Diverging Trends in National and Local Concentration*

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Abstract

Using U.S. NETS data, we present evidence that the *positive* trend observed in *national* product-market concentration between 1990 and 2014 becomes a *negative* trend when we focus on measures of *local* concentration. We document diverging trends for several geographic definitions of local markets. SIC 8 industries with diverging trends are pervasive across sectors. In these industries, top firms have contributed to the amplification of both trends. When a top firm opens a plant, local concentration declines and remains lower for at least 7 years. Our findings, therefore, reconcile the increasing national role of large firms with falling local concentration, and a likely more competitive local environment.

JEL codes: D22, D43, L16, L22, R12.

1 Introduction

Most product markets are local. The reason is simply that the transportation of goods and people is costly so firms set up production plants, distribution centers, and stores close to customers. In turn, individuals locate in areas where they can obtain the goods they desire. A coffee shop or restaurant in Manhattan does not compete with similar establishments in Seattle, and probably not even in Brooklyn. The wedge in prices created by the inconvenience and monetary cost of buying a product far away from the desired consumption point shields companies in different locations from direct competition. Of course the size of these costs, and therefore the geographic extent of the market, varies by product. Markets are also product-specific.

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Producers of a particular product are shielded from competition by producers of distinct but related goods and services to the degree that their consumption requires households to move away from their ideal variety.

Much has been written recently about the increase in national market concentration observed over the last two decades, and the role that large national firms have played in driving this trend. The evidence for the rise in concentration is uncontroversial; the share of the largest firms and the Herfindahl-Hirschman Index, among other measures of concentration, have increased consistently in most sectors since 1990.[1] A narrative has emerged whereby this increase in national concentration is perceived as the cause of lower product-market competition. This fall in competition is then viewed as the culprit of other apparent trends, such as rising markups and market power (Gutiérrez and Philippon, 2017; De Loecker, Eeckhout and Unger, 2018; Hall, 2018), the increasing profits of large firms (Barkai, 2017), declining labor market dynamism and firm entry (Decker, Haltiwanger, Jarmin and Miranda, 2017), and declining wages and declining labor share (e.g. Autor, Dorn, Katz, Patterson, and Van Reenen, 2017)[2]. Some studies have called into question the interpretation of these facts as evidence of increasing market power (see Hopenhayn, Neira and Singhania, 2019; Syverson, 2019), and the empirical robustness and validity of some of these trends has also been contested in recent work[3]. However, the uncontroversial rise in national market concentration remains as the main empirical foundation of this central narrative.

In this paper, we use the National Establishment Time Series (NETS) dataset to document four main facts regarding national and local product-market concentration in the U.S. economy between 1990 and 2014. Our first fact is that the observed positive trend in market concentration at the national level has been accompanied by a corresponding negative trend in average local market concentration. We measure concentration using the Herfindahl-Hirschman index (HHI), but our findings hold for a variety of statistics. We observe an increase in concentration at the national level overall across the vast majority of sectors and industries, but a fall in concentration when it is measured at the CBSA, County, or ZIP code levels.[4] The

[1] A 2016 report by the Council of Economic Advisers, for instance, finds that the national revenue share of the top 50 firms has increased across most NAICS sectors between 1997 and 2012. The report can be found at https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160414_cea_competition_issue_brief.pdf. Gutiérrez and Philippon (2017) show that this increase in U.S.-wide market concentration is not uniform across all sectors and has been most pronounced in non-manufacturing sectors. Barkai (2017), and Autor, Dorn, Katz, Patterson, and Van Reenen (2017), find that the national sales share of top firms has also been rising since 1997 and, in fact, helps explain the decline in the labor share over the same period.

[2] Other examples are Azar, Marinescu and Steinbaum (2017), Benmelech, Bergman and Kim (2018) and Qiu and Sojourner (2019).

[3] While rising market concentration at the national level is relatively undisputed, the evidence regarding markups is more mixed. De Loecker, Eeckhout and Unger (2018) show evidence of rising markups since the 1980s among publicly traded firms. However, Traina (2018) points out that the evidence on markups depends crucially on the measurement of variable costs. When variable costs include marketing and management costs, as well as other indirect costs of production, markups have been relatively flat since the mid-1980s. Hall (2018) also finds essentially constant markups at the sectoral level using KLEMS productivity data. Similarly, Karabarbounis and Neiman (2018) find generally flat markups over time when also accounting for selling, general, and administrative expenses. Anderson, Rebelo, and Wong (2018) focus on the retail sector and find stable markups since 1979 using scanner data on the price of transactions and measuring marginal costs as replacement costs at the store level. Edmond, Midrigan and Xu (2018) show that when weighted by costs rather than sales, as implied by the microfoundations they lay out, aggreate markups have increased only modestly.

[4] In the main text, we focus mostly on ZIP codes as our geographic definition of a local market. An online-only appendix

narrower the geographic definition, the faster the decline in local concentration. This is meaningful because the relevant definition of concentration from which to infer changes in competition is, in most sectors, local and not national.

The second fact shows that local concentration is falling across SIC 8 industries that together account for 78% of employment and 72% of sales. Furthermore, conditioning on industries where national concentration is rising, industries where local concentration has declined account for the majority of employment overall (72% of employment and 66% of sales) across all major sectors. The presence of these diverging trends is always large but more pronounced in services, retail trade, and FIRE relative to wholesale trade and manufacturing. This ordering is natural given that transport costs are less relevant in the latter two sectors. Together, these first two facts underscore an unmistakable decline in local concentration on average that is pervasive across all sectors.

How does one reconcile a positive trend in national concentration with a negative trend in local concentration? Our third fact shows that among SIC 8 industries that exhibit this pattern, top firms have accelerated these trends. That is, excluding the top firm in each industry (in terms of national sales in their SIC 8 industry in 2014), the national increase in concentration becomes naturally less pronounced. Perhaps more surprisingly, the decline in local concentration also becomes less pronounced. Put another way, large firms have materially contributed to the observed decline in local concentration.[5] Among industries with diverging trends, large firms have become bigger but the associated geographic expansion of these firms, through the opening of more plants in new local markets, has lowered local concentration thus suggesting increased local competition. In the considerably smaller set of industries where we observe increases in both national and local concentration, top firms have also been responsible for both forms of concentration.

Our fourth fact establishes that among industries with falling local concentration, the opening of a plant by a top firm is associated with a decline in local concentration at the time of the opening, and that this lower level of concentration persists for at least the next 7 years. This observation provides further evidence that in those industries, large enterprises do not enter and dominate the local market but instead lower its concentration, either by competing with the previous local monopolist or by simply adding one more establishment that grabs a proportional market share from other local establishments. In any case, the notion that entry by large firms eliminates local producers to the point of increasing concentration is certainly not supported in the vast majority of industries where most of U.S. employment resides.

Consider the much-publicized case of Walmart. Most of Walmart's establishments are in the discount department stores industry, an industry with declining local concentration. Consistent with fact four, when Walmart opens a store, the HHI falls by 0.15 in the associated ZIP code. In contrast, computing the HHI without taking into account the opening of a Walmart establishment, concentration remains constant. One can also consider the effect of Walmart on the number of firms in a market. When Walmart enters, the total number of establishments in the ZIP code increases, though by less than one-to-one (about 3/4). In other

presents results with other geographic units.

[5] This finding also holds when we exclude the top three firms in each industry instead of just the top firm.

words, Walmart generates some exit but the net result of opening a Walmart store is a greater number of competitors in the market for at least 7 years after entry.[6] This case is paradigmatic, but there are many others across all major sectors. For example, the expansion of Cemex, the top firm by sales in 2014 in the ready-mixed concrete industry, led to a similar decline in local concentration and an expansion in the local number of establishments in the industry.[7]

Our findings challenge the view that product-market concentration is increasing in the U.S. They do so not by challenging the evidence that national concentration has increased – we actually provide additional evidence to that effect across many industries – but by observing that this national trend does not imply a positive local trend in concentration. In fact, we show that it implies the opposite in most industries, a declining trend in concentration. Ultimately, concentration matters because it can lead to less competition. Hence, measures of concentration have to be aligned with product markets as well as their geographic and industrial scope. In particular, for the majority industries, concentration is likely more relevant to firm pricing and other strategic behavior at a more local level. Our findings are also consistent with the mixed evidence found in recent literature regarding secular changes in markups across individual industries. If local competition matters, we should not see increases in markups or profits in the markets where local competition is increasing. The measurement of markups in local markets associated with particular industries depends on important assumptions and requires very detailed data. The NETS data does not allow us to calculate these local statistics, but there exists evidence of flat markups over time in specific industries with declining concentration (Anderson, Rebelo, and Wong, 2018), and in the aggregate (Traina, 2018). Finally, our results are also consistent with recent papers contending that labor market concentration is falling in the US economy (Hershbein, Macaluso and Yeh, 2018; Rinz, 2018; Berger, Herkenhoff and Mongey, 2019).[8]

The National Establishment Time Series (NETS) dataset covers the universe of U.S. firms and their plants.[9] The dataset includes sales and employment numbers of all plants at different levels of geographic and industrial disaggregation down to the SIC 8 product code. Neumark, Zhang and Wall (2006), and Barnatchez, Crane and Decker (2017), provide thorough discussions of the advantages and disadvantages of this data source relative to U.S. Census data. The next section discusses many of these and the extent to which they are relevant for our findings. In particular, we show that for the industries covered in our study, the geographic distribution of employment in the data is very highly correlated with that in the U.S. Census

[6] Jia (2008) studies competition by Walmart and other discount retail stores. She proposes a structural model of this competition and argues that the profits of previously available retailers decrease when 'Walmart comes to town'. This is consistent with our view that Walmart lowers concentration by taking market share away from local competitors. Moreover, the exit of firms we observe is also consistent with those of Jia (2008) when measured at the county level. Holmes (2011) studies the expansion strategy of Walmart and, in particular, its geographic expansion strategy. Our findings are exactly consistent with this view of geographic expansion and provide related facts concerning its impact on local concentration. In contrast to these studies, our empirical findings extend to most U.S. industries in addition to the discount retail sector.

[7] This industry was singled out in Syverson (2008) as an example of an industry with a local market.

[8] Berger, Herkenhoff and Mongey (2019) also develop an equilibrium model of the U.S. labor market and find that, although there are large welfare gains from increasing competition, in their framework market power is unable to explain the decline in the labor share.

[9] Throughout the paper we interchangeably use the terms plant and establishment. We also treat firm and enterprise as synonymous.

and, moreover, that this correlation is stable over time. Our findings, therefore, cannot be driven by changes in data coverage, accuracy, or the speed of its updates. The small discrepancies we find between NETS and standard Census data sources can evidently not explain the variety of consistent patterns revealed in the data. In addition, a critical feature of the NETS data integral to our analysis is that it allows researchers to explore and share the role of individual enterprises in shaping changes in industry concentration. This defining characteristic of NETS, therefore, permits explorations that would otherwise be infeasible with Census data.

The facts we document are directly relevant to the design of antitrust policy and other policies that can prevent successful firms from growing at the national level. We document heterogenous trends across industries and, in some industries, concentration is clearly rising both at the national and local level. However, our results should provide pause for policy-makers that worry about increases in market power. On the whole, and in most industries, large firms are lowering local concentration and, therefore, most likely increasing product market competition. Carl Shapiro, a former Deputy Assistant Attorney General at the Antitrust Division of the Department of Justice, and member of the President's Council of Economic Advisers under Barack Obama, makes a similar argument. Discussing evidence on the positive trend in national market concentration, he observes: "So, while these data do reflect the fact that large, national firms have captured an increasing share of overall revenue during the past 20 years in many of these 893 'industries,' they do not, in and of themselves, indicate that the relevant local markets have become more concentrated." In this paper, we provide the empirical evidence supporting the notion that, in the face of rising national concentration, local markets have indeed become on average significantly less concentrated.[10]

The rest of the paper is organized as follows. Section 2 describes our data, the way we use it, as well as our benchmark measure of national and local concentration. Section 3 presents our main four facts and describes their implications. Section 4 concludes. An online-only appendix presents a large variety of additional calculations using other concentration statistics, and provides additional detail regarding the data and the results in the main text.[11]

2 Data and Concentration Statistics

Our analysis uses data from the National Establishment Time Series (NETS), which is provided by Walls & Associates, and comprises annual observations on specific lines of business at unique locations over the period $1990-2014$. In particular, NETS data allow us to observe sales and employment of between 8 and 19 million lines of business each year in our sample. Each line of business is assigned a data universal numbering system (DUNS) identifier that makes it possible to track its sales and employment over time at the SIC

[10] De Loecker and Eeckhout (2018) also argue that in order to measure concentration in a way that is meaningful as an indicator of market power, this measurement has to be carried out for specific goods and local markets using the universe of firms. This is exactly what we do in this paper using the NETS data.

[11] The online-only supplementary appendix to this paper is available at `http://www.princeton.edu/~erossi/DTNLC_Appendix.pdf`.

8 level of Standard Industrial Classification (SIC) and at specific latitudes and longitudes. Industries can be mapped into broader SIC 2 classifications or divisions, and locations can be mapped into ZIP codes, counties, or Core-Based Statistical Areas (CBSAs). In addition, each line of business is also assigned a headquarters (HQ) number that gives the particular enterprise to which it reports. Thus, the NETS data encompass the universe of establishments operating in the U.S., and the enterprise to which each belongs, between 1990 and 2014.

To better illustrate the nature of the NETS data, consider the case of Walmart as an example of an enterprise. It is headquartered in Bentonville, AR, and in 2014, it is associated with approximately 4700 establishments across all 50 states. Each of these 4700 establishments is assigned its own 8−digit primary SIC code, with 3718 establishments operating mainly as discount department stores (SIC 53119901), 603 establishments operating mainly as warehouse club stores (SIC 53999906), 241 establishments operating primarily as grocery stores (SIC 54110000), and the remaining establishments scattered mostly across various retail classifications.

Because each establishment in the NETS data is assigned a unique DUNS identifier, it is possible to track when an establishment enters our sample (for those that enter after 1990) and, if applicable, when it exits. In addition, the DUNS identifier follows each establishment over time even if it is sold from one enterprise to another, or becomes included in a merger of enterprises, so that sales and employment of particular establishments may be tracked irrespective of corporate-level changes.

Approximately a quarter of enterprises in the NETS data have only one employee. This feature of the data is typically not accounted for by alternative government sources of local employment as estimated by the County Business Patterns (CBP) or the Quarterly Census of Employment and Wages (QCEW).[12] Since these establishments nevertheless report positive sales, we include them in our benchmark analysis. In an online-only supplement to this paper, we show that our results are robust to excluding enterprises with only 1, fewer than 5, or fewer than 10 employees.

At the 2−digit SIC code, the data is classified in terms of 11 divisions, including Manufacturing, Services, Retail Trade, Wholesale Trade, and Finance, Insurance and Real Estate (FIRE), that together account for approximately 85 percent of sales and 80 percent of employment respectively in 2014. Because our analysis centers on the relationship between market concentration and the geographic expansion of enterprises, we exclude from our benchmark exercises industries that are intrinsically tied to specific locations because of weather or endowments of natural resources. These industries include Mining, Agriculture, Forestry, and Fishing, Construction, and Transportation and Public Utilities. We also exclude from our benchmark analysis any government establishment, including establishments belonging to enterprises whose headquarters are associated with a public administration SIC code, and establishments associated with education, non-profit endeavors, and central banking.

[12] Many enterprises with one employee are non-employer enterprises, or in other words, have no paid employees. While employment at those enterprises is then at times the result of imputations, Barnatchez, Crane, and Decker (2017) show that taking out those imputations leaves measures of local employment that are generally highly correlated with those in the CBP across industries.

Throughout the analysis, we consider different levels of industrial and geographic disaggregation. The most basic level of disaggregation we consider is defined as an SIC 8-ZIP code pair. The NETS data cover 18,000 SIC-8 industries and about 40,000 ZIP codes. Because we omit particular industries whose operations have intrinsic ties to geographic endowments, our sample includes 15,305 industries. In each year, we only use SIC 8-ZIP code pairs that have reported both positive sales and positive employment. This leaves us with around 6 million SIC 8-ZIP code pairs for each year on average that we aggregate in different ways below. Because we only consider in each year SIC 8-ZIP code pairs that have at least one establishment with positive sales and employment, the number of industry-geography pairs at a given level of aggregation (e.g. SIC 4-County) can vary from year to year. Below and in the online-only appendix, we show that our results are robust to exercises that only consider industry-geography pairs that have at least one establishment with positive sales and employment in every year. In the latter exercises, the number of industry-geography pairs is constant across time.

2.1 The NETS Data

One important advantage of the NETS data is that it covers every establishment in the U.S. at an exceptionally high level of disaggregation both by industry and geographic area. Unlike the comparable microdata available from the Census Bureau which produces the County Business Patterns (CBP) data, NETS does not require that a research proposal be approved describing how the data is to be used. It also does not require that an approved researcher travel to the location of a Federal Statistical Research Data Center (FSRDC) for secure access or compliance with the disclosure process to protect sensitive information. NETS data only require a subscription fee and can be easily accessed on any machine without undergoing a formal review process.

A critical feature of the NETS data is that NETS allows researchers to examine and illustrate the impact of individual enterprises, such as Walmart in the discount department stores industry, or Cemex in the ready-mix concrete industry. This feature of NETS is integral to our analysis in that it permits us to explore and disclose the extent to which findings on concentration are driven by specific and large enterprises in individual industries. This defining characteristics of NETS, which we exploit in this paper, thus permits explorations that would otherwise be infeasible with Census data.

Evidently, to the degree that NETS allows us flexibility not permitted with Census data, it is important to benchmark how the two datasets compare. Barnatchez, Crane, and Decker (2017) note that NETS include many non-employer establishments not covered by the CBP which tend to be very small establishments. When removing establishments with 1 employee or fewer than 5 employees, they find that overall trends in employment and establishments counts are closely aligned with the CBP. They suggest, therefore, verifying that findings using NETS data are robust to these sample restrictions. Barnatchez et al. (2017) also observe that differences between NETS and Census data are largely related to discrepancies in Agriculture, Mining, and Construction. In particular, in the latter two sectors, NETS appears to not have captured the full extent of recent employment changes. These include changes resulting from the boom-bust cycles associated with

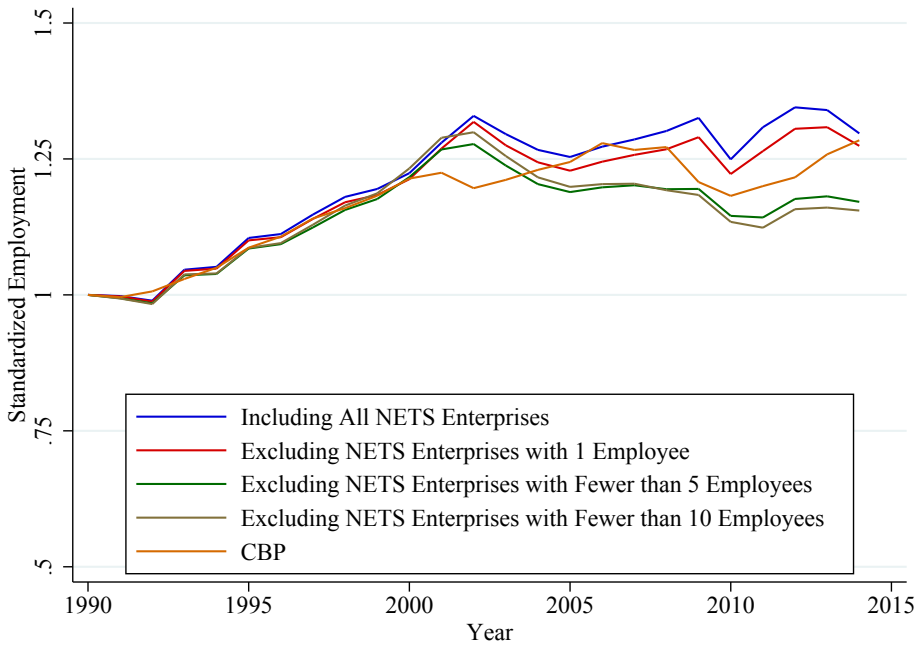
the shale-oil and gas expansion in the early 2000s for mining, and the bursting of the housing bubble in 2007 for construction. As mentioned above, our analysis excludes these sectors in any case since their activity is intrinsically tied to local geographic characteristics.

To get an idea of the differences between NETS and the CBP, Figure (1) illustrates standardized (i.e. set to 1 in 1990) aggregate employment in the NETS database and the CBP. Unlike Barnatchez et al. (2017), we remove from both datasets the set of industries described above. Consistent with their observations, in the NETS data, we plot standardized employment when including all enterprises as well as when excluding, in each year, enterprises with 1, fewer than 5, and fewer than 10 employees. As shown in the figure, the NETS data line up almost identically with the CBP data up to around 2002. Small differences arise after that year though all series appear to flatten out. Of note, almost throughout the sample, CBP employment lies in between employment excluding 1 and fewer than 5 employees in the NETS data. The difference in the sampling of small firms between NETS and the Census noted in Barnatchez et al. (2017), therefore, appears bounded by these two cases. In an online-only appendix, we show that all findings in this paper hold for all NETS cases shown in Figure (1). Moreover, as described below, all weighted average estimates in this study are weighted by employment so that, by construction, any differences in the sampling of small firms after 2002 is also given small weight. Observe also that higher frequency changes in Census data, such as the dip in employment following the Great Recession, are present in the various NETS cases shown in Figure (1). Evidently, differences in sampling between NETS and the Census manifest themselves mainly as a level effect after 2002.

While differences between NETs and the CBP primarily result from the sampling of small firms, a question arises as to whether these differences might have grown over time. To explore this question, Figure (2a) illustrates the cross-sectional correlation between CBP and NETS total employment across counties in each year of our sample. The correlation is high at above 0.98 in every year irrespective of the definition we adopt for the NETS data (i.e. enterprises with 1, fewer than 5, and fewer than 10 employees). More importantly, to the extent that differences exist, for the set of industries we consider, there is no obvious time trends in those differences. The CBP data allows us to construct these correlations industry by industry only at the county level, where these are very close, but not at the ZIP code level. At the more geographically disaggregated ZIP code level, the CBP only reports aggregate ZIP code employment without any industry breakdown. Consequently, we are not able to remove particular industries such as Agriculture, Mining, or Construction when comparing ZIP code level data between NETS and the CBP. However, even with those industries included, Figure (2b) shows that the correlation between ZIP code employment in NETS versus the CBP remains above 0.85 in every year. As with the county level data, to the extent that this correlation is not exactly 1 and that differences exist between the two datasets, there is no trend in the way that ZIP code employment differs between NETS and the CBP.

In summary, our findings are consistent with those of Barnatchez et al. (2017) who find differences between NETS and Census data related to the sampling of small firms. As the authors suggest, these differences appear to be bounded by exercises that remove small firms. Specifically, we find that standardized

Figure 1: Standardized National Employment in CBP and NETS Data



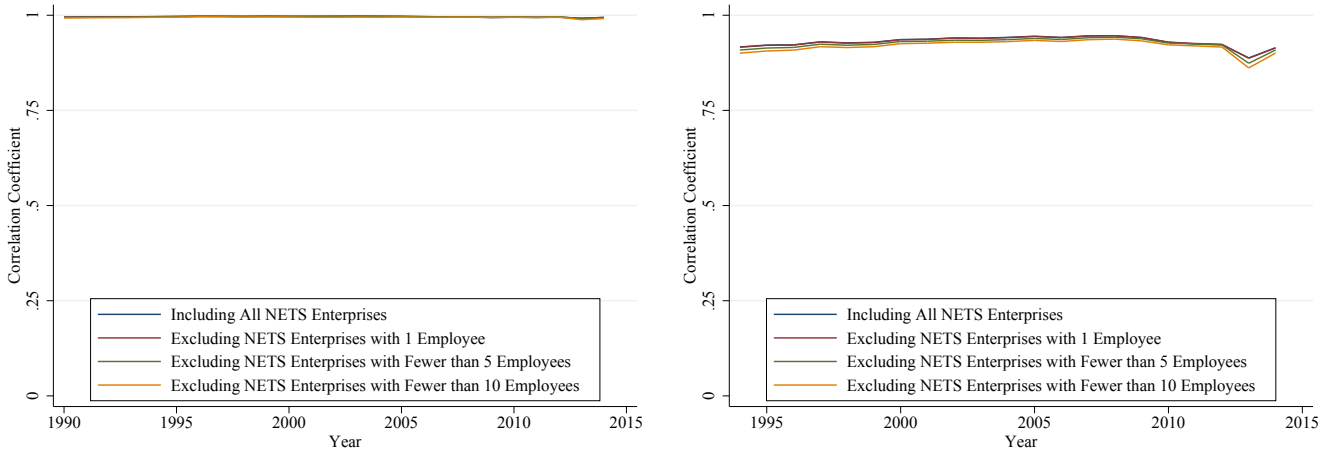
Notes: The plot compares standardized aggregate employment for CBP and NETS for the 5 major sectors used in this study: FIRE, Manufacturing, Retail, Services, and Wholesale trade. Each different line represents a different selection of enterprises to be included for the NETS sample.

CBP employment is bounded by cases that remove firms with 1 and fewer than 5 employees in the NETS data. Moreover, our analysis removes industries identified by Barnatchez et al. (2017) as those least closely matching employment in the CBP, though we remove them for different reasons as explained above. Finally, while there appears to be an increase in the difference between CBP and NETS employment starting in 2002, this discrepancy emerges mainly as one time change with no visible trends after 2002. All of these observations, therefore, suggest that any findings related to aggregate or industry-wide estimates that we discuss below cannot be driven by the scope or coverage of the two datasets.

2.2 Measuring Concentration

Establishments in our dataset are indexed by industry, i, location, ℓ, and year, t. Industries are defined by an SIC 8 code. Locations are defined by a latitude-longitude pair. We denote collections of industries into broader classifications (for example, SIC 2 or divisions) by d. We denote collections of locations into broader geographies (ZIP codes, CBSAs, Counties, States, or the whole U.S.) by g. When defining locations at the CBSA level, counties that are not within CBSAs are not represented, which amounts to between 5 and 10 percent of establishments in any given year.

Figure 2: County and ZIP-Level Correlations Between NETS and CBP Employment



Notes: Plot (a) produces a time-series of the cross-sectional correlation of county employment between CBP and NETS for the 5 major sectors used in this study: FIRE, Manufacturing, Retail, Services, and Wholesale trade. Plot (b) produces a time-series of the cross-sectional correlation of ZIP code employment between CBP and NETS for the full economy (CBP does not provide an industry classification at the zip-code level). In both plots, each different line represents a different selection of enterprises to be included for the NETS sample.

Let $S^{I,G}_{e,i,\ell,t}$ denote the nominal sales of enterprise e in industry i at location ℓ in year t, and $S^{I,G}_{e,i,g,t} = \sum_{\ell \in g} S^{I,G}_{e,i,\ell,t}$ its sales in the broader geography g (i.e. the sum of all its establishments' sales across all latitude-longitude pairs ℓ in geography g). The index I refers to the industrial level of aggregation (i.e. by SIC 2, SIC 4, SIC 6, or SIC 8). The index G indicates the geographic level of aggregation (i.e. by ZIP code level, CBSA level, County level, or the whole U.S.) that we use to define a location ℓ. We then denote by $s^{I,G}_{e,i,g,t}$ this enterprise's share of all sales in industry i located in geography g at date t for the levels of aggregation I and G. We adopt as our benchmark measure of market concentration the Herfindahl-Hirschman Index (HHI),

$$\mathcal{C}^{I,G}_{i,g,t} = \sum_{e} \left(s^{I,G}_{e,i,g,t} \right)^2 ,$$

where $C^{I,G}_{i,g,t} \in [1/N^{I,G}_{i,g,t}, 1]$ is the sales concentration, and $N^{I,G}_{i,g,t}$ the number of enterprises in industry i and geography g at time t. In the online-only supplement to this paper, we also consider alternative measures of concentration, such as the sales share of the top firm, or the adjusted Herfindahl, and show that all of our findings are robust to these other measures. In particular, to the degree that the number of small firms in an industry differs between NETS and CBP data, and that this difference were to have an increasing trend that materially reduces the lower bound of the Herfindahl index, the range of the adjusted Herfindahl index

no longer depends on the number of firms.[13]

3 National and Local Market Concentration: The Facts

We organize the discussion of our findings into four main facts. The first two facts document the diverging trends in national and local concentration and their importance across sectors and geographic definitions of a 'local' market. The third and fourth facts document the role that large firms have played in these trends. As a form of corollary to the last fact, we also present evidence specific to Walmart, a firm that has featured prominently in the debate on the evolution of market concentration.

3.1 Fact 1: Diverging Trends on Average

Fact 1 is summarized in Figures (3) and (4). Figure (3) shows a weighted average of the change in concentration, $\Delta\mathcal{C}_t^{I,G}$, across all industry-geography pairs (i, g) for different definitions of geography G, namely ZIP code, County, CBSA, and the whole U.S.,

$$\Delta\mathcal{C}_t^{I,G} = \sum_{i,g} w_{i,g,t}^{I,G} \Delta\mathcal{C}_{i,g,t}^{I,G}, \tag{1}$$

where the weights $w_{i,g,t}^{I,G}$ are given by the employment shares of industry-geography (i, g) in aggregate employment in year t, and $\Delta\mathcal{C}_{i,g,t}^{I,G}$ denotes the change in market concentration between year t and the first year for which we observe sales in the location-industry pair (i, g). As mentioned in Section 2, all findings presented in this paper are robust to excluding enterprises with 1, fewer than 5, and fewer than 10 employees. In part, this is because, by construction, our employment-weighted measures of concentration already assign small weights to industry-geography pairs that contain mostly small enterprises.[14]

As indicated in the 2016 CEA report, Barkai (2017), Gutiérrez and Philippon (2017), and others, market concentration at the national level has been steadily increasing since 1990. However, the exact opposite is true for less aggregated measures of concentration. Figure (3) shows that the more geographically disaggregated the measure of concentration, the more pronounced its downward trend over the last two and a half decades.

Figure (4) shows a weighted average of the change in concentration across all industry-geography pairs (i, g) within a particular division, d, namely Manufacturing, Services, Retail Trade, Wholesale Trade, and

[13] The adjusted Herfindahl is given by $\widetilde{\mathcal{C}}_{i,g,t}^{I,G} = \frac{\mathcal{C}_{i,g,t}^{I,G} - 1/N_{i,g,t}^{I,G}}{1 - 1/N_{i,g,t}^{I,G}} \in [0, 1]$ when $N_{i,g,t}^{I,G} > 1$ and $\widetilde{\mathcal{C}}_{i,g,t}^{I,G} = 1$ when $N_{i,g,t}^{I,G} = 1$.

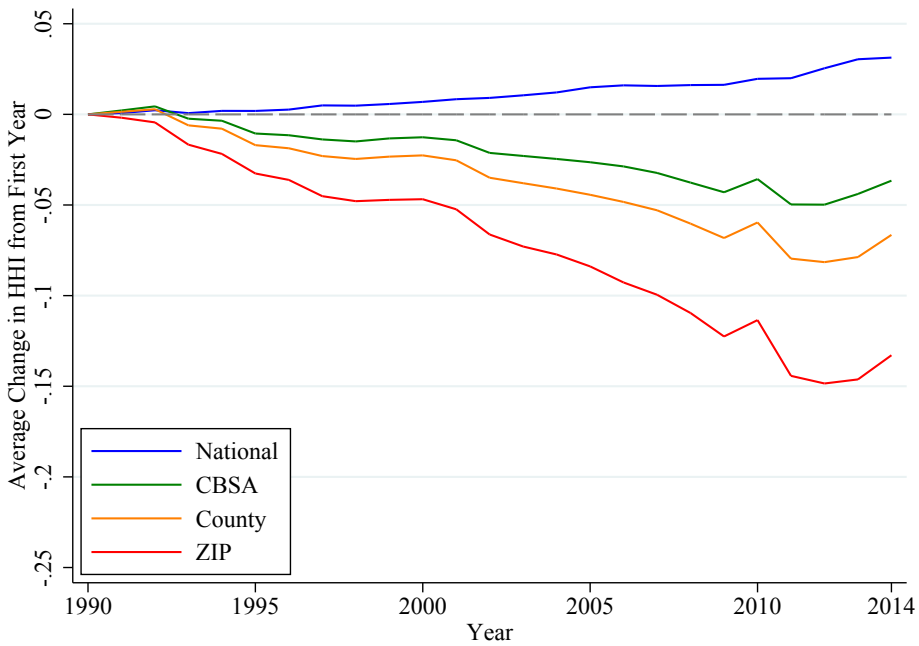
[14] Given differences in the number of firms and other industry characteristics, we study changes in HHI instead of the level of the HHI, so that we can compare trends in concentration across industries. This is why we aggregate changes in the HHI instead of aggregating levels of HHI. Using sales shares instead of employment shares as weights yields similar results.

FIRE, for geographies defined by ZIP code and the whole U.S.,

$$\Delta\mathcal{C}_{t,d}^{I,G} = \sum_{i\in d,g} w_{i,g,t,d}^{I,G} \Delta\mathcal{C}_{i,g,t}^{I,G}.$$

Figure (4) shows that while increasing market concentration at the national level holds broadly across all divisions, it is equally the case that concentration has steadily fallen at the ZIP code level in these divisions. Observe, in particular, that market concentration in the Retail Trade division has been increasing nationally more than in any other division. However, Retail Trade is also among the divisions that show the steepest decline in concentration at the ZIP code level. This fact is especially striking given that physical retail establishments in our dataset are likely to have very local markets.

Figure 3: Diverging economy-wide national and local concentration trends



3.1.1 Concentration by Industrial Classification and Employment

Figure (5) depicts the divergence between national and local concentration at the ZIP code level for different degrees of industrial aggregation I. This growing divergence between national and local concentration is most pronounced at the SIC 8 level but clearly present at lower levels of industrial aggregation as well, including the most coarse SIC 2 classification. Thus, we explore below in more detail how these diverging trends between national and local concentration are related to industrial classification.

Figure (6) repeats the exercise in Figure (5) but focusing on employment rather than sales. As the

Figure 4: Diverging division-level national and local concentration trends

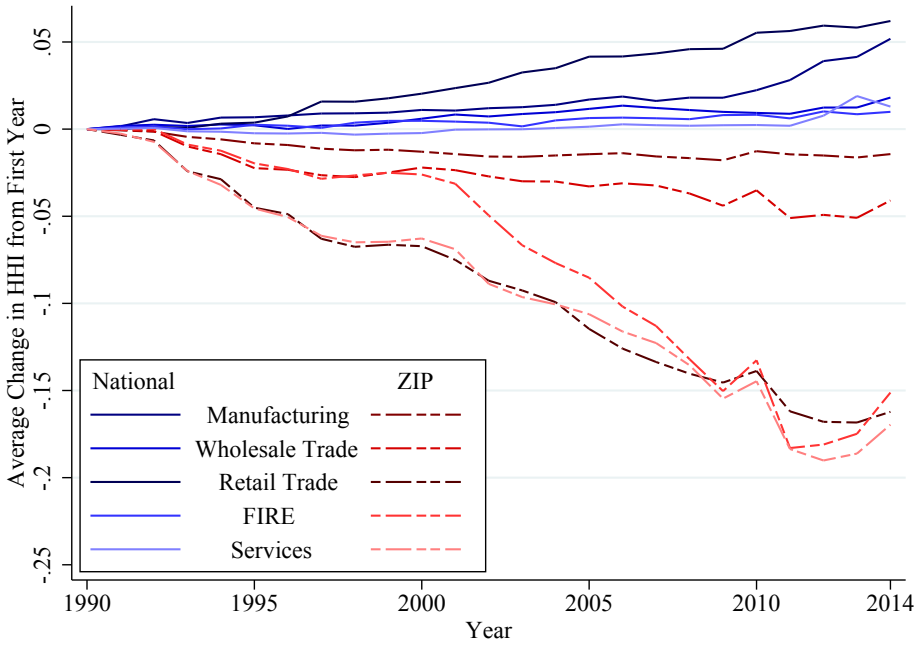


figure shows, using employment rather than sales is immaterial for the growing divergence between national and local concentration.[15] In the online-only appendix, we show that all of our other findings regarding diverging trends between national and local concentration also hold for employment as well as sales.

In summary, Figures (3) through (6) indicate a growing divergence in national and local concentration that holds for broad levels of industrial and geographic definitions. In the online-only appendix, we carry out and present a large number of exercises that highlight the robustness of our findings.[16]

3.1.2 Concentration and Sample Selection

Before proceeding with the analysis and an exploration of the roots underlying our basic Fact 1, we discuss an important aspect of this fact related to sample selection. In particular, because we omit in each year industry-geography pairs with no establishments, the resulting unbalanced panel can create situations where an industry-geography pair with a single establishment is dropped from one year to the next. Since the omitted observation is one with a single establishment, and thus associated with high concentration, local concentration decreases simply as a result of losing the observation. Conversely, of course, entry

[15] In the NETS data, establishment sales numbers are more frequently imputed than employment numbers. However, given that the CBP data does not report sales figures, the similarities in national and local concentration trends for sales and employment in NETS are consistent with the notion that, for a given enterprise, increasing sales by opening new establishments in local markets requires hiring labor in those markets.

[16] We also consider county and CBSA geographies, as well as the SIC 4 industrial classification code, that highlight respectively the importance of local markets and well defined industries.

Figure 5: Diverging economy-wide trends in sales concentration

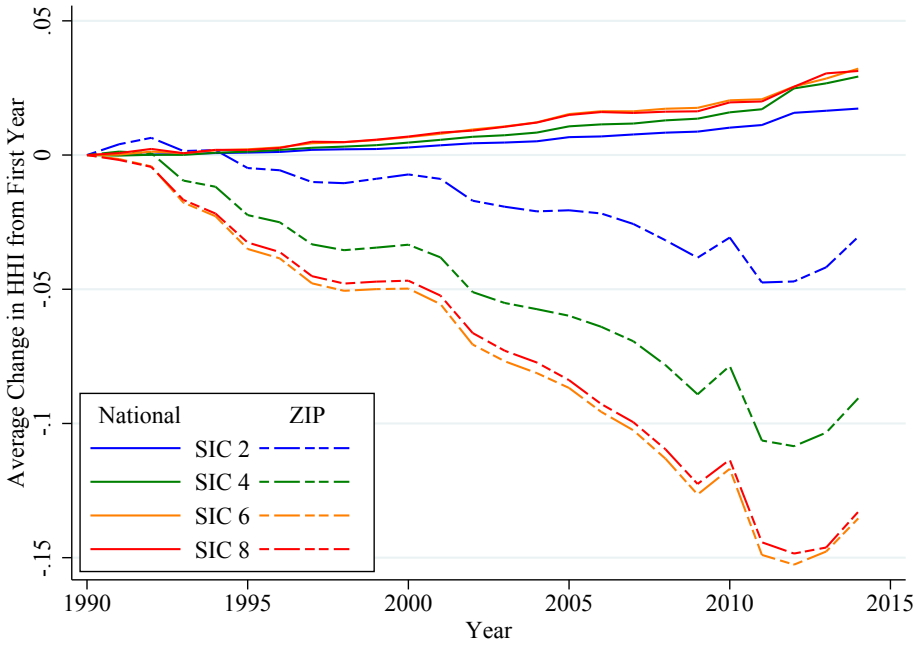
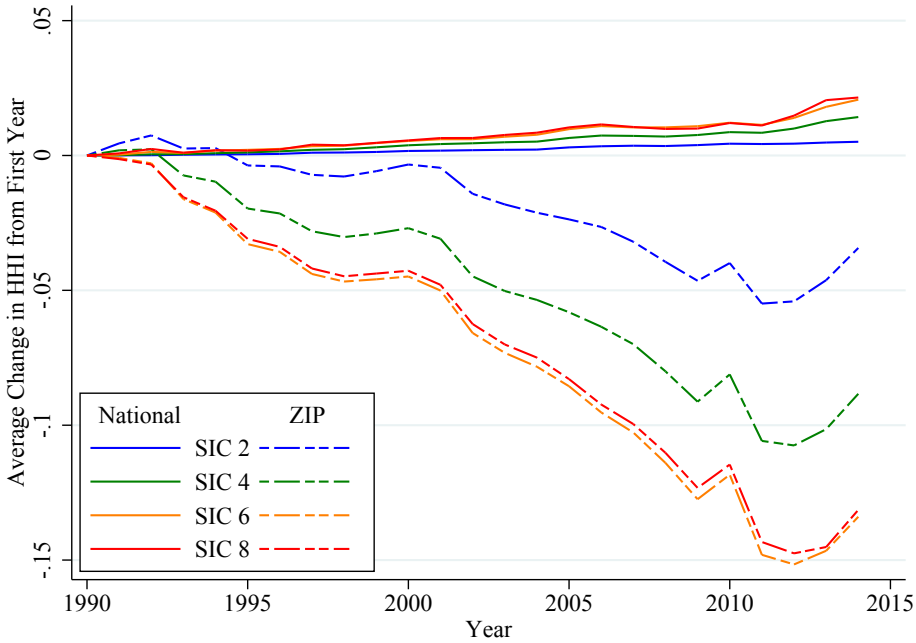


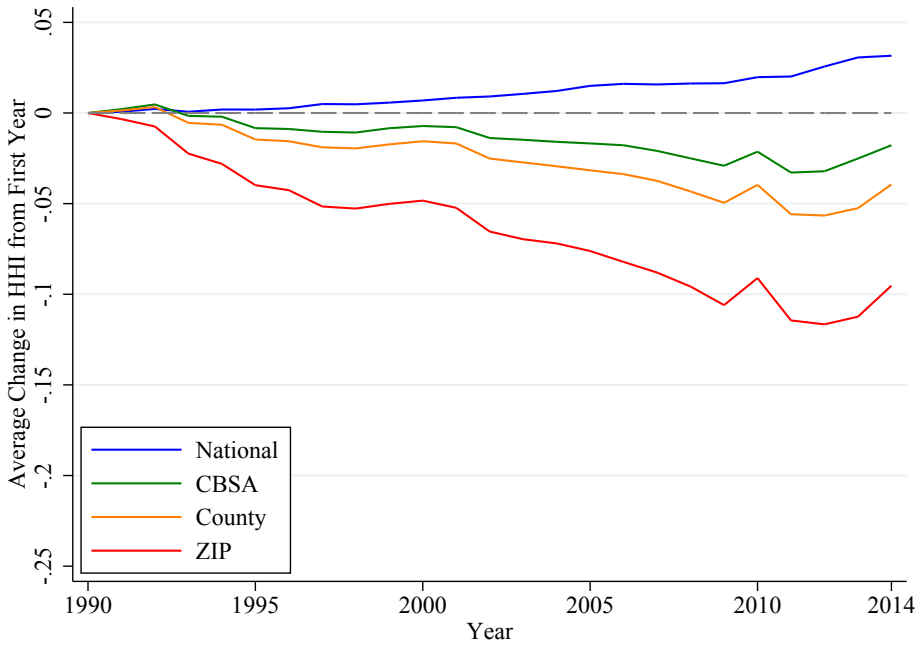
Figure 6: Diverging economy-wide trends in employment concentration



has the opposite effect whereby new establishments in markets without a previous incumbent raise local concentration.[17]

Figures (7) and (8) repeat the exercises in Figures (3) and (4) but only considering industry-geography pairs where at least one establishment is present in every year. The resulting panel, therefore, is balanced. Though slightly less pronounced, the divergence between national and local concentration trends remains unequivocal. Furthermore, it is still the case that this divergence becomes more pronounced as one moves towards more disaggregated definitions of local markets. It is also still the case that the divergence in concentration trends is particularly evident in service industries, such as Retail and FIRE, which make up the bulk of the U.S. economy.

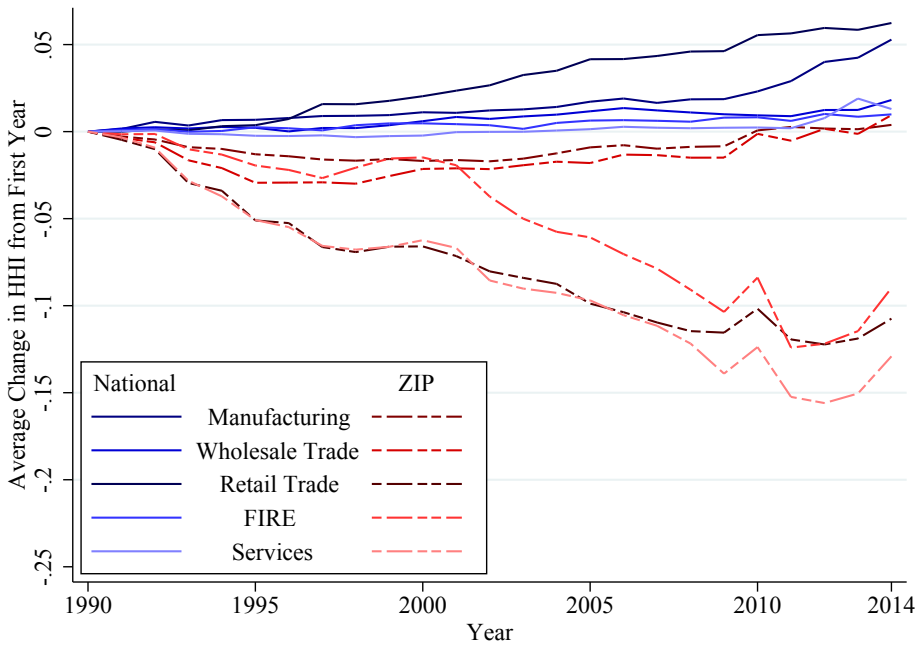
Figure 7: Diverging economy-wide national and local concentration trends with a balanced panel



In the online-only appendix, we show that these balanced-panel findings also hold for other measures of concentration such as the share of the largest firm or the adjusted Herfindahl. It is worth noting that, for more disaggregated definitions of local markets, measures of concentration based on the sales share of the largest X firms become less informative as X increases. The reason lies in strong selection issues. Consider for instance a concentration measure based on the sales share of the top 4 firms. In that case, measured concentration will necessarily be unchanged in all industry-geography pairs that have 4 or fewer firms throughout the sample. However, at the SIC 8-ZIP code level, 90 percent of observations turn out to have 3 firms or fewer and 93 percent of observations have 4 firms or fewer. This case is especially misleading

[17]See, for example, the argument and evidence presented in Ganapati (2018).

Figure 8: Diverging division-level national and local concentration trends with a balanced panel



if those pairs are increasingly moving from having 1 firm to 3 firms and concentration is actually falling. For example, in the discount department store industry (which includes Walmart), of the ZIP codes that had 1 firm in 1990 and at least 1 firm in 2014, 56 percent had at least 2 firms competing in 2014 but only 5 percent of those ZIP codes had more than 4 firms.

It emerges, therefore, that one has to be cautious when measuring concentration at local levels. Since industry-geography pairs with 4 or fewer firms represent the large majority of local markets, any study that attempts to measure market concentration in disaggregated sectors and highly disaggregated geographies using the share of the largest 4 firms faces strong measurement problems. Such studies (e.g. Ganapati 2018) do not challenge the results in our paper or their interpretation.

3.2 Fact 2: Pervasive Diverging Trends

Fact 2 is presented in Figure (9). Within each SIC 2 classification, the figure gives a breakdown of employment in industries with different market concentration trends. In particular, for a given SIC 2 classification, the height of each bar gives the percentage of employment in all industries within that classification that have rising market concentration at the national level between 1990 and 2014. For each SIC 8 industry i within an SIC 2 classification, we compute in each year $\Delta C_{i,t}^{I,G} = \sum_g w_{i,g,t}^{I,G} \Delta C_{i,g,t}^{I,G}$, where both g and G denote the whole U.S., and regress $\Delta C_{i,t}^{I,G}$ on t. The height of the bar then represents the percent of labor, within that SIC 2 and across all years, employed in all SIC 8 industries with positive national concentration

time trends. Thus, the major part of U.S. employment resides in industries with rising national concentration across all SIC 2 classifications. Within a bar associated with a given SIC 2 classification in Figure (9), the colors red, blue, and black represent, respectively, the percent of employment that resides in industries with declining, rising, and flat market concentration at the ZIP code level.[18]

Figure (9) shows the pervasiveness of SIC 8 industries with diverging trends.[19] That is, a substantive share of employment resides in industries with rising market concentration at the national level and declining market concentration at the ZIP code level. It also shows the heterogeneity in this share across SIC 2 divisions. For example, in SIC 2 53, which includes General Merchandise Stores, virtually all employment resides in SIC 8 industries with diverging trends (96.38%). In contrast, in SIC 2 21, which includes Tobacco Products, none of the SIC 8 industries exhibit a positive national trend and a negative local trend. Diverging trends are more pronounced in Retail, FIRE and Services, than in Wholesale Trade and Manufacturing, though still very much present in the latter two divisions.

The proportion of aggregate U.S. employment located in all SIC 8 industries with increasing national market concentration and decreasing ZIP code level market concentration is 43 percent. Thus, given that some industries have also had declining concentration at both the national and ZIP code level, 78 percent (or over 3/4) of U.S. employment resides in industries with declining local market concentration.[20]

3.3 Fact 3: The Role of Top Firms

Fact 3 explores the contribution that top firms –in terms of sales share– have made to the diverging trends in each SIC 8 industry. Figures (10) and (11) focus on just those industries whose market concentration has increased at the national level since 1990, represented by the height of the bars in Figure (9). Those industries account for roughly half of all industries in our sample, 61% of aggregate U.S. employment, and 67% of aggregate sales.

Within that set of SIC 8 industries, Figure (10) focuses on those that exhibit negative local concentration trends. These industries account for 72% of total employment in industries with positive national trend (66% of sales). The figure presents in solid orange and solid red, respectively, the national HHI and the local ZIP code level HHI among these industries. Given our industry selection, the national concentration (orange) line is increasing by construction and the local concentration (red) line is decreasing by construction. The dashed orange and dashed red lines in that figure depict the same objects but excluding the top enterprise in each SIC 8 industry as measured by sales in 2014.[21] We consider only industry-geography pairs (i, g) for which i's top enterprise has at least one establishment present in g in at least one year. Furthermore, because we are interested in isolating the effect of the top enterprise on market concentration, among those remaining

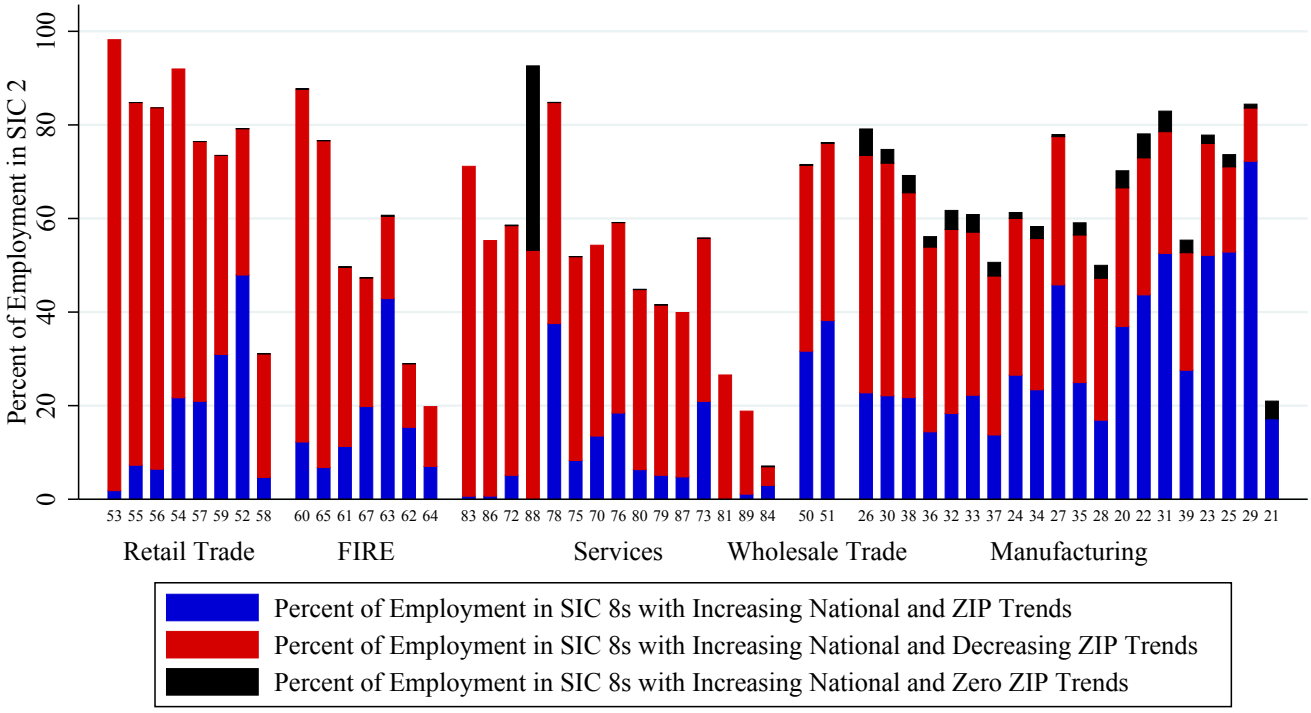
[18] Specifically, in the calculation of $\Delta C_{i,t}^{I,G} = \sum_g w_{i,g,t}^{I,G} \Delta \mathcal{C}_{i,g,t}^{I,G}$, both g and G now represent a ZIP code.

[19] We reserve the term of 'diverging trends' for a case of positive national trend and a negative local trend. The case of a negative national trend and a positive local trend is also possible, though much less common in virtually all industries.

[20] The share of national sales in sectors with decreasing local market concentration is 72%.

[21] We show in the online-only appendix that we obtain similar results when we exclude the top 3 firms rather than only the top firm.

Figure 9: Pervasive diverging trends across 2-digit sectors



industry-geography pairs, we then only include observations (i, g, t) where at least one establishment remains after dropping the top enterprise in i and its associated establishments.[22]

Figure (10) shows that among SIC 8 industries with diverging trends, excluding the top firm results in a national concentration trend that is less pronounced. The fact that large firms have contributed to the national increase in concentration is as expected. More surprising is the observation that the top firms have also contributed to the decline in local concentration. Figure (10) shows that when we exclude the top firm, the negative trend in ZIP-code-level concentration is less pronounced. Hence, the top firm (and more generally the largest firms) in an industry are responsible (though not entirely) for the diverging trends.

Figure (11) is constructed exactly as Figure (10) but uses the SIC 8 industries with increasing national trends which are not depicted in Figure (10). In other words, it uses the SIC 8 industries with positive national and local trends. The figure shows that for this set of industries, excluding the top firm lowers both the national and the local trend in concentration. Over the last ten years or so, it also shows that excluding the top firm reduces the trend in national concentration significantly more than that in local concentration.

How can the growth of large firms contribute to the divergence in these trends? To a large extent, top enterprises expand by adding new establishments in new locations. The new establishments tend to decrease

[22] We also exclude industry-geography pairs whose first year of observed sales results from only one establishment belonging to the top enterprise, since the change in market concentration cannot be computed in that case.

Figure 10: The role of top enterprises in national and local concentration trends in diverging industries

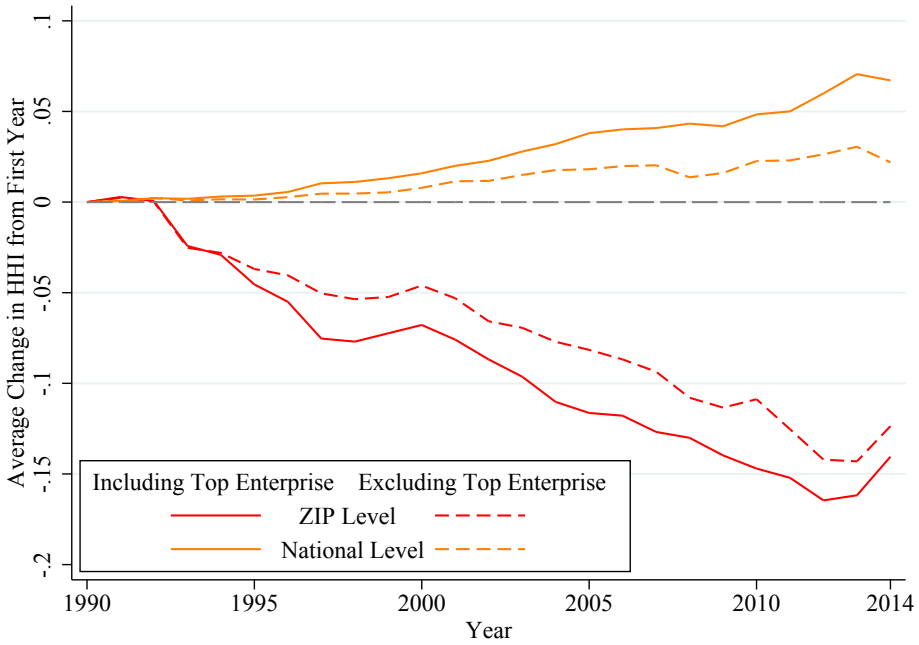
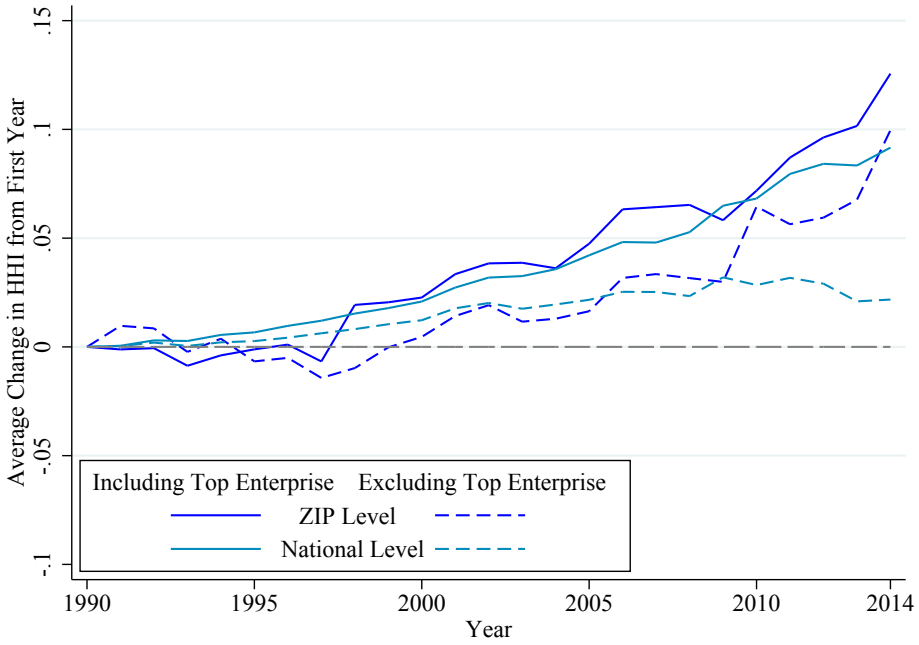


Figure 11: The role of top enterprises in national and local concentration trends in concentrating industries



local concentration as they compete with existing establishments in the area, even as the top firm acquires a larger national market share, increasing national concentration. Next, we explore the impact of local entry by a top firm.

3.3.1 Comparing Industries' Largest Firm to their Runner-Ups

To the extent that lower concentration is associated with more competitive markets, the findings in this paper are suggestive of local markets becoming more competitive despite concentration rising at the national level. Our analysis is indeed consistent with the notion that in many industries, the top enterprise expands into new markets by opening plants that compete with already established local monopolists. The case for increasing competition, however, is less clear if the observed fall in concentration is the result of a few firms entering several markets. As discussed in Bernheim and Whinston (1990), and Bond and Syropoulos (2008), when firms compete in multiple markets simultaneously, the potential for collusion can grow since these firms' ability to punish any deviation can be enhanced by their multiple 'contacts' across markets. Hence, increasing national concentration resulting from the increasingly large positions of two or three enterprises in an industry can result in declines in local concentration, more local contacts between competitors, and a rise in the ability to collude and thus effective market power of the largest firms. If, in contrast, increasing national concentration results from the gradual expansion of a single top firm competing with local firms, a decline in local concentration will be associated with reductions in market power in those local markets.

To gain insight into the role of the largest enterprise in a given industry relative to that of the largest 2 or 3 enterprises, Figure (12) repeats the exercise in Figure (10) but excluding the second and third largest enterprise instead of the top enterprise. For industries where national and local concentration trends diverge, excluding the second and third largest enterprises results in an increase in concentration at the local level as in Figure (10). Thus, as with the top enterprise, when the second and third largest enterprises enter new geographical markets, local concentration falls. However, unlike Figure (10), excluding the second and third largest enterprises increases national concentration. Put another way, unlike the top enterprise, the second and third largest enterprises contribute to reducing concentration at the national level. This finding is inconsistent with the view that the largest 2 or 3 enterprises are responsible for a simultaneous rise in national concentration and decline in local concentration as they expand in new untested markets. Instead, Figure (10) shows that entry of the the second and third largest enterprises leads to overall declines in concentration as with any other less dominant firm.

Analogous to Figure (12), Figure (13) repeats the exercise in Figure (11) for cases where both national and local concentration have been rising but excluding the second and third largest enterprises instead of the top enterprise. Comparisons with Figure (11) make it even more apparent that the second and third largest firms have an impact that on average differs from that of the most dominant enterprise across industries. In Figure (13), we see that the second and third largest enterprises contribute to lowering concentration both at the national and local level whereas the most dominant enterprise in Figure (11) contributes to higher concentration nationally.

Figure 12: The role of the second and third largest enterprises in diverging industries

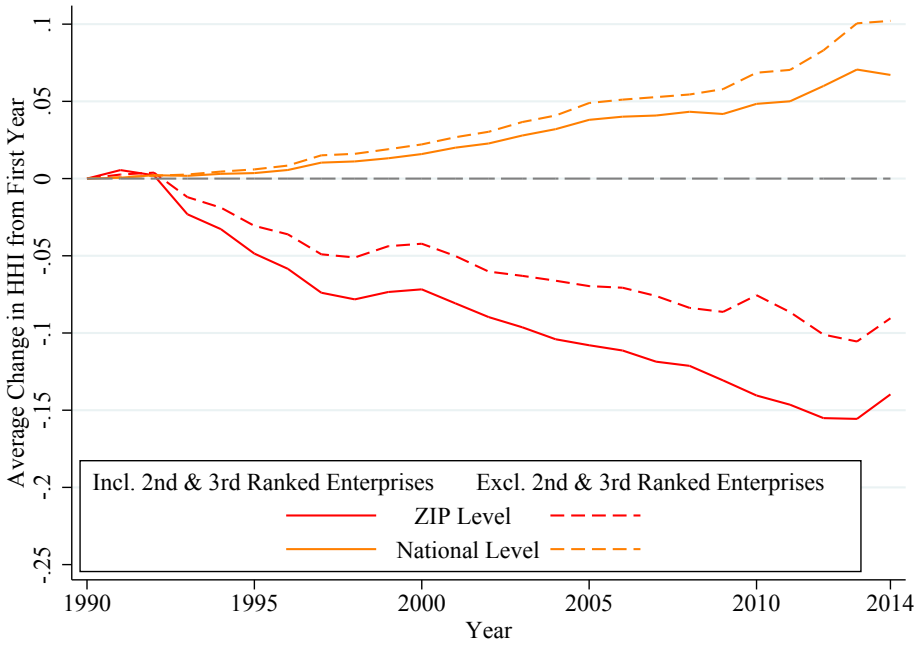


Figure 13: The role of the second and third largest enterprises in concentrating industries

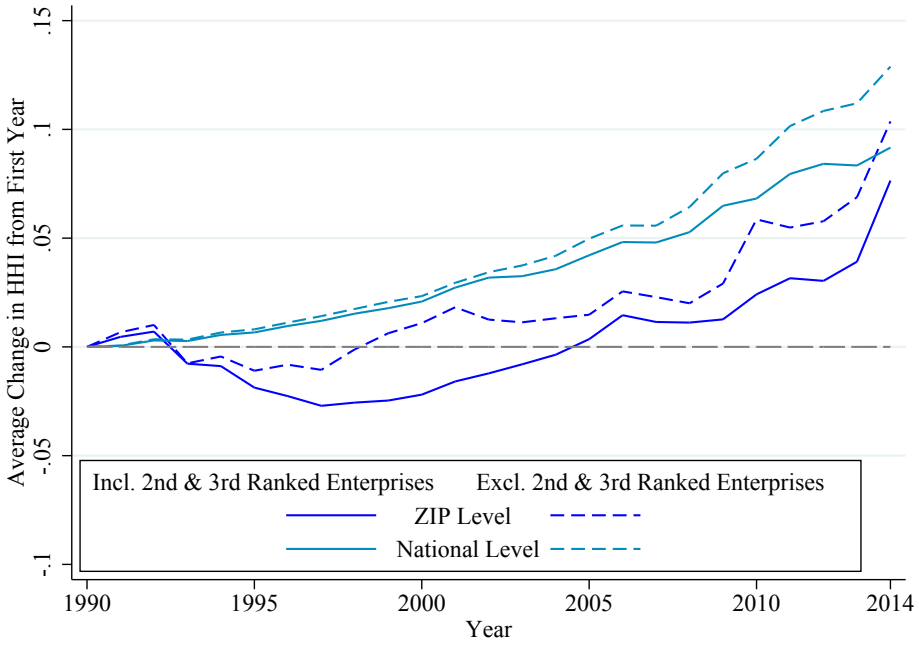
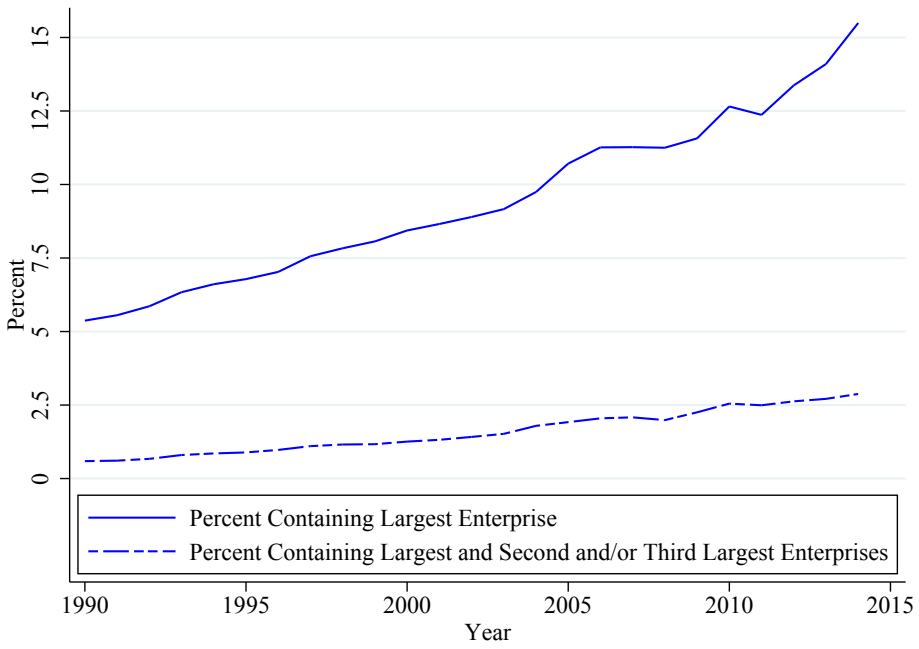


Figure 14: Expansion of Top Enterprises into ZIP Codes



Figures (14) helps further contrast the way in which, across industries, the dominant enterprises have expanded geographically relative to the next two largest enterprises. Specifically, the solid line in Figure (14) shows the proportion of SIC 8-ZIP code pairs, weighted by employment associated with that pair, where the dominant enterprise has at least one establishment. This proportion steadily increased from 5.4 percent in 1990 to 15.5 percent in 2014. In other words, on average across industries, the largest enterprise has unambiguously and steadily expanded into new local markets over the last 25 years. The dashed line in Figure (14) depicts the proportion of SIC 8-ZIP code pairs where not only the largest enterprise but also the second and third largest enterprises have at least one establishment. While the dashed line has gradually increased over the last 25 years, it has done so at a considerably slower rate than the solid line. Put differently, the difference between the two lines represents the proportion of SIC 8-ZIP code pairs in the U.S. where the top enterprise is competing with smaller firms rather than its next two largest competitors, and this difference has itself gotten markedly larger over the last three decades.

3.4 Fact 4: When a Top Firm Comes to Town

To further illustrate the impact of an industry's top enterprise on market concentration at the local level, Figures (15) and (16) present an event study describing the effect of local entry by an establishment associated with a top firm (defined by 2014 sales in an SIC 8 industry as in Fact 3) in a ZIP code. Specifically, Figures (15) and (16) examine the effect of a top firm opening a new establishment in a ZIP code on local

market concentration. The calculations here mimic those in Figures (11) and (10). In Figures (15) and (16), the $x-$axis plots a $10-$year window surrounding a top firm establishment opening in a given ZIP code, with 0 denoting the opening year. To better highlight the net effect of entry on concentration, we normalize the change in concentration to zero in the year prior to the establishment opening.

Figure (15) depicts the event study for all SIC 8 industries with increasing market concentration at the national level and decreasing local market concentration, that is, SIC 8 industries with diverging trends. Figure (16) illustrates findings for the remaining SIC 8 industries with increasing national concentration: those where both national and local trends are positive over our sample period. The solid lines in both figures present the evolution of the HHI index when the entering establishment is included; the dashed lines illustrate the same object when excluding the opening establishment owned by the top enterprise within each industry.

Among industries with diverging trends, the opening of an establishment in a ZIP code is associated with a fall in market concentration. Moreover, this fall persists at about the same size for at least 7 years after the event. In contrast, among industries with increasing local market concentration, the opening of an establishment leads to a temporary decrease in market concentration but one that reverses quickly. After 4 to 5 years, concentration is higher than it would have been absent the opening. Hence, in the former case, the establishment owned by the top enterprise does not become dominant, while in the latter case it eventually dwarfs the establishments of other firms. The data suggest that on the whole, the case where the top firm does not become dominant at the local level is markedly more relevant.[23]

The dashed lines in both Figures (15) and (16) suggest that when all shares are re-calculated excluding sales of the opening establishment belonging to the top enterprise in each industry, market concentration does not exhibit a significant trend over the entire $10-$year window. Thus, the dashed-lines lend credibility to a central assumption underlying the event study, namely that entry by a top enterprise in a local market is the main event affecting concentration in each market.

3.4.1 The Case of Walmart

The event study presented in Fact 4 averages the effect of entry by a top enterprise across many markets. It is informative, therefore, to further delve into the data within a particular sector. In the last couple of decades, one of the most widely studied cases of an expanding firm has been the case of Walmart.[24] Hence, here we repeat the calculations underlying Fact 4 but for the particular case of Walmart and the SIC 8 industries with which it is associated. The solid line depicted in Figure (17) represents a weighted average

[23]Neumark, Zhang and Wall (2006) and Barnatchez, Crane and Decker (2017) argue that NETS dataset might at times be slow in reporting the entry and exit of small firms. Given their findings, one might question the extent to which our results are driven by the exit of small firms not being reported accurately. However, the fact that the fall in the HHI persists for up to 7 years diminishes this potential concern. Another potential concern is that ZIP codes are too narrow a geographic definition of a market. In the online-only appendix, we show that the fall in the local HHI as a result of local entry by a top enterprise in industries with diverging trends holds and persists when we using counties rather than ZIP codes.

[24]See, for example: Basker (2007), Jia (2008), Ailawadi, Zhang, Krishna, Krueger (2010), Zhu, Singh, Manuszak (2009), Holmes (2011).

Figure 15: Effect on concentration when a top enterprise enters a local market in diverging industries

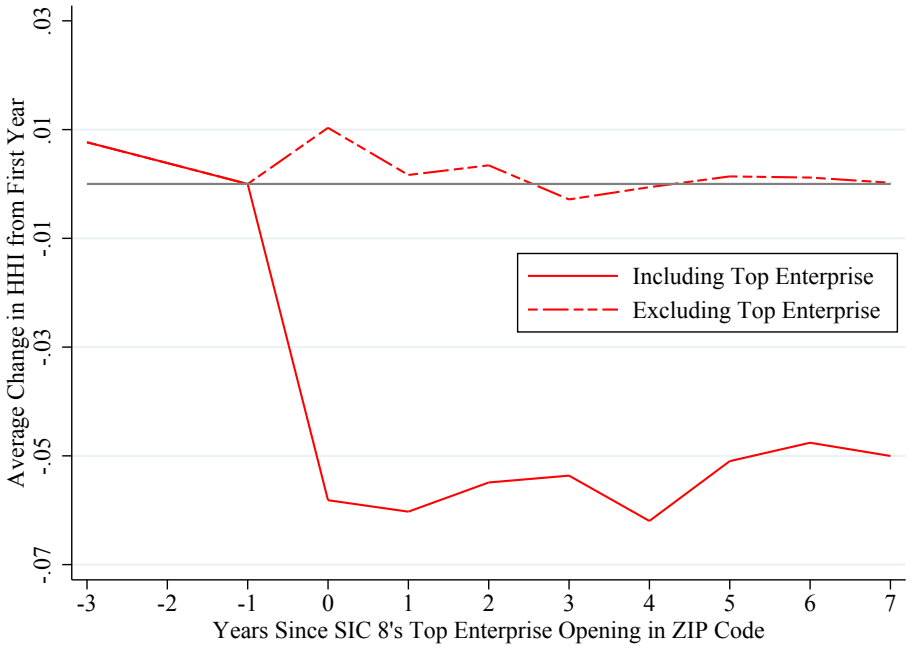
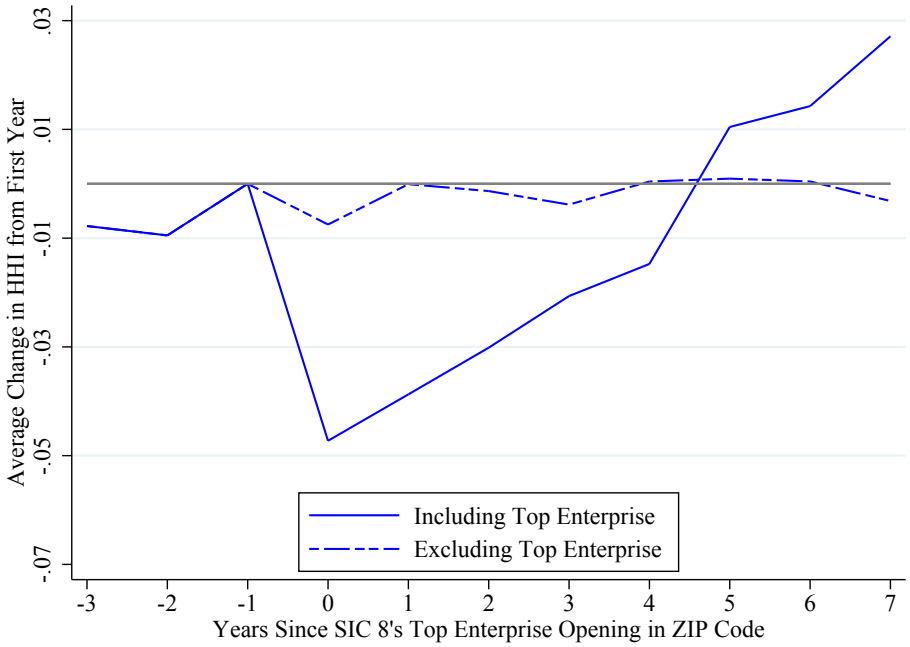


Figure 16: Effect on concentration when a top enterprise enters a local market in concentrating industries



of concentration within Walmart's primary industry (discount department stores) across all ZIP codes. The dashed line represents the same object but excluding the opening establishment owned by Walmart (i.e. all shares are re-calculated excluding Walmart's sales from the new establishment).

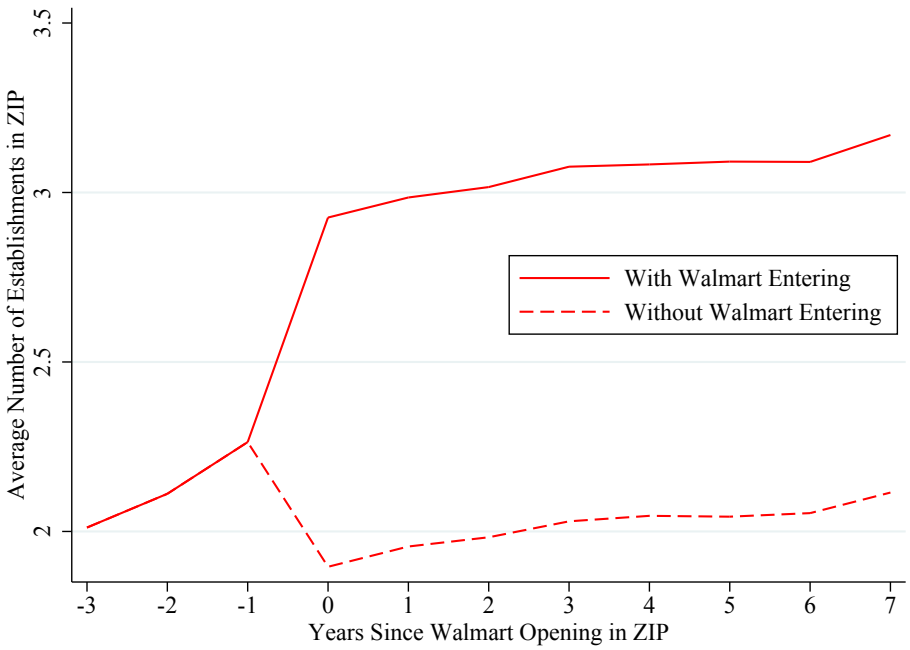
Our findings for Walmart are qualitatively similar to those in Fact 4 for industries with diverging trends (as is the case for Walmart's industries). Absent a Walmart opening, there is no trend in concentration, but there is a significant fall in the HHI of a ZIP code in which Walmart opens a new establishment. This lower level of concentration remains about constant for at least 7 years.

One advantage of considering a particular firm and its industries is that we can also show, and easily interpret, the effect of entry on the number of establishments in the local market. To do so, Figure (18) illustrates the effect of a Walmart establishment opening in a given ZIP code on the number of establishments in that ZIP code. The solid line in the figure indicates that, when averaged across all ZIP codes (weighted by geography-SIC 8 employment, as in all other figures), the opening of a Walmart establishment is associated with an increase in the number of local establishments. This increase is somewhat less than one-for-one (roughly 0.75) which suggests that the entry of Walmart is associated with some establishment exits across ZIP codes. Consistent with this observation, the dashed line indicates that when the newly established Walmart is excluded from the calculation, the number of establishments falls somewhat across ZIP codes.[25]

Figure 17: Effect on concentration when Walmart enters a local market

[25]Consistent with the findings in Jia (2008) and Basker (2007), carrying out these calculations at the county level reveals a more pronounced effect of Walmart's entry on firm exit. Nevertheless, the decline in the HHI is still large on impact and still negative after 7 years.

Figure 18: Effect on number of establishments when Walmart enters a local market



3.4.2 The Case of Cemex

Figure (9) suggests 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 (9) 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 largest enterprise in a ZIP code. To use one example, Figures (19) and (20) highlight the SIC 8 code 32730000, Ready-Mixed Concrete, whose top enterprise by sales in 2014 is Cemex, a building materials company. Figure (19) shows that the arrival of Cemex into a ZIP code reduces concentration in its industry by about 0.1. Although this effect dissipates after 7 years, concentration measured excluding Cemex remains higher than it otherwise would when included so that this company is still contributing to lower local concentration. Figure (20) shows that, as with the case of Walmart, while some existing establishments do exit when Cemex opens a plant, 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 (2004) and Syverson (2008) also argue that high transport costs make local measures of concentration more relevant. In this paper, we show that these more local measures exhibit a downward trend.

Figure 19: Effect on concentration when Cemex enters a local market

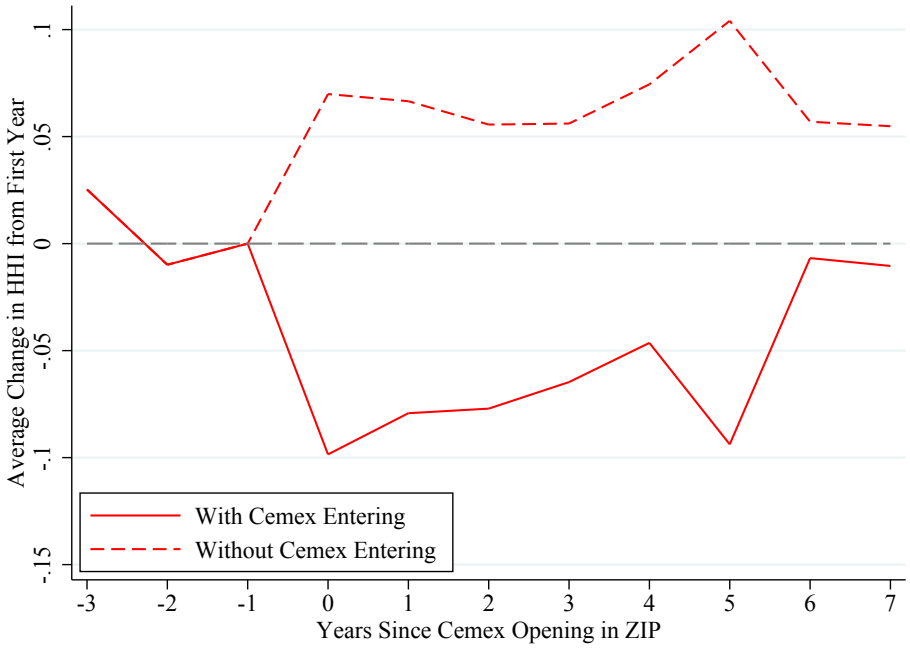


Figure 20: Effect on number of establishments when Cemex enters a local market

4 Conclusions

We have shown, by way of four main facts, that the increase in market concentration observed at the national level over the last 25 years is being shaped by enterprises expanding into new local markets. This expansion into local markets is accompanied by a fall in local concentration as firms open establishments in new locations. These observations are suggestive of more, rather than less, competitive markets.

The findings in this paper potentially help reconcile the observation of increasing concentration at the national level and the more mixed evidence on increasing markups and profits. Almost no theory of product market competition associates decreasing concentration with either increasing markups or increasing profits. One exception resides in theories of multi-market collusion where a few firms competing in many markets can have enhanced opportunities to collude. Although this form of collusion could be important in specific industries, we show that an expanding top firm competing with local producers is a much more common occurrence. Thus, our facts indicate that the rising trend in national concentration is not, in and of itself, necessarily a concern for anti-trust policy. By decreasing local concentration, the growth of top firms has likely increased local competition in many industries and, therefore, helped improve the quality and reduce the prices of much of what we buy.

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