Local and National Concentration Trends in Jobs and Sales: The Role of Structural Transformation[*]

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Abstract

National U.S. industrial concentration rose between 1992-2017. Simultaneously, the Herfindhahl Index of local (six-digit-NAICS by county) employment concentration fell. This divergence between national and local employment concentration is due to structural transformation. Both sales and employment concentration rose within industry-by-county cells. But activity shifted from concentrated Manufacturing towards relatively un-concentrated Services. A stronger between-sector shift in employment relative to sales explains the fall in local employment concentration. Had sectoral employment shares remained at their 1992 levels, average local employment concentration would have risen by 9% by 2017 rather than falling by 7%.

JEL: L11, L60, O31, O34, P33, R3
Keywords: Employment concentration, sales concentration, local labor markets, structural transformation

1   Introduction

There is broad consensus that national industrial concentration rates have risen substantially in the US since 1980 (Autor et al., 2020; Furman and Orszag, 2018; Barkai, 2020). Similar trends are visible in many other countries (Bajgar et al., 2019, 2020), although there is some controversy over the exact magnitudes (Philippon, 2019). It is less clear whether comparable or countervailing trends prevail at the local geographic level. Many, although not all (Benmelech et al., 2022), papers have found a decrease in local *employment* concentration when using data from the Longitudinal Business Database (LBD) (Rinz, 2022). Because the standard LBD does not contain data on *sales*, however, papers examining local sales concentration have relied on other datasets such as the NETS, which indicates a fall in local concentration (Rossi-Hansberg et al., 2021).[1] Although the NETS has the virtue of granularity, there are concerns about its coverage and accuracy (Crane and Decker, 2020), especially for very small local establishments and for very large firms, the latter being especially crucial for measures of concentration.

Understanding the evolution of local market concentration is critical for adjudicating among competing explanations for the changing industrial landscape and assessing their implications for worker and consumer welfare. Some scholars regard high and increasing concentration trends as a signal of weakening product market competition (Philippon, 2019), evidenced by rising markups (De Loecker et al., 2020) and slowing productivity growth (Syverson, 2017). However, it is well-known that concentration may be a poor measure of competition. Apart from the classical IO mechanism that competition may increase reallocation towards larger, highly productive firms, the Economic Census does not take imports into account (see Amiti and Heise (2021)). Moreover, national concentration measures are not the relevant construct for markets that are highly localized, as is the case for many services (Benkard et al., 2021). Local concentration is also of special concern for labor markets, particularly for low-wage workers who mainly search for employment locally and may face imperfect competition for their services.[2]

This paper advances knowledge of the evolution of *local* sales and employment concentration in the U.S. by drawing on the U.S. Economic Census, which enumerates sales and employment at the establishment level across the entire population of employer firms within broad sectors. We focus on the 1992–2017 period but also present results from 1982–2017 for the subset of four of six sectors

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[1] NETS is based on compilation of survey data and publicly available accounting data. The new LBD-Admin data contain sales information but only from 1998 onward and only at the firm level. This is problematic for calculating local concentration measures as large firms span many local areas.

[2] Many recent papers have found evidence for employer monopsony power in US labor markets using a variety of methods. For example, see Lamadon et al. (2022), Manning (2011) , Yeh et al. (2022) and the overview in Card (2022)

where consistent data are available. We explore, first, whether trends in local sales and employment concentration have tracked their national counterparts. Second, we consider the proximate sources of divergences between local and national trends. The analyses in this paper are descriptive, but they reveal both surprises and potential causes for concern.

Our key results are as follows. Analyzing the most recent available Economic Census data for 1992–2017 for six large sectors—Manufacturing, Retail Trade, Wholesale Trade, Services, Utilities and Transportation, and Finance—we first confirm the substantial increase in national U.S. industry concentration, measured by both sales and employment, that was reported in Autor et al. (2020) based on data that ended in 2012. Second, and perhaps more surprisingly, we document that trends in local concentration parallel those for national concentration in the case of sales but diverge from the national trend in the case of employment. Measured at the level of county by NAICS six-digit industry, *sales* concentration has risen roughly in parallel with national concentration whereas *employment* concentration has fallen, opposite to the case for national employment concentration.

Sharp changes in industrial structure—particularly the decline in the Manufacturing sector—are key to understanding these diverging trends. At a local and (to lesser extent) national level, Manufacturing is measured to be more concentrated than Services. Indeed, Rinz (2022) shows that local employment concentration is about three times higher in Manufacturing than in Services. Accordingly, the reallocation of economic activity away from Manufacturing towards (primarily) Services has reduced aggregate concentration. Conversely, both sales and employment concentration have *risen* within industry-by-county cells. In the case of sales, this rise in within-cell concentration only partially offsets the reallocation of sales towards less concentrated sectors. Thus, consistent with findings in Smith and Ocampo (2022) for the retail sector, local sales concentration rises.[3] Simultaneously, the reallocation of employment towards less concentrated industry-county cells *more than fully offsets* the rise in within industry-county employment concentration, leading to a net fall in local employment concentration. This countervailing effect is larger for employment than sales because the reallocation of economic activity from Manufacturing to Services has been larger for employment than for sales. Nevertheless, the rise in within industry-county employment concentration is substantial. Holding industry structure fixed at its 1992 level, local employment concentration would have risen by about 9% instead of falling by 7%.

The implications of these findings for both consumers and workers are nuanced. To the degree that rising national sales concentration reflects weakening product market competition, the evidence of rising sales concentration in local markets magnifies these concerns. Alternatively, the

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[3]Distinct from both Smith and Ocampo (2022) and the estimates reported in this paper, Rossi-Hansberg et al. (2021) find a fall in local sales concentration in NETS data. We discuss potential sources for these differences below and in Appendix A.2.

rise in local sales concentration likely in part reflects the spread of national chains (Smith and Ocampo, 2022), which are typically more productive and offer greater product variety than their local rivals (Hsieh and Rossi-Hansberg, 2021). These forces paint a similarly mixed picture for labor market competition. For young workers with high sectoral and geographic mobility, falling local employment concentration likely implies greater competition. Among workers with limited sectoral mobility (e.g. incumbent employees with a substantial degree of industry skill-specificity), the rise of firm concentration may mean a *fall* in outside opportunities.

The paper is structured as follows. Section 2 describes the data. Section 3 reports our descriptive analysis, and 4 discusses implications. Appendices detail the data (A.1) and consider relationships to, and discrepancies with, other papers (A.2 and A.3). The data underlying the analysis are available for download at concentration trends.

2   Data

2.1   Data Construction

We overview our data sources here, with details provided in Appendix A.1. The U.S. Economic Census is conducted every five years and surveys all establishments in selected sectors about their current economic activity. We analyze the Economic Census for the quarter-century interval of 1992–2017 for six large sectors: Manufacturing, Retail Trade, Wholesale Trade, Services, Utilities and Transportation, and Finance.[4] The covered establishments in these six sectors comprise approximately 80 percent of both total employment and GDP. We assign each establishment in each year to a 2017 NAICS-based, time-consistent, six-digit code (broadly equivalent to a four-digit SIC code). Our NAICS six-digit classification for industries is consistent over our sample time interval and highly comparable to Fort and Klimek (2018). We also show robustness to alternative industry definitions such as the SIC, used by Autor et al. (2020).

Within each sector, the Census reports each establishment's employment, sales, and, importantly for our purposes, an identifier for the firm to which the establishment belongs. The exact definition of sales differs based on the nature of the industry, but the measure seeks to capture total sales, shipments, receipts, revenue, or business done by the establishment. While sales are reported for all sectors, the Economic Census for the Manufacturing sector additionally reports value-added at the establishment level.[5]

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[4] Data coverage for the Utilities and Transportation sector and the Finance sector begins in 1992. Within the six sectors, several industries are excluded from the Economic Census - see A.1 and (Autor et al., 2020) for more details.

[5] Value-added is calculated by subtracting the total cost of materials, supplies, fuel, purchased electricity, and contract work from the total value of shipments, and then adjusting for changes in inventories over that year.

2.2 Structural Transformation

Figure 1 documents the substantial shift in sectoral composition over our sample period—a structural transformation—with a rapid decline in the share of economic activity in Manufacturing and nearly as large an increase in Services: Manufacturing's share of employment fell by 9.6 percentage points and its share of sales fell by 7.8 percentage points; Services' share of employment rose by 10.5 percentage points while its share of sales rose by 7.1 percentage points. Activity shares in the other sectors were broadly stable over the quarter-century: the employment share in both Wholesale and Finance fell by almost one percentage each; the employment share in Retail and Utilities rose modestly (0.6 and 0.2 percentage points respectively). Sales shares fell slightly in Finance, Retail, and Utilities, while rising by a slightly larger 1.6 percentage points in Wholesale.

Figure 1: Shifts in economic activity across sectors
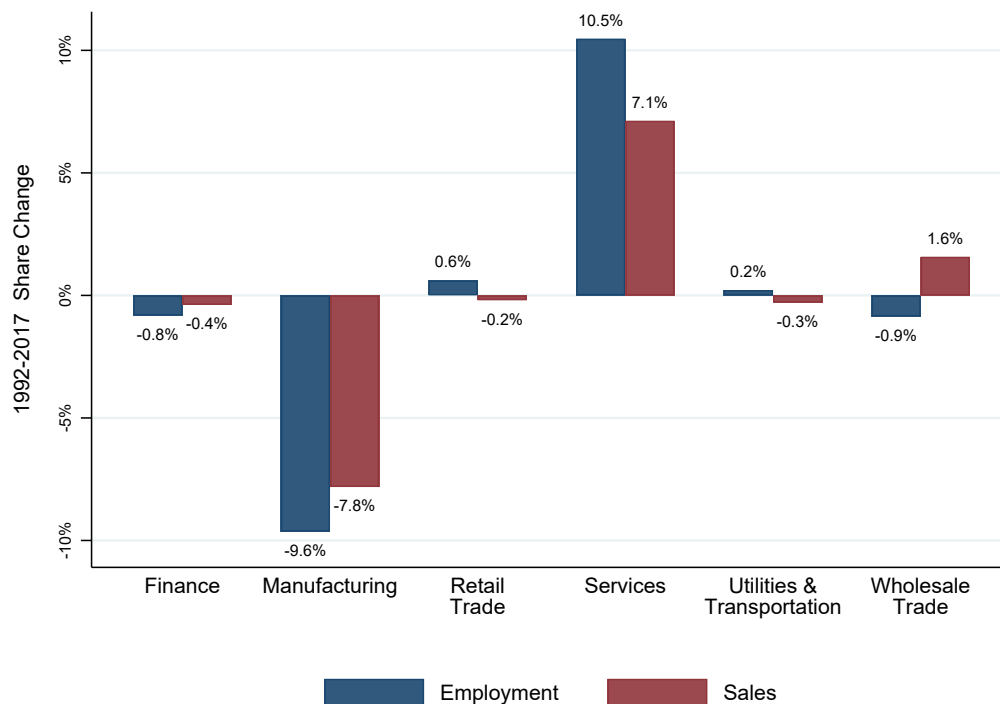
Notes: Figure shows the 1992–2017 percentage point change of employment and sales shares in the six Census sectors.

3 Trends in concentration

3.1 National Concentration Trends

Methodology

Before zooming in on local concentration, we update by five additional years the trends in national sales and employment concentration reported in Autor et al. (2020).[6] In aggregating across six-digit NAICS sectors, we weight industries by sales when using sales concentration measures and by employment when using employment concentration measures. Because the Census of Finance and Census of Utilities and Transportation do not begin until 1992, we focus on the 1992–2017 period in much of the rest of the paper. Appendix Figure A1 documents that analogous patterns extend back to 1982 for the four Census sectors for which data are available.

For each Census sector k, we measure national (NAT) concentration in year t for outcome $l \in \{\text{employment (E) or sales (Y)}\}$ as:

$$HHI_{kt}^{l,NAT} = \sum_{j \in k} w_{jt}^l HHI_{jt}^{l,NAT}, \tag{1}$$

where $HHI_{jt}^{l,NAT}$ is the Herfindahl Index in outcome l in industry j in year t, and the weight w_{jt}^l is six-digit industry activity l share of industry j in sector k in time t. For example, the weight for industry j for the sales HHI is $w_{jt}^Y = Y_{jt}/\sum_{j \in k} Y_{jt}$, where Y_{jt} is total sales of industry j at time t. The Herfindahl Index is the sum of squared 'market'[7] shares for all firms in the relevant cell, multiplied by 100 for expositional convenience.[8] For example, in an industry j, the national sales HHI is:

$$HHI_{jt}^{Y,NAT} = 100 \times \sum_{i \in j} \left(s_{ijt}^Y\right)^2, \tag{2}$$

where $s_{ijt}^Y = Y_{ijt}/Y_{jt} = Y_{ijt}/\sum_i Y_{ijt}$ is the sales share of firm i in industry j at time t.

Analogously, the economy-wide concentration ratio is the weighted average of the average concentration in each sector:

$$HHI_t^{l,NAT} = \sum_k w_{kt}^l HHI_{kt}^{l,NAT}, \tag{3}$$

where $w_{kt}^Y = \sum_{j \in k} Y_{jt}/\sum_j Y_{jt}$.

Figure 2 displays trends in overall concentration, measured within six-digit NAICS industry

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[6]For much longer term trends in US concentration (including pre-1982 data) see Kwon et al. (2023).

[7]We place the word market in quotations since we cannot be sure of the relevant market.

[8]With this scaling, the upper bound of complete 'monopoly' in our data is 100. Some anti-trust practitioners prefer to multiply by 10,000 instead of 100. These scalings are of course equivalent, up to a factor of proportionality.

codes and aggregated to the national level. The solid line between the blue circles shows that national concentration has been rising for both employment (left hand panel) and sales (right hand panel). Between 1992 and 2017, the economy wide HHI rose by 2.3 points for sales (from 4.4 in 1992 to 6.7 in 2017) and by 1.7 points for employment (from 2.5 in 1992 to 4.2 in 2017). These are large proportionate increases: 53% for sales HHI and 68% for employment HHI.

Figure 2 further explores the role of shifts across sectors of the economy in driving these trends by calculating a counterfactual time series for concentration that holds fixed the sector shares w_{kt}^l from Equation 3 at their 1992 levels. This re-weighting (shown by the red triangles and dashed line) has little effect on the movement in national HHIs. In fact, concentration rises by slightly *more* when holding sector shares constant, demonstrating that much of the rise in concentration has occurred within broad sectors. A second series in the figure reports a more constrained counterfactual where the share of each six-digit NAICS industry (not simply its encompassing sector) is held fixed at its 1992 level (green squares). This reweighting mutes the rise in concentration, but the effect is again modest.

Nothing fundamental depends on the exact way that we aggregate industries or define concentration indices. For example, Autor et al. (2020) examined Economic Census data 1982-2012 using consistent industry definitions based on the SIC four-digit classification rather than the six-digit NAICS used in our baseline results. Appendix Figure A1 reports identical SIC-based measures of top-4 and top-20 concentration, here extended through 2017. These patterns are qualitatively similar patterns to those in Figure 2.

3.2 Local Concentration Trends

The patterns at the national level in the previous figures stand in contrast to the patterns at the local level, which are reported in Figure 3. For this and subsequent calculations, we generally define local concentration in county c in industry j as:

$$HHI_{cjt}^l = 100 \times \sum_{i \in j,c} \left(s_{icjt}^l \right)^2, \tag{4}$$

where s_{icjt}^l is the share of firm i in industry j in county c.[9] Economy wide average local concentration is:

$$HHI_t^l = \sum_k w_{kt}^l \sum_{c,j \in k} w_{cjt}^l HHI_{cjt}^l, \tag{5}$$

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[9]Counties provide our primary unit of geography throughout the analysis. As shown in Appendix Figure A2, the same qualitative patterns hold when we consider states rather than counties (see Robustness section).
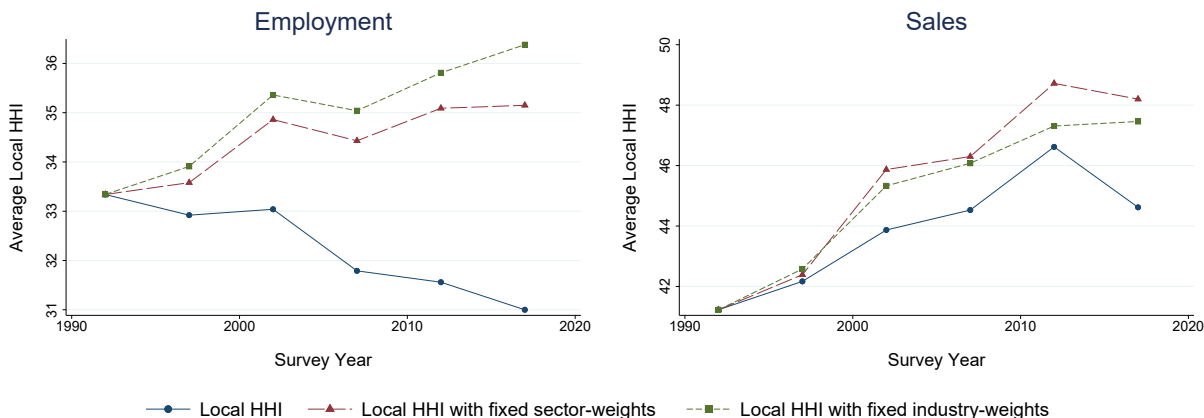
Figure 2: National industrial concentration
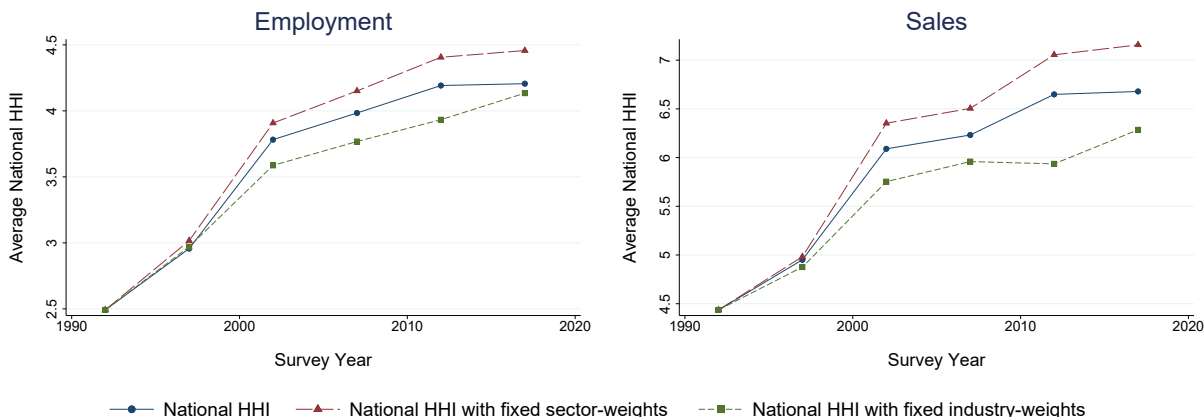
Notes: The left and right panels show the HHI across six-digit NAICS industries for employment and sales, respectively. With our scaling, the upper bound of the HHI is 100. In the left panel, all industries are weighted by their share of employment in each year, and in the right panel, industries are weighted by their share of sales in a given year. The blue circles show the overall change in national concentration. We hold the weight of each of the six sectors fixed at their 1992 levels in the series in red with triangle markers, and hold the weights of each six digit NAICS industry fixed at their 1992 levels for the series in green with square markers. These 6 sectors are as in Figure 1: Utilities and Transportation, Manufacturing, Services, Retail Trade, Wholesale Trade, and Finance.

where w_{cjt}^l is the share of activity l in industry j in sector k and county c and w_{kt}^l is the share of activity l in sector k in year t. Figure 3 shows that the evolution of local sales concentration is qualitatively similar to that of national sales concentration, although concentration is of course higher at the local level. The local sales HHI rose from 41.2 in 1992 to 44.6 in 2017, a gain of 3.4 points (or 8.3%) (right-hand panel of the figure). Figure 3 also reports the employment HHI, which is lower than that for sales (both nationally and locally). More surprisingly, sales and employment concentration move in opposite directions during most five-year intervals of the 1992 through 2017 time window. The employment-based HHI *fell* by 2.3 points, from 33.3 in 1992 to 31.0 in 2017, which stands in contrast to the 3.4 point rise in the sales HHI. Our estimates for local *employment* concentration echo those of Rinz (2022), who uses the LBD. Our results for local *sales* concentration differ from those reported in Rossi-Hansberg et al. (2021), a result that we discuss below and in Appendix A.2.

The importance of structural transformation in driving these overall trends can be clearly seen in Figure 4. Panels A and B plot the trends for local concentration of both employment (left panel) and sales (right panel) separately for each of the six sectors shown in Figure 1, each normalized to zero in 1992. In Finance, Manufacturing, Wholesale Trade, and Retail Trade, local employment and sales concentration is *rising* by several points in each sector. For Services, local employment concentration is flat. The only sector with falling local employment concentration is Utilities and Transportation. While Panels A and B focus on the trends, Panels C and D show that there are

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Figure 3: Local industrial concentration

Notes: The left and right panels shows the HHI across six-digit industries and counties for employment and sales, respectively. With our scaling, the upper bound of the HHI is 100. In the left panel, all industries are weighted by their share of employment in each year, and in the right panel, industries are weighted by their share of sales in a given year. In the red lines, the weights of each sector are fixed in 1992. These six sectors are as in Figure 1: Utilities and Transportation, Manufacturing, Services, Retail Trade, Wholesale Trade, and Finance. In the green lines, the weights of each six-digit NAICS industry are fixed in 1992.

large level differences in local concentration across sectors. Average local employment concentration in Manufacturing is more than double that in Services. Since Utilities and Transportation are a small share of the economy, the fall in overall employment local concentration arises from a shift of employment from high local concentration sectors like Manufacturing to lower local concentration sectors like Services. Since the shift of sales across sectors was more modest than the shift of jobs, this reallocation was not strong enough to overturn the within sector concentration trends for local sales, but was large enough to lead to an overall decline of local employment concentration.

The quantitative importance of this structural transformation on overall local concentration is vividly illustrated by the series plotted in red in Figure 3. While the local employment HHI fell by 2.3 points between 1992 and 2017, we estimate that, holding sectoral employment weights fixed at their 1992 levels, concentration would have risen instead by 1.9 points to 35.2.

In holding sectoral weights fixed, we continue to allow concentration within a sector to evolve across industries and counties as occurred while rescaling each sector in each year to match its share of the overall economy in 1992. If instead, we rescale weights so that each NAICS six-digit industry share remains at its 1992 level (rather than its encompassing sector share), we estimate that concentration would have risen further to 36.4, an increase of 3.1 points—that is, a 9% rise in the local employment HHI ($9 \approx 100 \times 3.1/33.3$) rather than the observed 7% fall ($7 \approx 100 \times 2.3/33.3$).[10]

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[10]These counterfactuals allow industrial composition to shift across counties over time. An important advantage of this approach is that it does not require restricting the analysis to the set of county-industry cells that were present in 1992. Since the full set of industries and sectors is constant over time by construction, the sample is identical

Figure 4: Average local concentration by sector
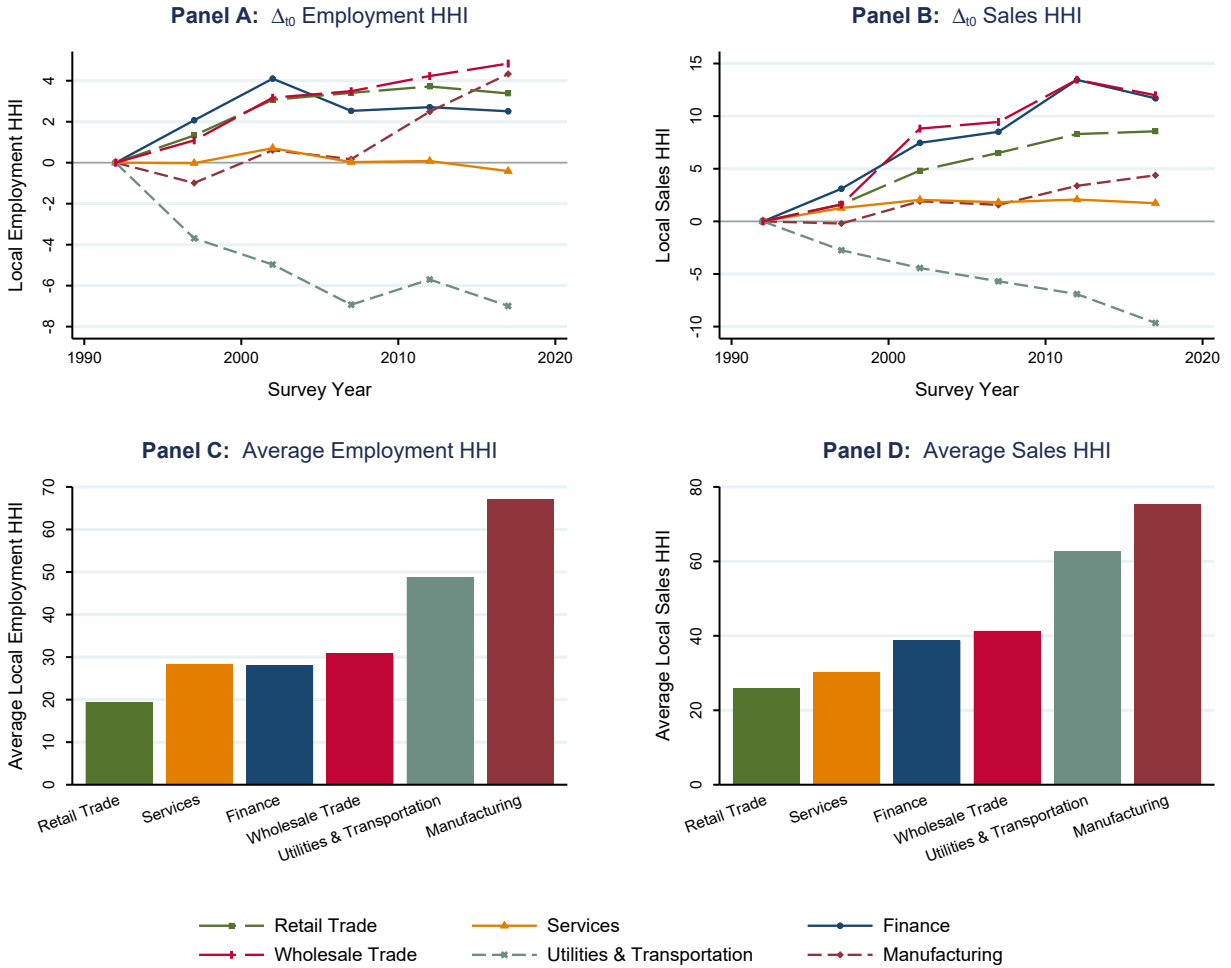
Notes: This figure plots the change in the local employment HHI (Panel A) and sales HHI (Panel B) relative to their 1992 levels for each sector separately. We base the HHI for each sector at zero in 1992. Panel C has the 1992-2017 average level of the local employment HHI for each sector and Panel D has the same for local sales HHI. With our scaling, the upper bound of the HHI is 100.

The right hand panel of Figure 3 shows that local sales HHIs jumped by 3.4 points between 1992 and 2017. Holding six-digit NAICS industries fixed, sales concentration would have risen even more—about 6.2 points. Holding sectors fixed, it would have risen by 7.0 points. Thus, for both employment and sales concentration, shifts in sectoral composition buffered the rise of local employment and sales concentration within sectors and industries.

Why was the effect of structural transformation in offsetting rising within-sector concentration so much larger in the case of employment than sales concentration? A key factor is that productivity—specifically, output per worker—generally rises faster in Manufacturing than in other sectors. This means that the reallocation of activity from Manufacturing to other sectors tends to be greater for employment than for sales.[11] Recall from Figure 1 that between 1992 and 2017, Manufacturing lost 7.8 percentage points of aggregate sales while Services gained 7.1 percentage points. In the same interval, Manufacturing lost 9.6 percentage points of aggregate employment while Services gained 10.5 percentage points. All else equal, sectoral reallocation from Manufacturing to Services reduces both local sales and employment concentration. But the de-concentrating effect is larger for employment than sales because the extent of reallocation is greater.

One way to gauge the differential effects of sectoral reallocation on sales relative to employment concentration is to calculate how much local sales concentration would counterfactually have fallen had the sectoral reallocation of sales followed the same sectoral and geographic pattern as employment. We do this by calculating:

$$HHI_t^Y = \sum_{cj} w_{cjt}^E HHI_{cjt}^Y, \tag{6}$$

where w_{cjt}^E are the employment-based weights for the county-industry cell. Applying this formula, we find that sales HHIs do in fact counterfactually fall rather than rise. This confirms that it is the greater extent of reallocation of employment rather than sales that explains the greater role of reallocation in offsetting rising sectoral concentration in employment.

To better delineate the roles played by changes in concentration within sectors versus the reallocation of activity across sectors in shaping trends in local concentration l, we perform a

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in all three series in Figure 3. A disadvantage is that we are implicitly assuming that the reallocation of economic activity across locations would have evolved similarly even if the overall sector nationally had not changed size.

[11]US real manufacturing output per hour approximately doubled between 1992 and 2017. For the non-farm business sector as a whole (which includes manufacturing), it rose by substantially less, roughly two-thirds, in the same time interval (U.S. Bureau of Labor Statistics, 2023a,b).

three-way shift share decomposition across broad sectors k:

$$\Delta HHI_t^l = \sum_k \left(w_{k0}^l \Delta HHI_{kt}^l \right) + \sum_k \left(HHI_{k0}^l \Delta w_{kt}^l \right) + \sum_k \left(\Delta w_{kt}^l \Delta HHI_{kt}^l \right) \tag{7}$$
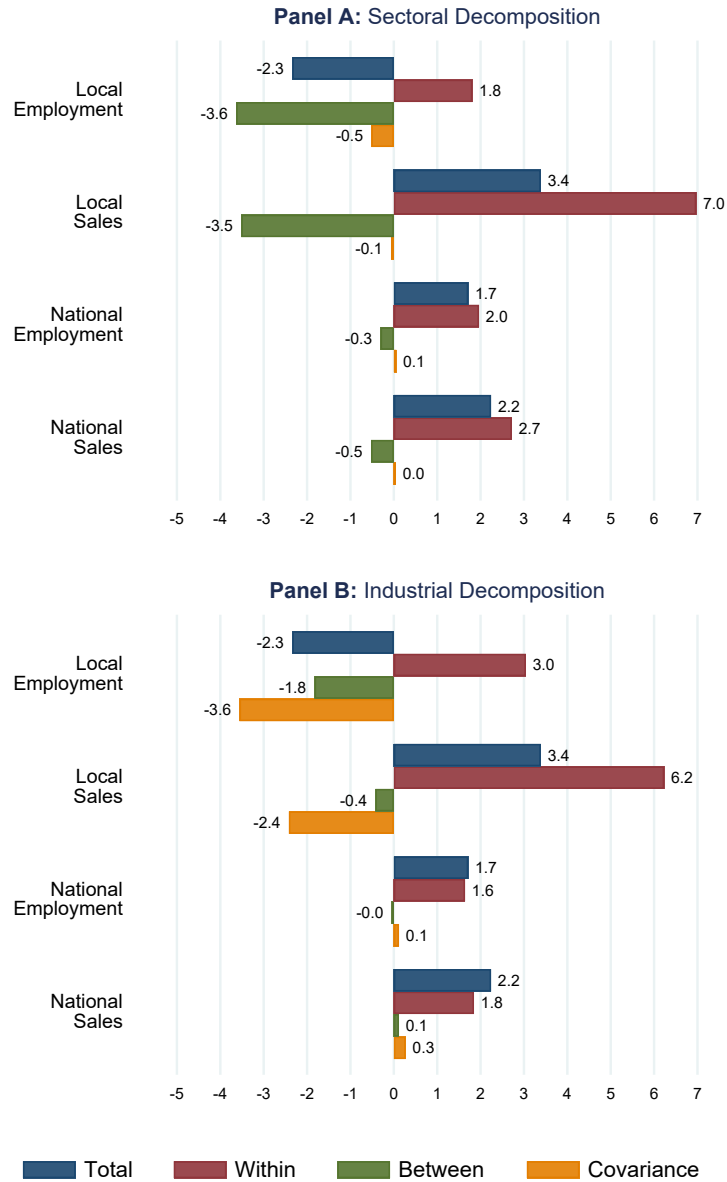
where $HHI_{kt}^l = \sum_{c,j \in k} w_{cjt}^l HHI_{cjt}^l$ is the average local HHI for outcome l in sector k in year t and w_{kt}^l is the national share of outcome l from sector k in year t. The first term, using beginning of period (1992) weights (w_{k0}^l), captures the change in local concentration of sales or employment within a broad sector k, holding constant initial sales or employment segment shares (a "within" effect). The second term captures the change in local concentration stemming from shifts in economic activity across broad segments of the economy k, holding constant initial sectoral concentration (a "between" effect). Finally, the third term captures the extent to which sectors with increases in economic weight (measured by sales or employment) also saw increasing concentration (a "covariance" term). Since this shift-share is taken across broad sectors, all shifts in economic activity across detailed industries within a sector will be captured as a within-sector change in concentration.

Paralleling the decomposition for local concentration, we also decompose changes in national concentration into components due to within-sector changes, between-sector changes, and their covariance as:

$$\Delta HHI_t^{l,NAT} = \underbrace{\sum_k w_{k0}^l \Delta HHI_{kt}^{l,NAT}}_{\text{within effect}} + \underbrace{\sum_k HHI_{k0}^{l,NAT} \Delta w_{kt}^l}_{\text{between effect}} + \underbrace{\sum_k \Delta w_{kt}^l \Delta HHI_{kt}^{l,NAT}}_{\text{covariance effect}} . \tag{8}$$

Panel A of Figure 5 plots the components of equations (7) and (8), beginning with local employment. The overall fall of 2.3 points in the local employment HHI (blue bar) between 1992 and 2017 reflects the countervailing effects of a between-sector fall in concentration of -3.6 points (green bar), a within-sector concentration rise of 1.8 points (red bar), and a covariance term of -0.5 points (orange bar). The negative covariance term indicates that sectors with rising concentration had falling employment shares—but this component makes a small contribution. By contrast, for the local sales HHI, the observed rise of 3.4 points becomes a 7.0 point rise when we hold fixed the initial sectoral distribution of sales. Thus, this 7.0 point rise is offset by about half by sectoral reallocation. (In this case, the covariance term is close to zero.) The lower two bars of the figure perform the same exercise for national concentration. In both cases, the aggregate effect is dominated by within-industry rises in employment and sales concentration. At the national level, sectoral reallocation also tempers these within-sector concentration increases, but the offset is a small proportion of the net rise in this case.

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Figure 5: Shift-share decomposition of concentration trends

Panel A: Sectoral Decomposition

Local Employment: -2.3, 1.8, -3.6, -0.5

Local Sales: 3.4, 7.0, -3.5, -0.1

National Employment: 1.7, 2.0, -0.3, 0.1

National Sales: 2.2, 2.7, -0.5, 0.0

Panel B: Industrial Decomposition

Local Employment: -2.3, 3.0, -1.8, -3.6

Local Sales: 3.4, 6.2, -0.4, -2.4

National Employment: 1.7, 1.6, -0.0, 0.1

National Sales: 2.2, 1.8, 0.1, 0.3

■ Total   ■ Within   ■ Between   ■ Covariance

Notes: Both panels show the decomposition of the change in HHI from 1992–2017 following Equation (7). In panel A, the decomposition is taken across the 6 sectors (Utilities and Transportation, Manufacturing, Services, Retail Trade, Wholesale Trade, and Finance). In panel B, the decomposition is taken across all six-digit NAICS codes. In both panels, employment shares are used as weights for employment HHI measures and sales shares are used as weights for sales HHI measures.

We repeat this exercise in panel B of Figure 5, here using finer six-digit NAICS industries rather than broad sectors. The results are broadly similar, but the finer disaggregation accentuates the role of rising industry concentration in pushing up both sales and employment concentration, and it moderates the countervailing role of between-industry shifts in pushing down both forms of concentration. When performing this industry-level rather than sectoral decomposition, the covari-

ance term plays a larger role in offsetting the impacts of rising concentration in both employment and sales: industries where concentration is rising most rapidly are contracting as a share of local economic activity. Simultaneously, a comparison of the two panels of Figure 5 indicates that most of the moderating effect of reallocation on concentration is captured by reallocation across broad sectors rather than reallocation across industries within sectors.

3.3   The role of geographic reallocation

Alongside substantial reallocation of economic activity across sectors, the last several decades saw a sizable reallocation of economic activity across counties, with a widening gap in economic outcomes between urban and rural areas (Gyourko et al., 2013; Hsieh and Moretti, 2019). Since urban areas tend to have larger markets and lower HHIs, this shift could also have contributed to the fall in local employment concentration documented above. Appendix Figure A3 shows that reallocation across geography actually played a relatively small role. This figure explores a counterfactual where we allow the industrial composition of the economy to change but fix the county's share of overall employment or sales to remain at its 1992 level. This has a small moderating effect on local employment concentration, confirming that employment shifted over these decades from more highly concentrated counties (which tend to be rural) to less concentrated counties (which tend to be urban). Fixing county shares at their initial levels has no effect on trends in local sales concentration, indicating that geographic reallocation does not explain the divergence between local sales and employment concentration.

3.4   Robustness

Our principle finding is that sectoral reallocation (structural transformation) generated a net reduction in local employment concentration while partially offsetting rising local sales concentration. In this subsection, we document the robustness of this finding.

Looking back an additional decade

We begin by examining concentration trends for a longer time interval, back to 1992. Figure A4 reports trends in national and local concentration using the four sectors for which consistent data are available back to 1982: Manufacturing, Services, Retail Trade, and Wholesale Trade. This longer time series yields patterns that are comparable to those in the full set of industries that are available from 1992 forward. The local sales HHI rose from 41.7 to 44.2 between 1982 and 2017

while the local employment HHI fell from 35.2 to 30.5.[12]

Alternative geographical aggregation

We chose county as our primary level of local analysis as this is the most straightforward to do in the Census. To address the concern that this geographical unit might be too narrow, Appendix Figure A2 reports trends in local concentration defined as industry by state cells rather than industry by county cells. Similar qualitative patterns hold when we consider this higher state level of geographical aggregation. However, in this case, the trend in local employment concentration is basically stable rather than falling, as was seen in industry-county cells. This pattern is logical: national-level employment concentration has risen (Figure 2) while county-level employment concentration has fallen (Figure 3); the state-level concentration trend lies somewhere in between. By the same logic, trends in Commuting Zone-level concentration fall between state and county trends.

Alternative industry aggregation

Since NAICS industry codes are substantially finer within the Manufacturing sector than outside of it, and because the HHI concentration measure rises mechanically with the level of disaggregation, it is possible that the mitigating effect on concentration of the sectoral shift to Non-Manufacturing is in part an artifact of broader industry aggregation outside of manufacturing. Appendix Figure A5 explores this concern, first by aggregating all data to either three-digit or four-digit NAICS industries, and second by aggregating exclusively Manufacturing industries to the four-digit NAICS industry level while leaving all other sectors at the six-digit NAICS level. While of course the level of the HHI differs across these permutations, local employment concentration falls and local sales concentration rises under all three alternative aggregation schemes.

Contrasting our findings with those of other recent papers

Appendices A.2 and A.3 discuss the differences between our findings and those of recent papers such as Rossi-Hansberg et al. (2021) and Hsieh and Rossi-Hansberg (2021). We summarize key takeaways in this subsection.

Rossi-Hansberg et al. (2021) find that local *employment* concentration has fallen, a finding that our results confirm using independent data sources. Conversely, Rossi-Hansberg et al. (2021) report that local sales concentration has *decreased*, which is opposite to our findings. The primary source

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[12]This figure also documents the robustness of our conclusions to excluding the Finance sector, where output is particularly hard to measure.

of the difference, we believe, arises from the NETS data that are used by Rossi-Hansberg et al. (2021). Built from Dun and Bradstreet (D&B) records, the NETS database contains a mixture of public available accounting data and private-sector survey data. Since firms surveyed by D&B are not legally compelled to report their sales or employment data, there is considerable imputation in NETS, with sales frequently imputed from employment (and employment itself often unreported). By contrast, establishments are legally obligated to report sales and employment to the Census Bureau. Crane and Decker (2020) analyze these potential limitations of the NETS and find that NETS under-represents both very small and (more worryingly for concentration measures) very large firms.

By contrast, using annual employment data from the Longitudinal Business Database LBD), Rinz (2022) reports a fall in local employment concentration that accords closely with our findings above.[13] In a related paper, Hsieh and Rossi-Hansberg (2021) also use Economic Census data as we do here, but focus on a subset of "service" industries. Although not the subject of their paper, they report an increase in local sales concentration (measured by the HHI) in the vast majority of local markets (MSAs), akin to our primary findings (see their Figure 8, for example).[14]

Although our findings for trends in local concentration and their relationship to structural transformation are novel, we conclude that existing analyses of administrative Census data are qualitatively consistent with what we report here.

Online Sales

Local sales concentration based on establishment sales is less meaningful for firms that sell online (an issue that does not affect employment). Figure A6 examines the sensitivity of measures of sales concentration to the treatment of online sales. The left-hand panel excludes e-commerce sales while the right-hand panel reallocates online sales across establishments within each firm according to establishments' shares of overall firms sales.[15] Under both variants (e-commerce excluded, e-commerce reallocated) and all weighting schemes, we find a substantial rise in local sales concentration that closely accords with the main results in Figure 3.

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[13]Unfortunately, the LBD is less helpful for adjudicating among sales concentration series. Although the LBD-R (the Revenue-Enhanced LBD) contains sales data, these data are reported at the firm- rather than establishment level, which makes it infeasible to confidently allocate sales by multi-product, multi-establishment firms to their source industries or establishments.

[14]See also Smith and Ocampo (2022), who focus on the retail sector.

[15]This allocation approach implicitly assumes that the geographic distribution of online sales is similar to the geographic distribution of other sales when we reallocate sales in e-commerce (NAICS code 454000, "Non-store Retail") across establishments.

Value added weights

Our use of establishment-level sales as weights for sales concentration implicitly gives substantial weight to establishments that outsource heavily and therefore use intermediate inputs intensively (thus, inflating sales relative to value-added). An alternative is to use value-added weights. Unfortunately, establishment value-added is unavailable in the Economic Census outside of Manufacturing. We take two approaches to circumventing this limitation. First, Appendix Figure A7 reports sales concentration series that use sectoral value-added shares reported in the National Income and Product Accounts (NIPA) as weights.[16] The patterns are equally clear with this alternative weighting. Second, we have limited the analysis to Manufacturing using value-added weights and confirmed that the results again look very similar.

4   Implications

This paper has used near-population establishment micro data from the Economic Census from 1992 through 2017 to examine trends in *local* concentration in the United States and compare these trends to their national-level counterparts. Whereas local concentration in sales has increased in parallel with national sales concentration, local concentration in employment has declined despite rising at the national level. The phenomenon that reconciles these divergent local and national trends is *structural transformation*, specifically, the secular movement of employment and (to a lesser degree) sales towards less concentrated industry-by-country cells. Underlying these changes is the sizable shift in sales, and even more so employment, from the relatively concentrated Manufacturing sector (which lost about 7% to 8% of total economy-wide sales and 10% of total employment between 1992 and 2017) to the relatively un-concentrated Service sector.

The structural transformation of economic activity in the US and other advanced economies is well-known. What has potentially escaped attention, is that this force pushes concentration downward due to the simple fact that both sales and employment concentration are greater in Manufacturing on average than other sectors. At the national level, this de-concentrating effect is modest. It looms large at the local level, however, offsetting by half the effect of rising sales concentration within sectors and *more than fully offsetting* the effect of rising employment concentration within county by industry cells.

It would be premature to draw normative implications from these trends. Two caveats are particularly relevant. First, the descriptive statistics presented here on sales and employment concentration in cells defined by industries at various levels of geographic disaggregation should

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[16]We continue to use sales weights within sectors.

not naively be viewed as *markets*—since we do not have estimates of the ability of workers and consumers to switch among them (e.g. Benkard et al. (2021)). Even if such industry-area cells constituted well-defined markets—in the sense that substitution elasticities were sufficiently low— observing that a firm has a high market share does not necessarily indicate that the firm possesses (or exercises) market power.

Second, because our measures of firm-level employment and sales are based on censuses of establishments located in the US, they exclude sales by non-US based firms—though sales of imported goods by US based firms are included. This omission is not a major shortcoming for employment, but it will tend to inflate measures of sales concentration. For manufacturing industries with substantial foreign penetration, such as automobiles, this is an important limitation (see Amiti and Heise (2021) for further discussion). Since we see similar rises in within-industry sales concentration in largely non-tradable sectors, such as Retail and Wholesale, we suspect that this measurement issue is unlikely to be the primary explanation for the patterns we document.

With these caveats in place we offer the following high-level observations. First, much recent evidence finds that labor market frictions drive a wedge between wages and marginal products of labor (e.g., Card (2022); Lamadon et al. (2022); Manning (2003, 2011); Yeh et al. (2022)). In concentrated labor markets in particular, where workers have fewer outside options, wages tend to be lower than would otherwise be expected (Arnold, 2021; Azar et al., 2018; Berger et al., 2022; Benmelech et al., 2022). This body of evidence suggests that a fall in local employment concentration, as we document above, would typically imply an *increase* in labor market competition, constraining the exercise of labor market power.

But this picture is nuanced. The aggregate fall in concentration documented here stems from a sharp reallocation of economic activity between industries—which reduces concentration— accompanied by a rise in concentration within detailed industries. These countervailing forces leave open the question of whether workers are likely to benefit. The rise in within-industry concentration means that workers who are relatively immobile across sectors may face diminished outside options, particularly if their geographic mobility is constrained. For such workers, the net effect of industrial transformation may be to reduce competition for their services in the industries in which they are currently specialized rather than providing access to more competitive sectors in which their primary skills are less relevant. One prominent example would be workers employed in—or displaced from—manufacturing jobs. Evidence indicates that such workers fare poorly, perhaps because their sectoral mobility is limited (Autor et al., 2014). Our ongoing work explores these labor market consequences.

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A   Appendix

A.1   Data Details

Our primary datasource is the quinquennial U.S. Economic Census. The Census surveys each establishment in a selected sector on employment, annual payroll, and sales, among other topics. Payroll includes all forms of paid compensation, such as salaries, wages, commissions, sick leave, and employer contributions to pension plans.

We use data from six broad sectors: Retail Trade, Wholesale Trade, Services, Manufacturing, Finance, and Utilities and Transportation. Data are available from 1982–2017 for the first four of these six sectors. For the remaining two sectors (Finance and Utilities and Transportation), data are available from 1992–2017. Within these six sectors, several industries are excluded from the Economic Census: rail transportation is excluded from Transportation; postal service is excluded from Wholesale Trade; funds, trusts and other financial vehicles are excluded from Finance; and schools (elementary, secondary, and colleges), religious organizations, political organizations, labor unions and private households are excluded from Services. The Census excludes government-owned establishments from covered industries. We omit the Construction sector due to data limitations and we drop some industries in Finance, Services, and Manufacturing that are not consistently covered over time. See (Autor et al., 2020) for more details.

We link all establishments within a firm using the establishment's firm ID, which is constructed by the Census Bureau and is reported in the Economic Census. We identify establishments using the 2016 version of the establishment identifier in the LBD. To each establishment, we assign a six-digit 2012-based NAICS code provided by Fort and Klimek (2018). This six-digit NAICS code is provided within the LBD, not the Economic Census itself. For all years from 1982–2012, we are able to merge the Economic Census to the LBD to identify the assigned NAICS codes. Since the 2017 LBD was not available at the time of analysis, we used the 2016 LBD (the most recent year available) to assign the NAICS code for the 2017 data. The 2016 data do not include establishments that were newly created between 2016 and 2017.

A.2   Comparison with Rossi-Hansberg et al. (2021)

Rossi-Hansberg et al. (2021) find that local sales concentration has decreased in concert with local employment concentration, opposite to our results for sales concentration above. There are several potential reasons for this discrepancy. In the main text, we highlight the key driver of our divergent findings: fundamental differences between Economic Census data used here and NETS data used

by Rossi-Hansberg et al. (2021). There are, however, other details that contribute modestly to the differences. First is the methodology for aggregating HHIs across markets. Rossi-Hansberg et al. (2021) compute changes in concentration in the cross-section and aggregate the changes between some initial period and year t using the share of that market in year t. This methodology implicitly places more weight on the initial period for industries and counties that grow over time. We instead aggregate across industries and counties using a contemporaneous time-varying weight (see equation 3).

Several subtle variations in the definitions of industries and geographies across the datasets also make a minor difference. Our analysis uses six-digit NAICS codes while Rossi-Hansberg et al. (2021) use more disaggregated SIC codes. We define a local market using the county, while they primarily define a local market using the zip code. We include industries in Transportation and Utilities, while they do not include those sectors. These differences are explored in detail within the Retail sector by Smith and Ocampo (2022), who also conclude that they are unlikely to be primary drivers of the difference between their Census-based patterns and those in Rossi-Hansberg et al. (2021).

A.3 Comparison to *Hsieh and Rossi-Hansberg (2021)*

Hsieh and Rossi-Hansberg (2021) also use data from the Economic Census (as we do here) and LBD to explore the implications of changes in the firm size distribution for market concentration between 1977 and 2013. They focus on the "service" segment, defined as those industries where firms have rapidly expanded the number of markets they serve. While the samples that we use differ somewhat in the set of industries and years covered, both papers begin from the same basic fact pattern: concentration of employment has risen nationally but fallen locally. Hsieh and Rossi-Hansberg (2021) argue that these patterns can be explained by the nature of firm growth. They show that large firms have grown primarily by entering new geographic markets, particularly small and mid-sized cities. They argue that this geographic expansion led to a rise in national concentration but a fall in the local concentration of employment, as entering firms gained market share from local incumbents. We instead highlight the importance of sectoral shifts in explaining these patterns, and we argue that within a broad sector, local concentration of both sales and employment has risen.

Our findings are more directly comparable to those in Figure 8 in Hsieh and Rossi-Hansberg (2021). This figure shows the change in the local HHI of sales and employment between 1977 and 2013 in each MSA using a weighted average of MSA-level industry-level HHIs. (Here, the weight is the Sato-Vartia average of the employment share of each industry-MSA in 1976 and 2013.) The

takeaway from this figure is that the local HHI of employment falls in the majority of MSAs while the local HHI of sales *rises* in the majority of MSAs. This pattern is consistent with the divergent trends in local employment versus sales concentration that we document in Figure 3. It is also consistent with the evidence in Figure A3 above, showing that the local employment HHI is falling over time, even holding county weights fixed.

Finally, while the patterns for local and national concentration in the current paper and those in Hsieh and Rossi-Hansberg (2021) are broadly consistent, they are not directly comparable due to differences in industry weighting. In Figure 3, we weight industries within a county either by their time-varying employment weight or by fixing the industry's size nationally in 1992. Relative to initial period weights, the Sato-Vartia weight used in Hsieh and Rossi-Hansberg (2021) will upweight industries that grow over the period and downweight industries with shrinking employment over the period.

We found in Figure 5 that industries that grow in terms of employment are also those with falling local employment concentration (i.e. there was a negative contribution from the covariance term in Equation 7). Specifically, end of period industry weights put more weight on services, which have falling concentration over time, and less weight on manufacturing, where concentration has been rising over time. This implies that weighting industries using the Sato-Vartia weight will tend to show greater declines (or smaller increases) in concentration than would be found when fixing initial industry weights. Additionally, the analysis in Figure 8 of Hsieh and Rossi-Hansberg (2021) restricts attention to those industries that were present in an MSA in both 1976 and 2013. The figures in our analysis do not impose such a restriction.[17]

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[17]Specifically, for the counterfactual plots in Figure 3, we fix industry weights nationally while allowing the distribution of industry employment to move across counties as in the data. This is implemented by calculating the local HHI in each county-industry-year cell, averaging to the industry-year using county's share of employment in each year, and then fixing the national industry weight in the initial year.

Appendix Figures and Tables

Figure A1: Sectoral average top–4 and top–20 industrial concentration ratios
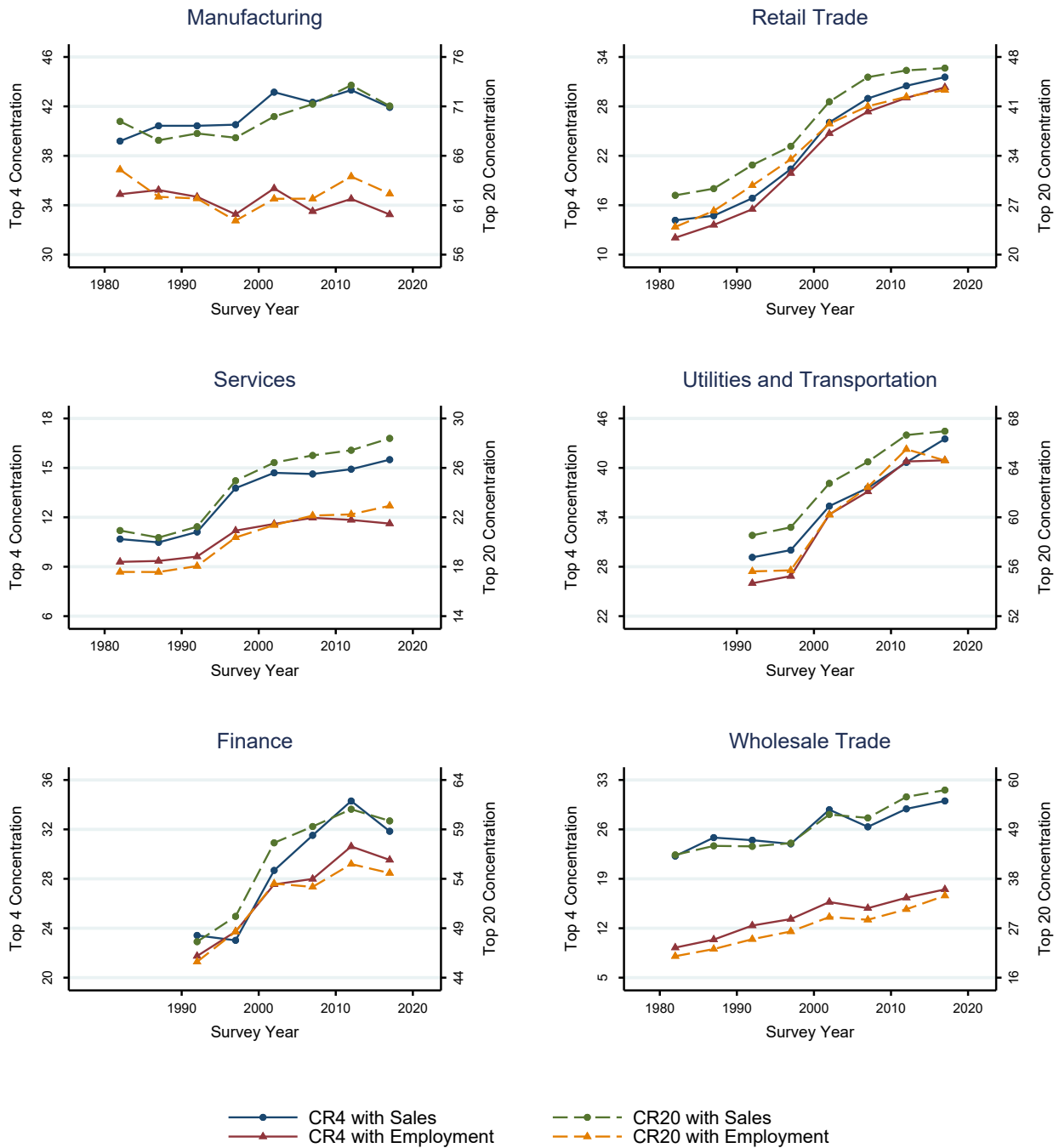
Notes: This figure plots the average employment and sales industrial concentration ratios for the six Census sectors. Sectoral concentration ratios are averaged across four-digit SIC industries, respectively weighting all industries by their employment and sales share each year. The top-4 firm and top-20 firm concentration ratios, CR4 and CR20, are plotted on left and right axis, respectively.

## Figure A2: Local industrial concentration, state-level aggregation
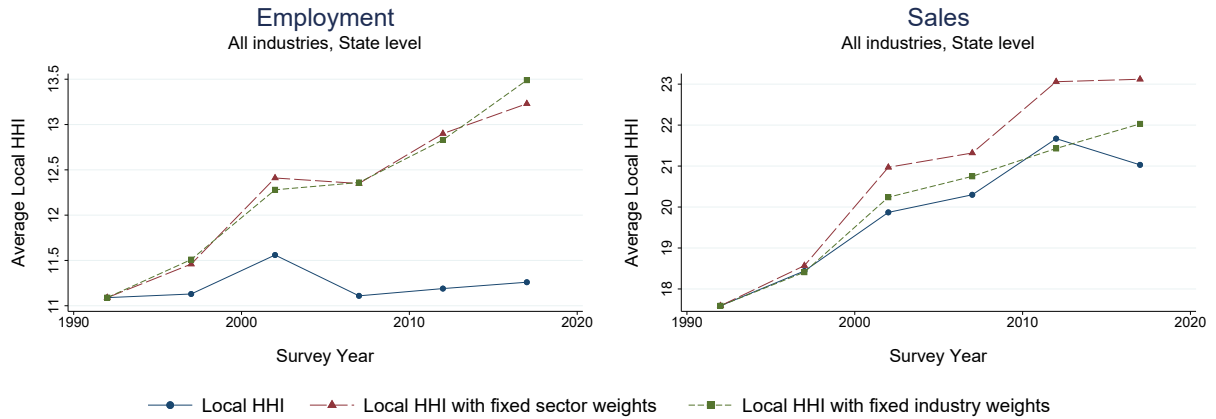
Notes: Figure plots the economy-wide employment and sales HHIs measured at the six-digit NAICS by state level. With our scaling, the upper bound of the HHI is 100. Sectors and industries in each state are respectively weighted by their employment (left panel) and sales (right panel) share each year. Census sector and industry weights are respectively held fixed at their 1992 levels in the series with red triangle markers and green square markers. Aside from calculating concentration across all firms in the state instead of the county, the figures here are identical to those in Figure 3.

## Figure A3: Local concentration: Cross-county shifts
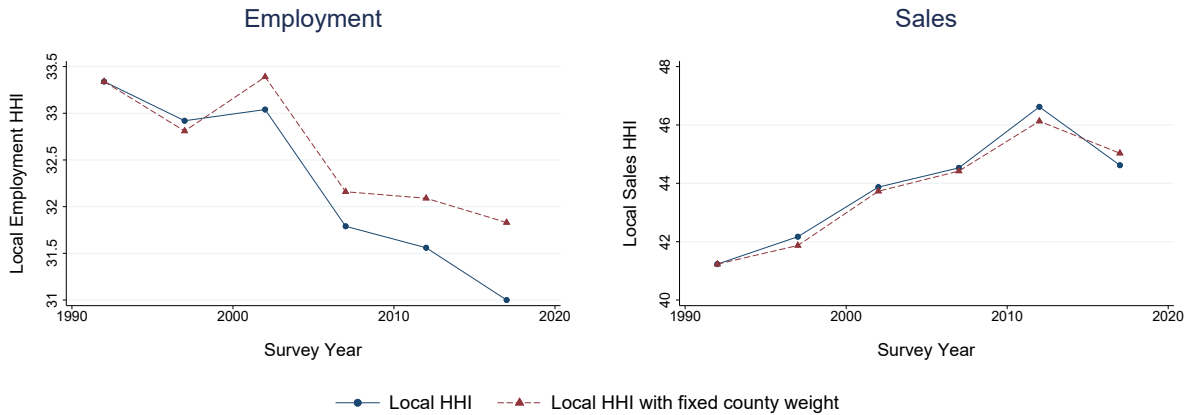
Notes: This figure plots economy-wide local employment and sales concentration aggregating across all six-digit NAICS industry HHIs in each county. With our scaling, the upper bound of the HHI is 100. Sectors and industries in each county are weighted by their employment (left panel) and sales (right panel) share each year. County weights are held fixed at their 1992 levels in the series with red triangle markers.

Figure A4: Concentration measures, excluding Finance and Utilities & Transportation
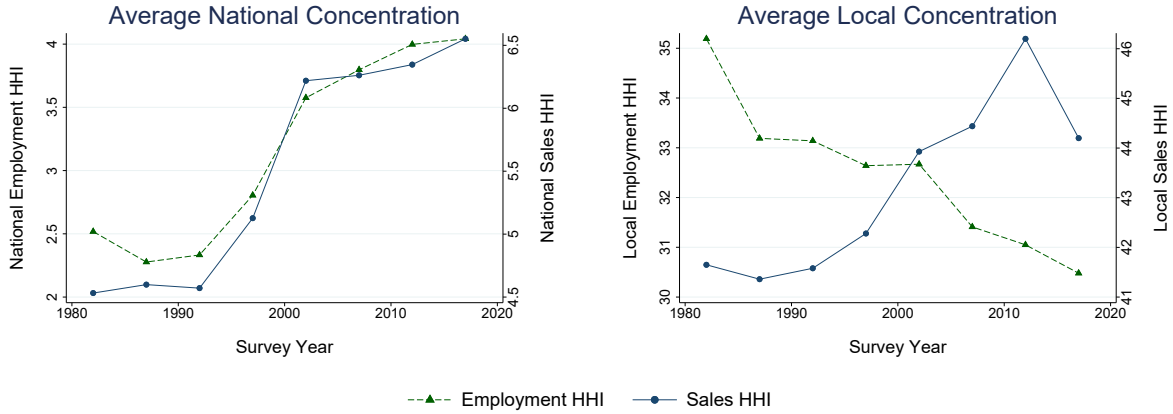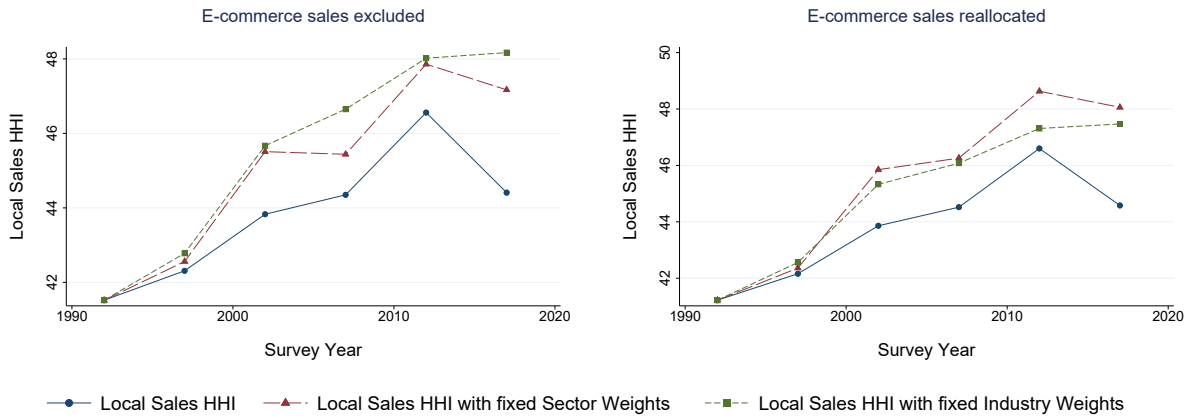

Notes: This figure plots the economy-wide national (left panel) and local (right panel) employment and sales HHIs from 1982–2017, including the following Census sectors: Manufacturing, Services, Retail Trade, and Wholesale Trade. The employment and sales HHIs are plotted on the left and right axis, respectively. With our scaling, the upper bound of the HHI is 100.

Figure A5: Local concentration: Alternative industry aggregations
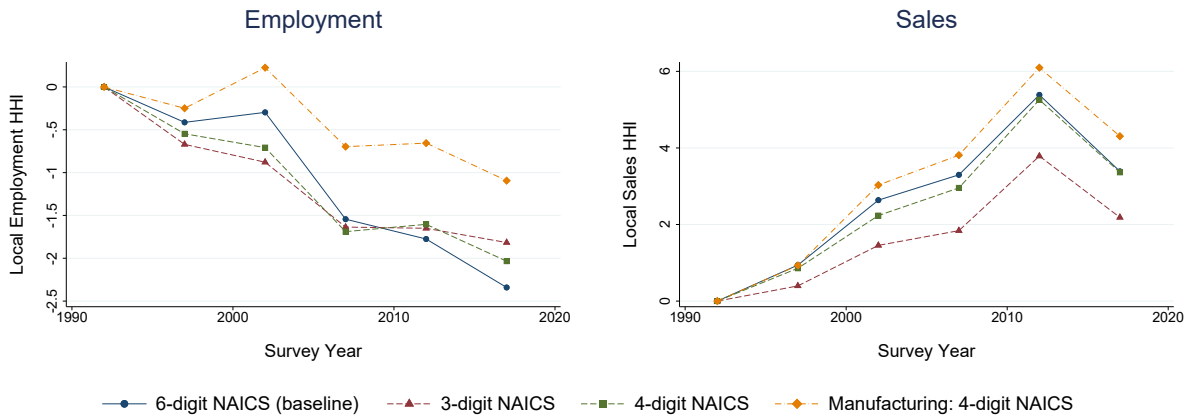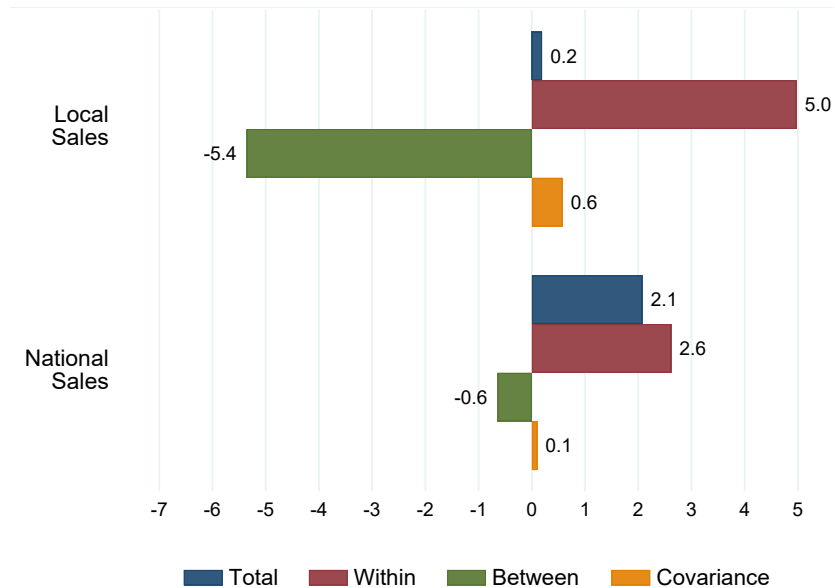

Notes: This figure plots the change in economy-wide local employment and sales HHIs relative to their 1992 levels for different levels of industry aggregation. Industries are respectively aggregated to three-digit, four-digit and six-digit NAICS codes in the blue, red and green time series; and industries within the Manufacturing Census sectors to four-digit and outside the manufacturing sector to six-digit NAICS codes in the yellow time series. Industries and counties are respectively weighted by their employment (left panel) and sales (right panel) share each year.

Figure A6: Local sales concentration: Different treatments of E-commerce sales

Notes: Figure plots the economy-wide local sales concentration by aggregating six-digit NAICS industry HHIs in each county across all sectors. Sectors and industries in each county are weighted by their sales shares in each year. In the left panel, e-commerce sales are excluded, and in the right panel, they are reallocated throughout the firm to each establishment according to that establishment's share of sales. Sector weights and industry weights are respectively held fixed at their 1992 levels in the series with red triangle markers and green square markers.

Figure A7: Sales concentration shift-share decomposition, value-added sectoral aggregation

Notes: This figure shows the decomposition of the change in the economy-wide national and local sales HHIs from 1992–2017, where the decomposition is taken over the six Census sectors. Sectors are weighted using NIPA value-added shares, and industries within sectors are weighted using sales shares.