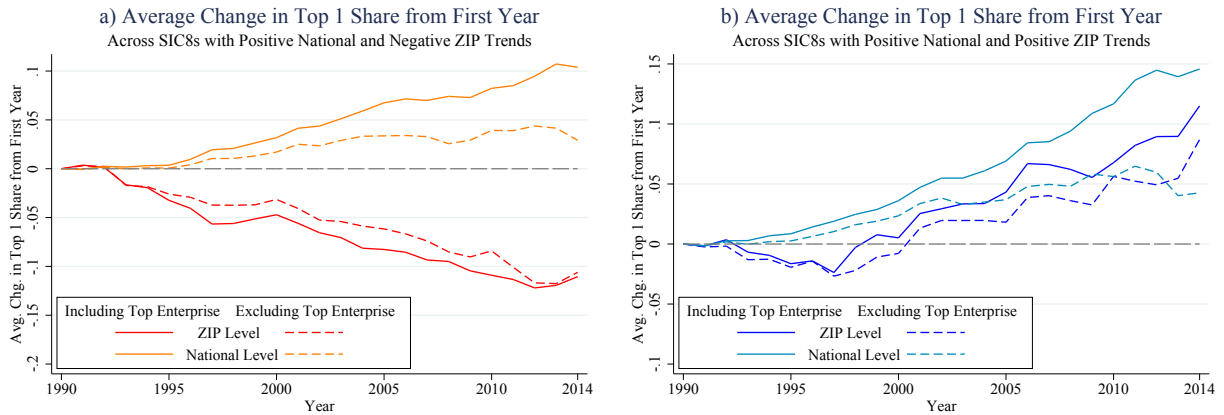Figure 10: Share of Top Enterprise: The role of top firms in national and local concentration trends

a) Average Change in Top 1 Share from First Year
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in Top 1 Share from First Year
Across SIC8s with Positive National and Positive ZIP Trends

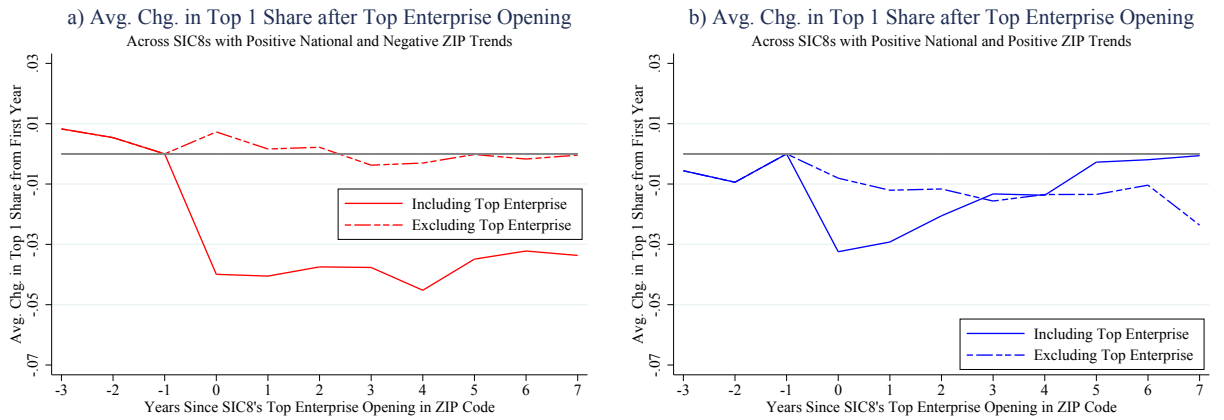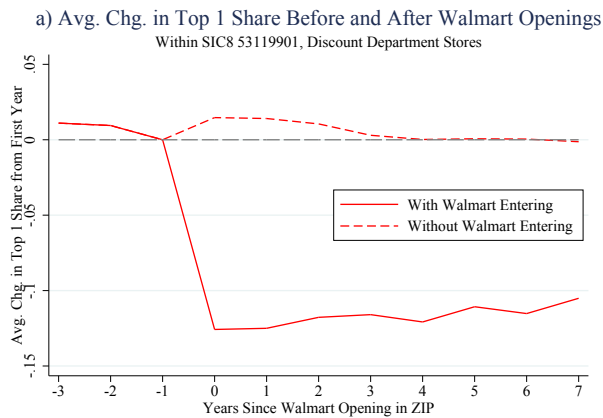Figure 11: Share of Top Enterprise: Effect on concentration when a top firm enters a local market

a) Avg. Chg. in Top 1 Share after Top Enterprise Opening
Across SIC8s with Positive National and Negative ZIP Trends

b) Avg. Chg. in Top 1 Share after Top Enterprise Opening
Across SIC8s with Positive National and Positive ZIP Trends

Figure 12: Share of Top Enterprise: Effect on concentration when Walmart enters a local market

a) Avg. Chg. in Top 1 Share Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

17

2.2 Removing Nonemployer Enterprises

As discussed above, this section contains two modifications to the NETS database in order to reduce the occurrence of nonemployer establishments in the data. The first modification, removing enterprise-year pairs with only one employee, likely leaves a large number of nonemployment establishments remaining, while dropping enterprise-year pairs with four or fewer employees probably overstates the prevalence of such establishments.

2.2.1 Removing Enterprises with Only 1 Employee

The figures below present results excluding, in each year, the sales and employment of enterprises with only 1 employee.[9] There are no substantial changes from the corresponding results in the main text.

Figure 13: Removing Enterprises with One Employee: Diverging national and local concentration trends

---
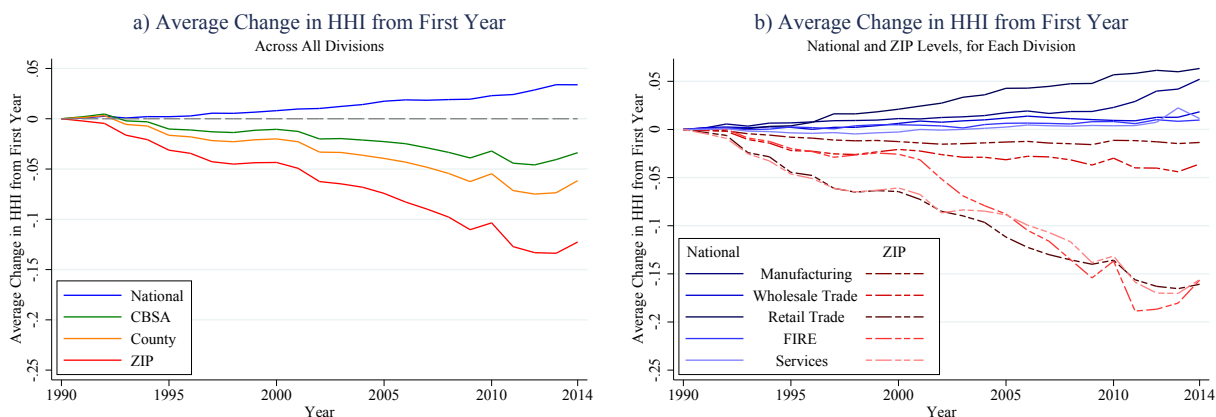
[9]That is, we exclude the sales of each establishment when calculating the HHI and exclude the employment when calculating geography-industry-year employment for taking weighted averages.

Figure 14: Removing Enterprises with One Employee: Pervasive diverging trends across 2-digit sectors
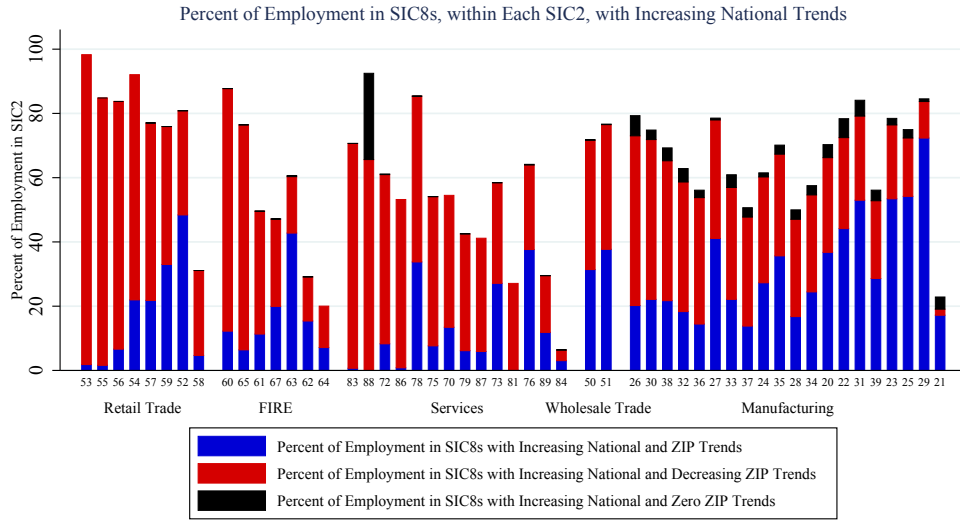

Figure 15: Removing Enterprises with One Employee: The role of top firms in national and local concentration trends
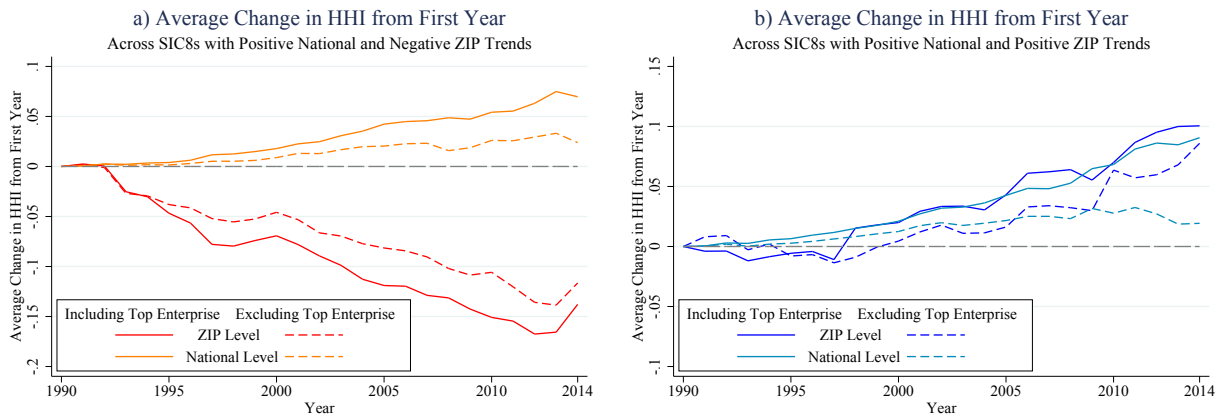
Figure 16: Removing Enterprises with One Employee: Effect on concentration when a top firm enters a local market
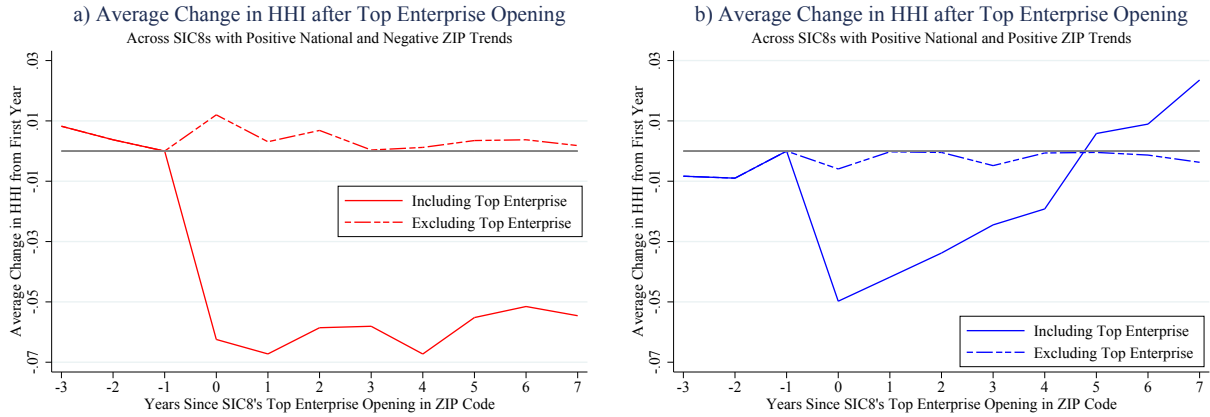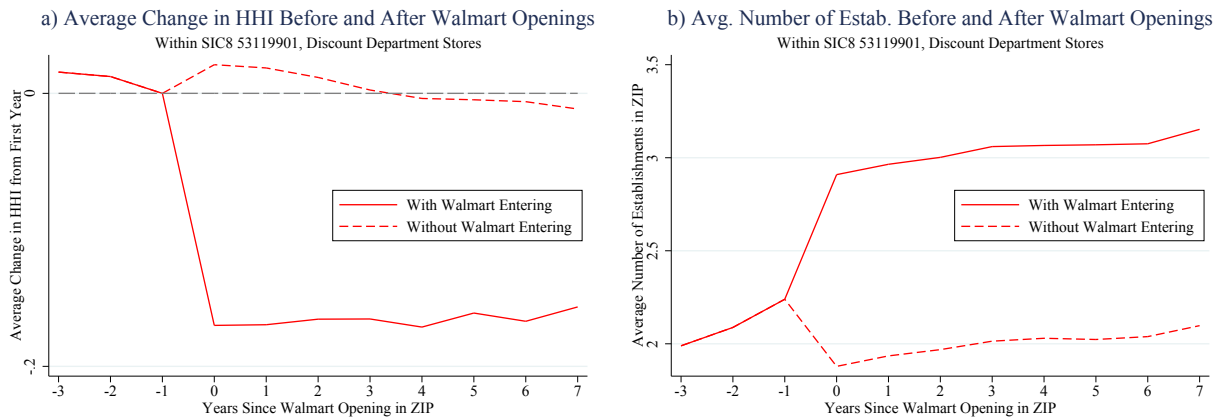

a) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Positive ZIP Trends

Figure 17: Removing Enterprises with One Employee: Effect on concentration when Walmart enters a local market

a) Average Change in HHI Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

b) Avg. Number of Estab. Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

2.2.2 Removing Enterprises with Fewer than 5 Employees

Here we reproduce the main text figures excluding, in each year, enterprises with fewer than
five employees. Figure (18) shows that the decrease in concentration at more local levels is
somewhat less pronounced here than in Figure (1) in the main text, while Figure (19) reveals
some sectors, including General Merchandise Stores (SIC 2 53), have a modestly lower share
of employment in industries with diverging trends. On the other hand, in Figures (20)
and (21), the downward effect of top enterprises on local concentration in industries with
diverging trends is actually more pronounced.

Figure 18: Removing Enterprises with Fewer than 5 Employees: Diverging national and local
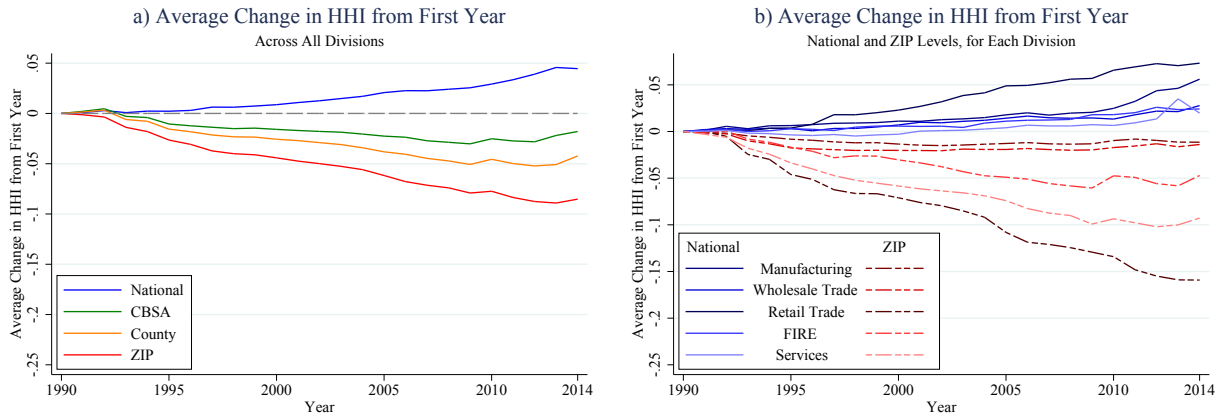concentration trends

Figure 19: Removing Enterprises with Fewer than 5 Employees: Pervasive diverging trends across
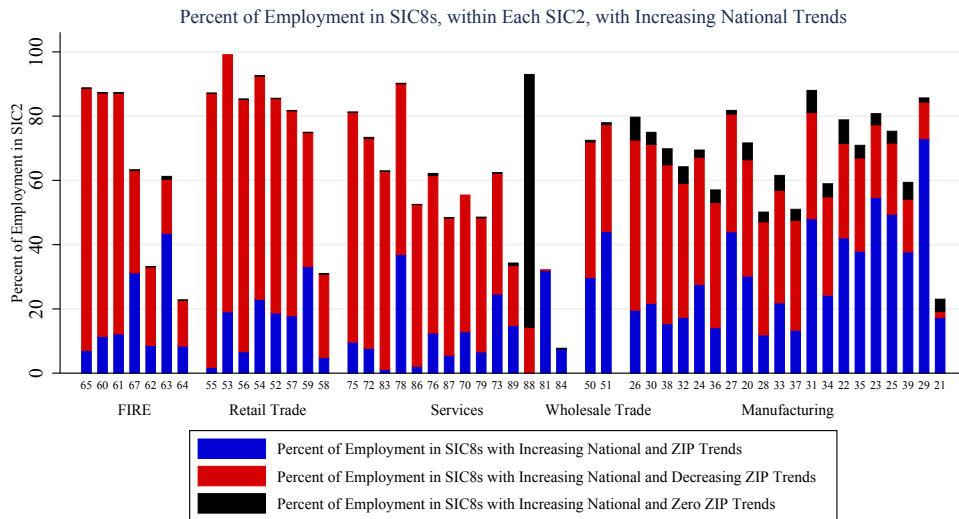2-digit sectors

Figure 20: Removing Enterprises with Fewer than 5 Employees: The role of top firms in national and local concentration trends

a) Average Change in HHI from First Year
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in HHI from First Year
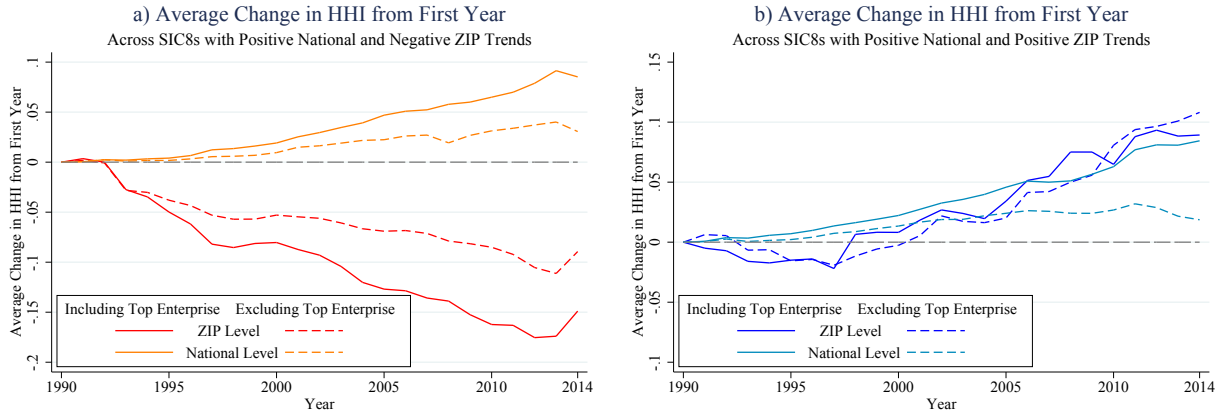Across SIC8s with Positive National and Positive ZIP Trends

Figure 21: Removing Enterprises with Fewer than 5 Employees: Effect on concentration when a top firm enters a local market

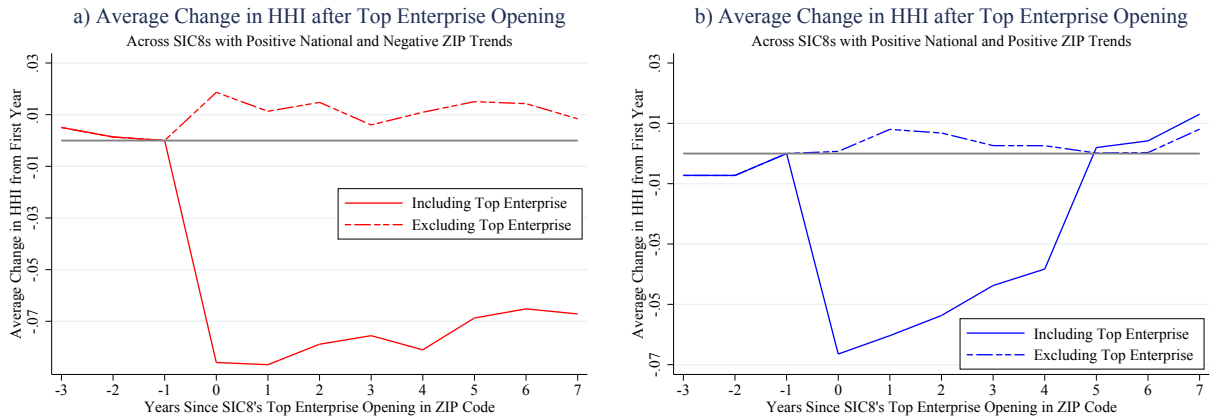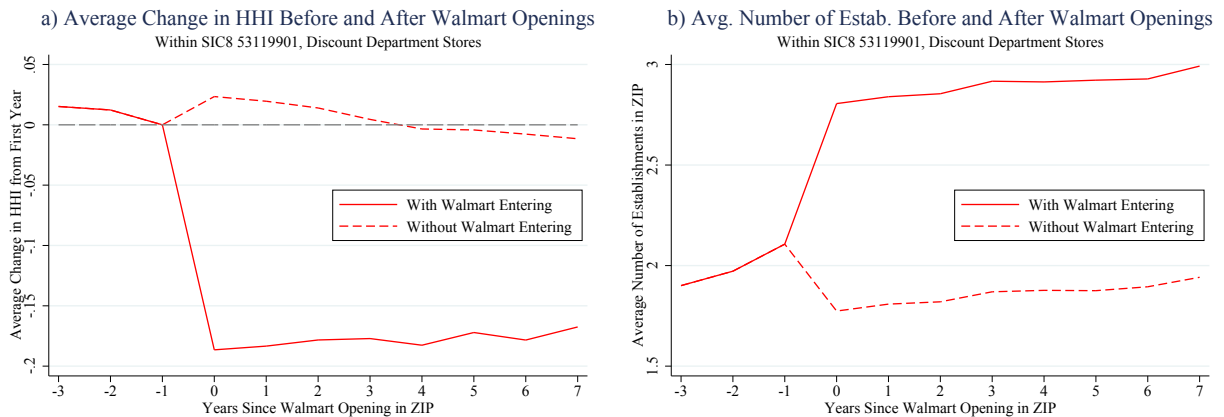a) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Positive ZIP Trends

Figure 22: Removing Enterprises with Fewer than 5 Employees: Effect on concentration when Walmart enters a local market

a) Average Change in HHI Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

b) Avg. Number of Estab. Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

22

2.3   Including Health Services

All the figures in the main text exclude the health care sector, corresponding to SIC 2 80 (Health Services), because there is some evidence that institutional and policy changes specific to this sector, including the Affordable Care Act, have strongly affected concentration trends (Fulton (2017), for instance, finds an overall increase in concentration in hospital and health insurance markets between 2010 and 2016). In this section, we repeat Figures (1)-(4) in the main text including establishments whose primary SIC 2 code is 80.[10] In Figure (24), we can see that slightly over 40% of employment in this sector resides in industries with increasing national trends, most of which is contained in industries that also have decreasing local trends. Furthermore, Figure (23b) shows that including this sector, which is contained in the Services division, makes the national and local trends for this division very slightly more and less pronounced, respectively. The remaining figures illustrate that including this sector has almost no discernible effect on the aggregate trends observed in the main text.

Figure 23: Including Health Services: Diverging national and local concentration trends

---
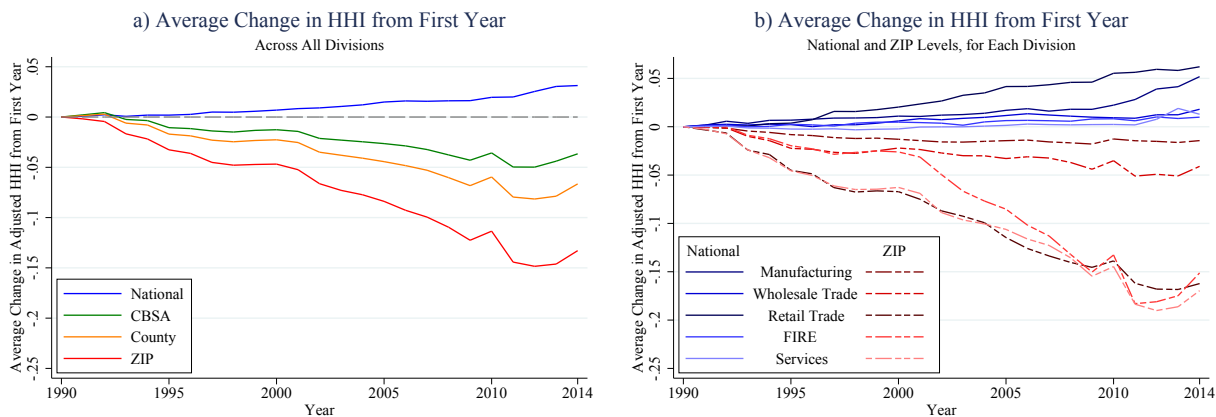
[10]We do not repeat Figure (5) because including this sector has no effect on Walmart's primary industry.

Figure 24: Including Health Services: Pervasive diverging trends across 2-digit sectors

Percent of Employment in SIC8s, within Each SIC2, with Increasing National Trends
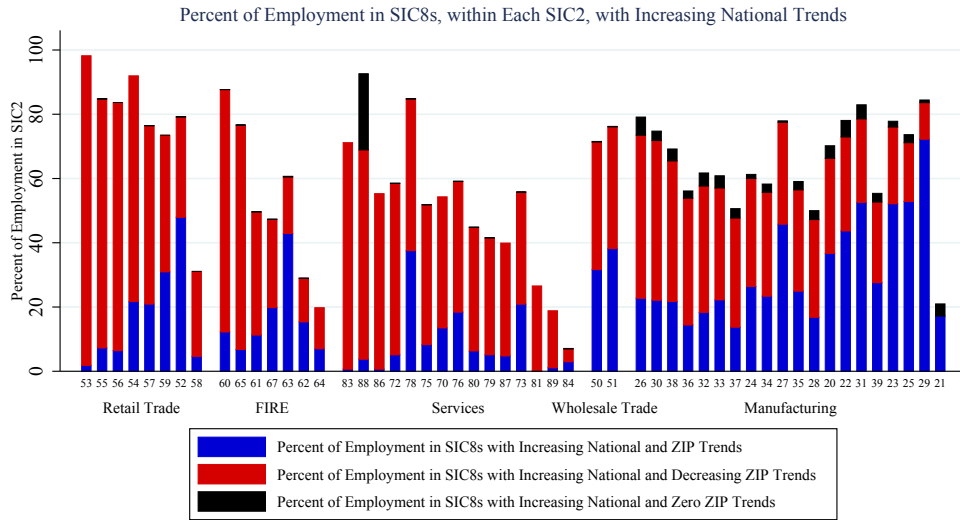
Figure 25: Including Health Services: The role of top firms in national and local concentration trends

a) Average Change in HHI from First Year
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in HHI from First Year
Across SIC8s with Positive National and Positive ZIP Trends
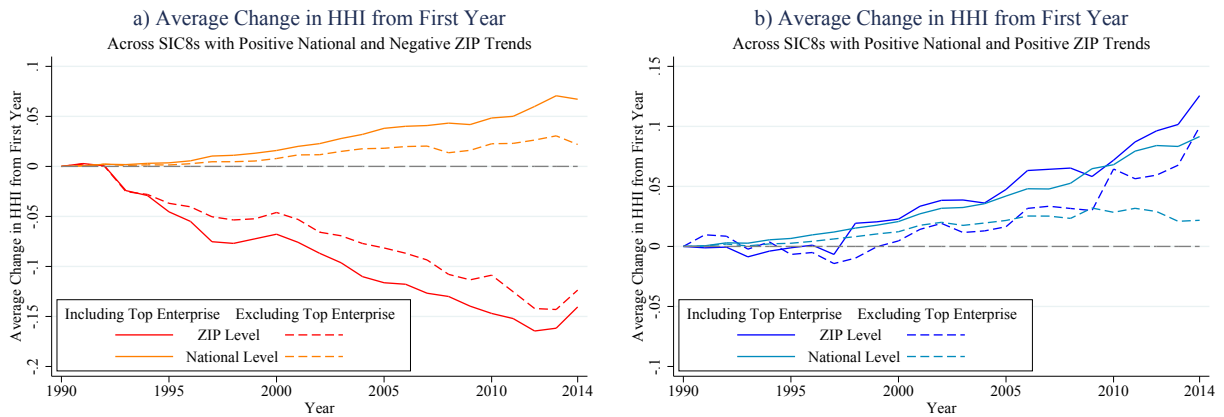
Figure 26: Including Health Services: Effect on concentration when a top firm enters a local market

a) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Positive ZIP Trends

24
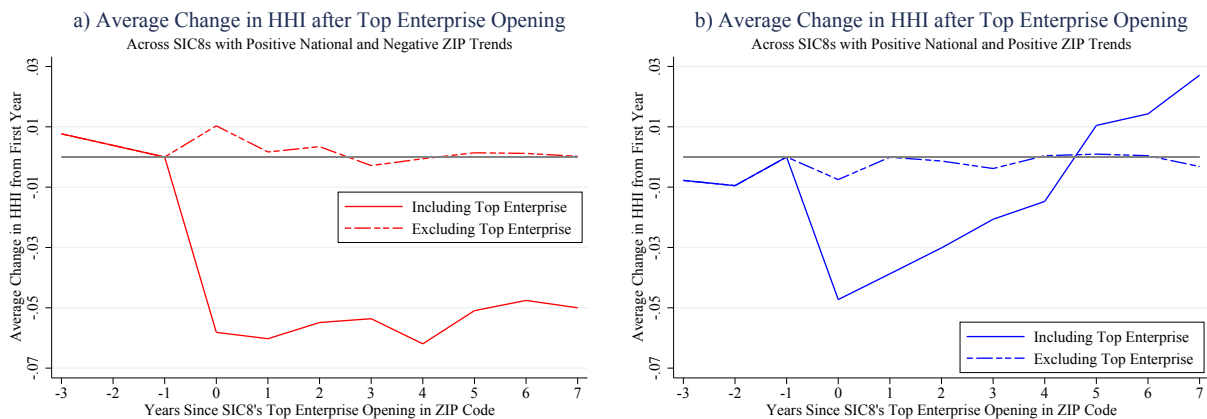
2.4   Results for Other Geographic Measures

As shown in Figure (1a) in the main text, while the decline in concentration is most pronounced at the ZIP code level, concentration is also declining over time at the county and Core-Based Statistical Area (CBSA) levels.[11] This section reproduces Figures (1b) and (2) for these two geographic levels. At the county level, it is still the case that concentration in all divisions is declining over time, while concentration is declining at the CBSA level in all divisions except Manufacturing, which has a roughly flat trend. Figure (28) indicates that industries with diverging trends are still prevalent in both cases, comprising approximately 29 and 23% of employment at the county and CBSA levels, respectively. Among industries that have increasing national trends, 48% of employment is located in industries that have declining employment at the county level and 38% at the CBSA level.
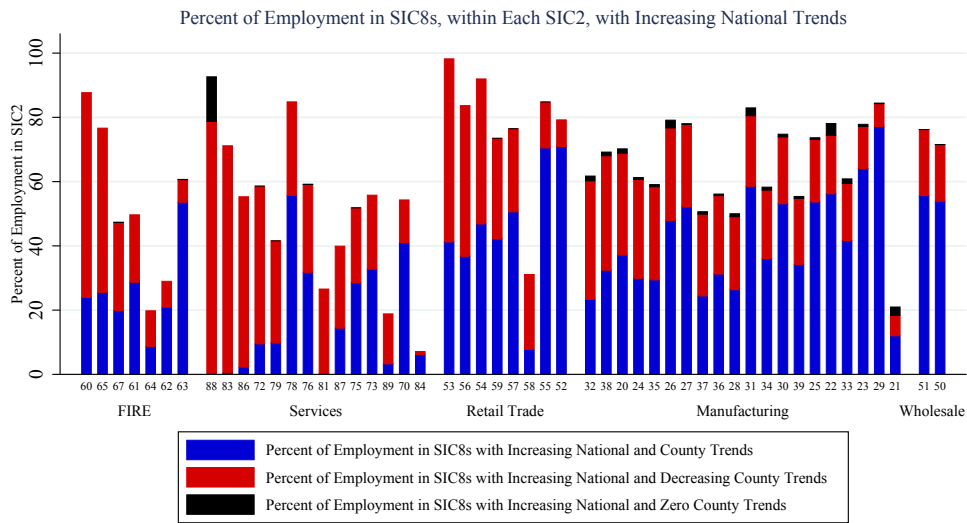
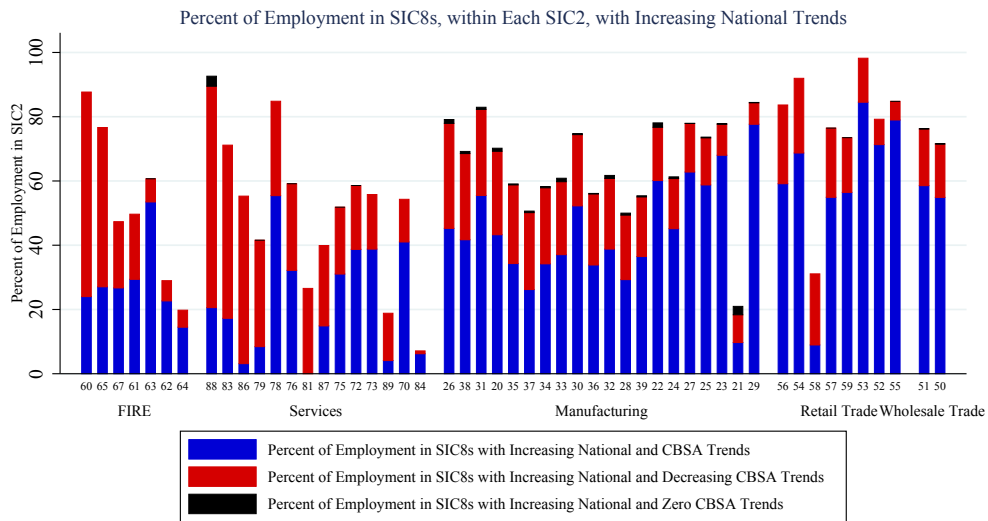Figure 27: County and CBSA Levels: Diverging national and local concentration trends

(a) County Level   (b) CBSA Level

---
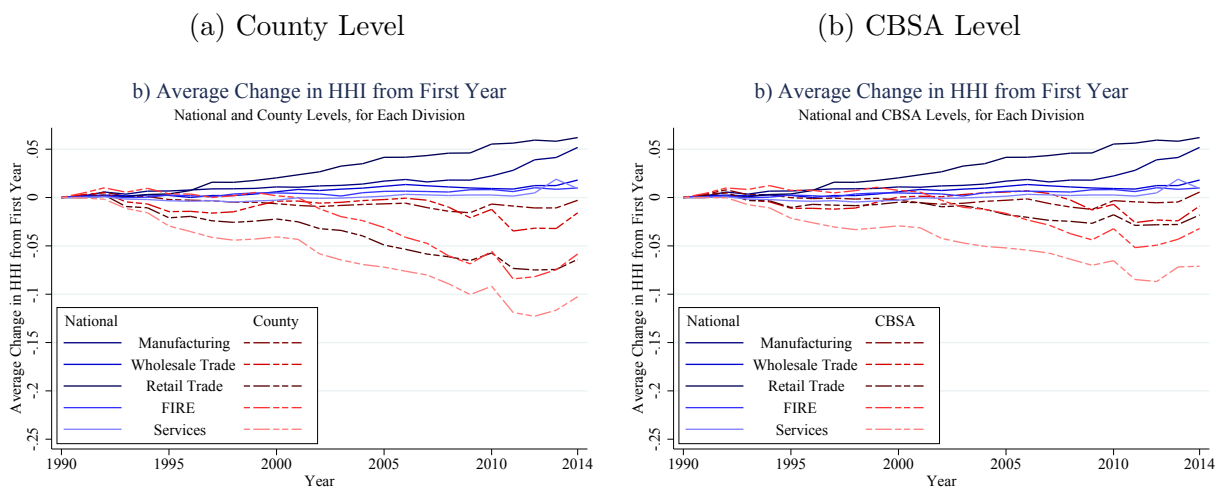
[11]A CBSA is defined as either a Metropolitan or Micropolitan Statistical Area and is a collection of counties. Although CBSA boundaries can expand over time as new counties are added to them, for all years here we classify counties into CBSAs based on 2014 CBSA definitions. We also drop any observations not located in CBSAs.

Figure 28: County and CBSA Level: Pervasive diverging trends across 2-digit sectors

(a) County Level

Percent of Employment in SIC8s, within Each SIC2, with Increasing National Trends

Legend:
- Percent of Employment in SIC8s with Increasing National and County Trends
- Percent of Employment in SIC8s with Increasing National and Decreasing County Trends
- Percent of Employment in SIC8s with Increasing National and Zero County Trends

(b) CBSA Level

Percent of Employment in SIC8s, within Each SIC2, with Increasing National Trends

Legend:
- Percent of Employment in SIC8s with Increasing National and CBSA Trends
- Percent of Employment in SIC8s with Increasing National and Decreasing CBSA Trends
- Percent of Employment in SIC8s with Increasing National and Zero CBSA Trends

2.5   Using Sales Instead of Employment Weights

In the main text, we weight geography-industry-year groupings by their employment when taking averages of changes in concentration across groupings. The below figures show that weighting instead by sales of each grouping is relatively immaterial for our main findings.[12]

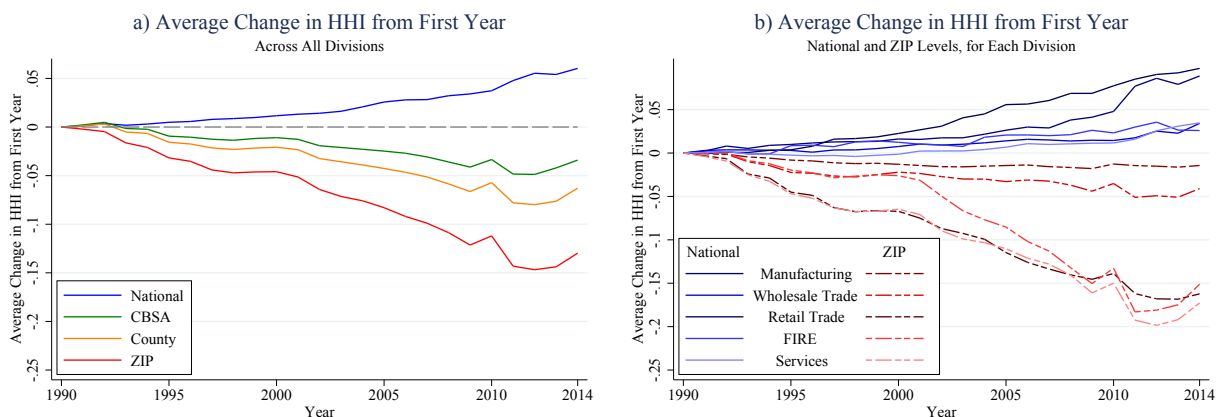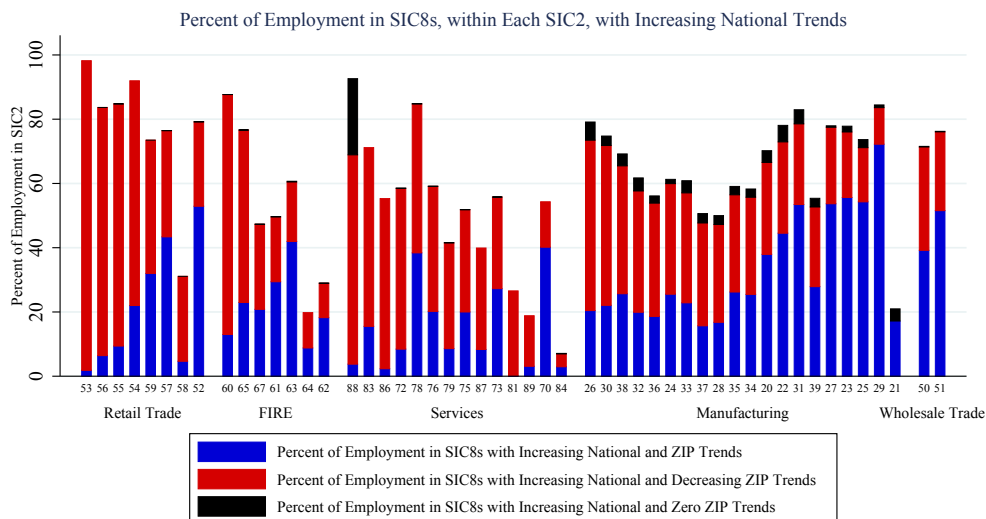Figure 29: Sales Weights: Diverging national and local concentration trends

Figure 30: Sales Weights: Pervasive diverging trends across 2-digit sectors

---

[12]In this set of figures, the HHI and the change in the HHI is exactly the same for every geography-industry pair as in the main text, with concentration defined in terms of sales. Only the weights used when averaging across groupings change.

Figure 31: Sales Weights: The role of top firms in national and local concentration trends
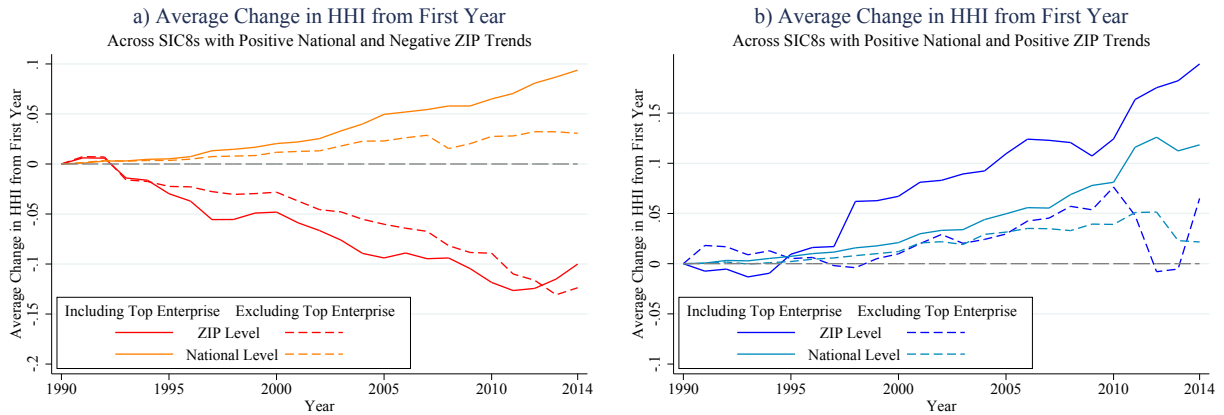
a) Average Change in HHI from First Year
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in HHI from First Year
Across SIC8s with Positive National and Positive ZIP Trends

Figure 32: Sales Weights: Effect on concentration when a top firm enters a local market

a) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Negative ZIP Trends

b) Average Change in HHI after Top Enterprise Opening
Across SIC8s with Positive National and Positive ZIP Trends
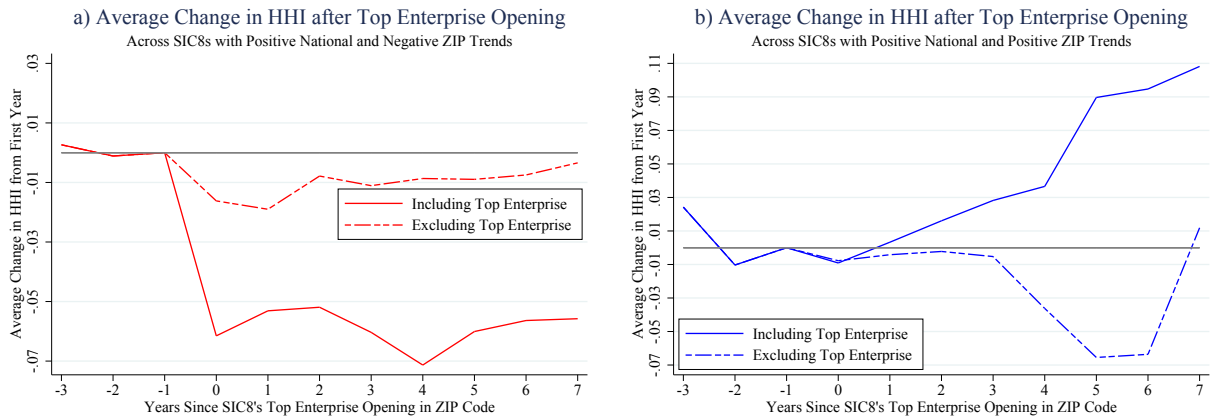
Figure 33: Sales Weights: Effect on concentration when Walmart enters a local market

a) Average Change in HHI Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

b) Avg. Number of Estab. Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores
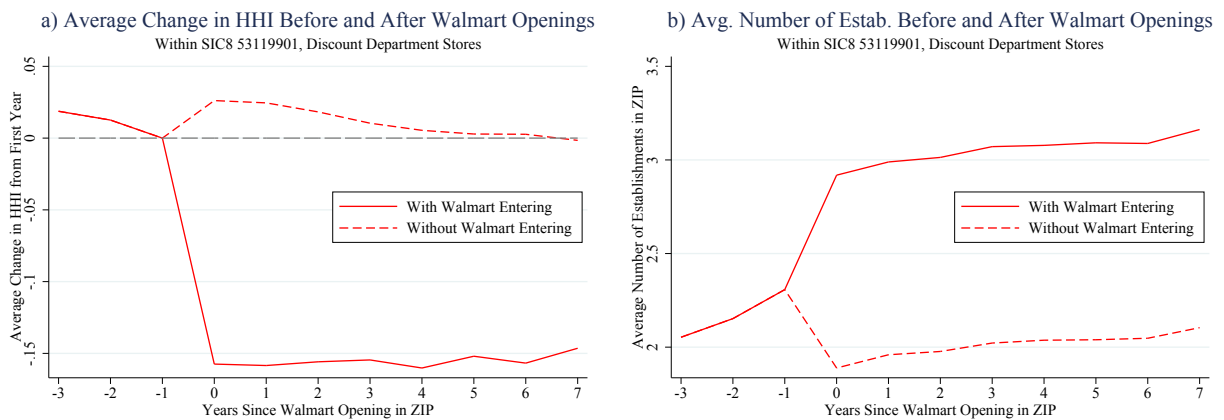
2.6 Other Results

The results in this section expand on the figures in the main text.

2.6.1 Effect of Top Enterprises on Number of Establishments

Figure (34) expands on Figure (5b) in the main text by looking at the number of number of establishments in industry-ZIP code pairs over time in response to the arrival of an industry's top enterprise into that ZIP code. The red line displays the weighted average number of establishments in the years before and after an opening of an industry's top enterprise across industries with diverging trends; the blue lines display the same number average across industries with positive trends at the national and local levels. When a top enterprise opens in an industry with positive local trends, there is on average no exit of existing establishments, while there is close to one-to-one exit of existing establishments in industries with diverging trends. Over time, however, for both sets of industries the number of establishments both including and excluding establishments belonging to the top enterprise increases following an opening. Because these lines are weighted by employment in a geography-industry-year grouping, which is highly correlated with the number of establishments, the results of this figure should be interpreted with caution.

Figure 34: Number of Establishments When Top Enterprise Enters
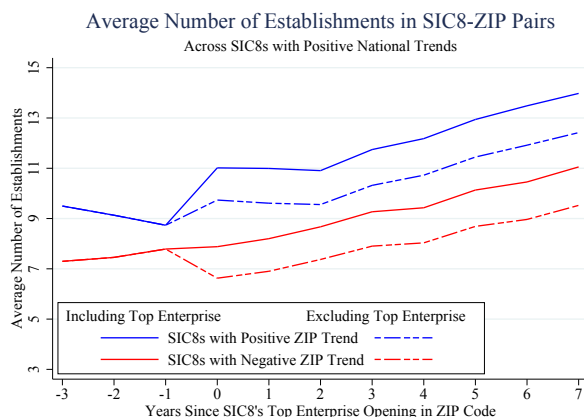

2.6.2 Replicating Figure (3) with Top 3 Enterprises

Here, we replicate Figure (3) in the main text using the top 3 enterprises (as measured by sales in 2014) in each industry as opposed to just the top enterprise. That is, we look at geography-industry pairs where at least one of these enterprises is present in at least one year. Within this subset of pairs, we drop geography-industry-year groupings where there are no enterprises in that group remaining after dropping the top three enterprises in that

industry. We then calculate, for each grouping, the HHI both including and excluding the top 3 enterprises. Figure (35a) shows that when averaged across SIC 8 industries with diverging trends, removing the top 3 enterprises makes the increase in the national trend much less pronounced, but increases concentration at the local level. In contrast, Figure (35b) shows that across industries with increasing trends at the national and local levels, excluding the top 3 enterprises brings down concentration at both levels. These observations are consistent with Figure (3) in the main text.
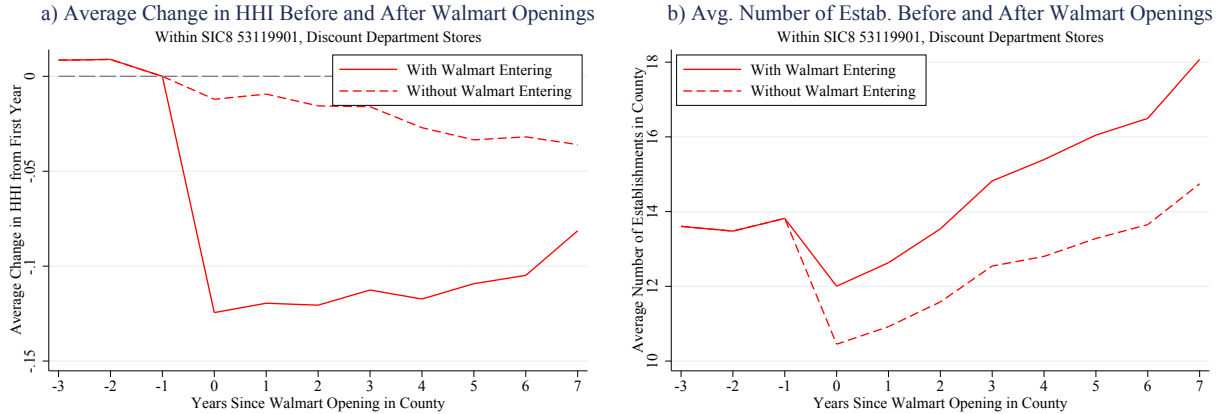
Figure 35: The role of the top 3 firms in national and local concentration trends
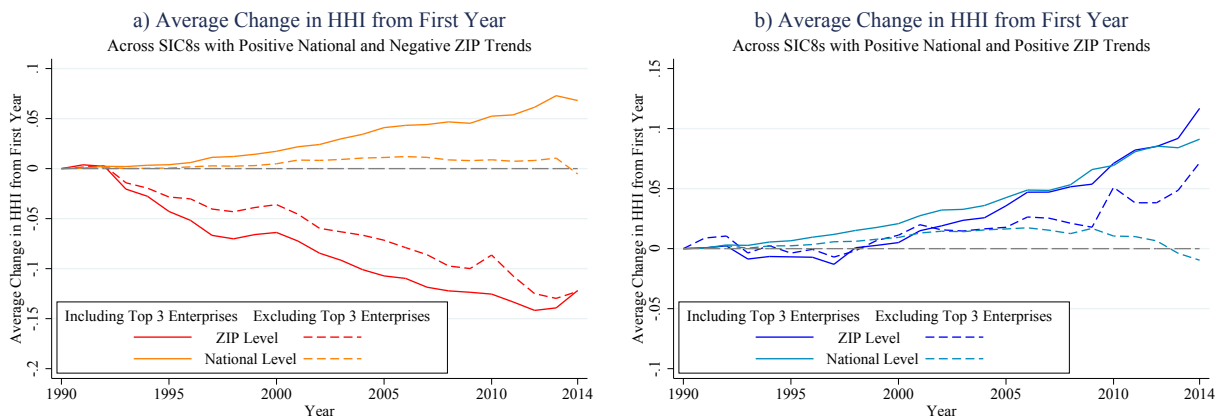
2.6.3 Effect on Concentration when Walmart Enters a County

While most industries within the retail sector have local markets, in some instances a ZIP code may be too narrow a definition of a market. In the case of Walmart, for instance, it is likely that many Walmart stores draw shoppers from beyond the immediate ZIP code and instead serve entire counties. Along these lines, Figure (36) reproduces Figure (5) in the main text at the county level. That is, within SIC 8 53119901, we look only at counties where Walmart is present in at least one year, and only look at county-year pairs in which concentration can be measured after removing Walmart. We then calculate both the HHI and the number of establishments including and excluding Walmart in the years before and after a Walmart opening, and take a weighted average across counties for each year relative to Walmart openings. Figure (36a) shows that county-level concentration within this industry declines after Walmart enters a county, and this effect still persists for at least 7 years. In Figure (36b), we see that the arrival of Walmart into a county is associated with with exit of about three non-Walmart establishments, on average. This result indicates substantially higher exit at the county than at the ZIP code level and is consistent with Jia (2008).
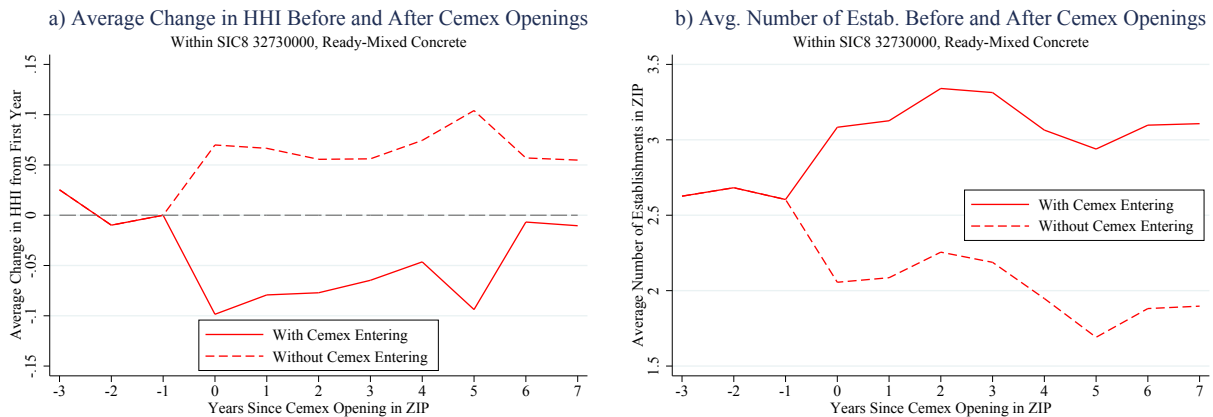
Figure 36: County Level: Effect on concentration when Walmart enters a local market

a) Average Change in HHI Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

b) Avg. Number of Estab. Before and After Walmart Openings
Within SIC8 53119901, Discount Department Stores

2.6.4 When a Top Enterprise Comes to Town: An Example in Manufacturing

Figure (2) in the main text indicates that a very high share of employment in Retail Trade resides in industries with diverging national and local trends, while this phenomenon is much less prevalent in Manufacturing and Wholesale Trade. However, the sector-level of aggregation presented in Figure (2) obscures considerable heterogeneity within industries in a given sector. It is still the case that many Manufacturing industries have diverging trends and see declining local concentration following the arrival of their top enterprise in a ZIP code. To use one example, Figure (37) highlights the SIC 8 code 32730000, Ready-Mixed Concrete, whose top enterprise by sales in 2014 is Cemex, a building materials company. Panel (37a) shows that the arrival of Cemex into a ZIP code decreases its HHI by about 0.1. Although this effect dissipates after 7 years, the HHI measured excluding Cemex remains higher than it would be including them, so that this company is still bringing local concentration down. Panel (37b) shows that, as with the case of Walmart, there is some exit of existing establishments when Cemex opens a plant but the overall number of establishments in the ZIP-industry pair rises, on average. Although Syverson (2008) documents increasing national concentration within this industry, consistent with our findings, Syverson (2008) and Syverson (2004) argue that high transport costs make local measures of concentration, which we show exhibit a downward trend, more relevant.

Figure 37: Effect on concentration when Cemex enters a local market

| a) Average Change in HHI Before and After Cemex Openings | b) Avg. Number of Estab. Before and After Cemex Openings |
| Within SIC8 32730000, Ready-Mixed Concrete | Within SIC8 32730000, Ready-Mixed Concrete |

References

[1] **Barnatchez, Keith, Leland D. Crane, and Ryan A. Decker.** 2017. "An Assessment of the National Establishment Time Series (NETS) Database." Finance and Economics Discussion Series 2017-110.

[2] **Choi, Taelim, John C. Robertson, and Anil Rupasingha.** 2013. "High-Growth Firms in Georgia." Federal Reserve Bank of Atlanta Working Paper 2013-20.

[3] **Fulton, Brent D.** 2017. "Health Care Market Concentration Trends in the United States: Evidence and Policy Responses." *Health Affairs* 36 (9): 1530-1538.

[4] **Jia, Panle.** 2008. "What Happens When Wal-Mart Comes to Town: An Empirical Analysis of the Discount Retailing Industry." *Econometrica* 76 (6): 1263-1316.

[5] **Neumark, David, Brandon Wall, and Junfu Zhang.** 2006. "Employment Dynamics and Business Relocation: New Evidence from the National Establishment Time Series." NBER Working Paper 11647.

[6] **Neumark, David, Brandon Wall, and Junfu Zhang.** 2011. "Do Small Businesses Create More Jobs? New Evidence for the United States from the National Establishment Time Series." *The Review of Economics and Statistics* 93 (1): 16-29.

[7] **Syverson, Chad.** 2004. "Market Structure and Productivity: A Concrete Example." *Journal of Political Economy* 112 (6): 1181-1222.

[8] **Syverson, Chad.** 2008. "Markets: Ready-Mixed Concrete." *Journal of Economic Perspectives* 22 (1): 217-33.

[9] **Walls & Associates.** 2014. "National Establishment Time-Series (NETS) Database."

[10] **Zhu, Ting, Vishal Singh, and Mark D. Manuszak.** 2009. "Market Structure and Competition in the Retail Discount Industry." *Journal of Marketing Research* 46 (4): 453-66.