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A Tale of Two Samples: Unpacking Recent Trends in Industrial Concentration

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A Tale of Two Samples: Unpacking Recent Trends in Industrial Concentration

Robert Kulick and Andrew Card[†]

We use publicly available data from the U.S. Census Bureau’s quinquennial Economic Censuses to examine trends in industrial concentration in the U.S. economy from 2002 to 2017. We find that, contrary to the popular narrative, industrial concentration is not rising and actually declined from 2007 to 2017. A notable difference between our methodology and previous studies using Economic Census data is that we use all available six-digit NAICS industries to conduct a cross-sectional analysis of industrial concentration levels in each Economic Census year, while previous studies have excluded industries subject to redefinition over time. When attention is restricted to only “comparable industries,” we find, as with previous studies, that average concentration increased modestly from 2002 to 2017. We then show that restricting attention to comparable industries is problematic from a sample selection perspective as the sample of comparable industries exhibits substantially lower levels of concentration in 2002 than the set of industries later subject to redefinition in subsequent Economic Census years. The problematic nature of relying on the comparable industries sample to characterize economy-wide trends in concentration is confirmed by evidence that concentration levels in the comparable industries sample display significant mean reversion over time. Thus, finding a trend towards increasing concentration in this sample may, to a significant extent, reflect the role of transient economic shocks. Furthermore, to the extent changes in concentration are systematically related to competition and economic outcomes, we find that increases in concentration are correlated with increased output, increased employment, and higher wages. Case studies from the retail sector and the taxi industry provide examples of situations where increasing industrial concentration is the direct result of increasing market competition.

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I. INTRODUCTION

The narrative that the U.S. economy is plagued by systemic “over-concentration” has been building momentum in scholarly articles¹ and in the popular press,² and manifested most recently in the DOJ’s and FTC’s (collectively, the “Agencies”) notice requesting public comment on potential changes to the Merger Guidelines.³ The Agencies propose linking industrial concentration to enforcement in a variety of ways, including by making the identification of “a trend toward concentration in [an] industry” a lynchpin of the analysis of individual transactions, along with incorporating adjusted “concentration thresholds” as a trigger for heightened regulatory scrutiny.⁴

While economists generally agree that industrial concentration – that is, concentration measured across industries typically based on North American Classification System (“NAICS”) codes⁵ – is a poor proxy for market concentration – concentration calculated using market shares in properly specified markets defined by consumer substitution patterns⁶ – the Agencies’ focus on industrial concentration is understandable. As a practical

¹ See e.g., Lina M. Khan, *The End of Antitrust History Revisited*, 133 HARVARD LAW REVIEW 1655-1682, 1671 (2020) (“[S]tudies reveal high concentration now to be a systemic, rather than isolated, feature of our economy.”); Ufuk Akcigit & Sina T. Ates, *Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory*, 13(1) AMERICAN ECONOMIC JOURNAL: MACROECONOMICS (2021) 257-298, 258 [hereafter Akcigit & Ates (2021)] (“In particular, we first review a broad set of stylized facts documented in the literature. These facts are as follows: (1) Market concentration has increased[.]”); Lina M. Khan & Sandeep Vaheesan, *Market Power and Inequality: The Antitrust Counterrevolution and Its Discontents*, 11 HARVARD LAW & POLICY REVIEW 236-294, 294 (2017) (“Over the last year, politicians and policy elites have started to recognize the fact that current antitrust policy has failed, yielding high concentration and low competition across sectors.”).

² Joseph E. Stiglitz, *America Has a Monopoly Problem—and It’s Huge*, THE NATION (October 23, 2017), available at: <https://www.thenation.com/article/archive/america-has-a-monopoly-problem-and-its-huge/> (“There has been an increase in the market power and concentration of a few firms in industry after industry[.]”); David Dayen, *America’s Monopoly Problem Goes Way Beyond Tech Giants*, THE ATLANTIC (July 28, 2020), available at: <https://www.theatlantic.com/ideas/archive/2020/07/pandemic-making-monopolies-worse/614644/> (“The truth is that, even if Congress somehow decreed the breakup of all four tech giants, the U.S. would still have an astounding number of industries controlled by a tiny number of firms.”).

³ United States Department of Justice and Federal Trade Commission, “Request for Information on Merger Enforcement,” (January 18, 2022), available at: <https://www.regulations.gov/document/FTC-2022-0003-0001> [hereafter Merger RFI].

⁴ *Id.*

⁵ Since 1997, Economic Census data have been organized using the North American Industry Classification System (NAICS). The NAICS classifies economic activity in the United States using a hierarchical system of numerical codes, ranging from two to six digits. Businesses are grouped “according to similar[ities] in the processes used to produce goods or services” with distinctions between production processes narrowing as one progresses from two-digit codes (which define broad “sectors”) to six-digit codes (which define individual “industries”). See Executive Office of the President, Office of Management and Budget, “North American Industry Classification System, United States, 2017,” at 3, 15-18, available at: https://www.census.gov/naics/reference_files_tools/2017_NAICS_Manual.pdf; United States Census Bureau, “History of the 1997 Economic Census,” at 17, available at: <https://www2.census.gov/library/publications/economic-census/1997/misc/pol00-hec.pdf>.

⁶ Indeed, the NAICS Manual itself explicitly states that the NAICS “groups producing units, not products or services... which is required for market-oriented analysis.” *Id.* at 16; Directorate for Financial and Enterprise Affairs Competition Committee, “Market Concentration – Note by the United States,” Organisation for Economic Co-operation and Development (May 27, 2018), ¶5, available at: [https://one.oecd.org/document/DAF/COMP/WD\(2018\)59/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2018)59/en/pdf) (“The U.S. Census Bureau publishes data for broad ranges of economic activity at several levels of aggregation. At no level is the Census data capable of demonstrating increasing concentration of ‘relevant markets’ in the antitrust sense, i.e., ranges of economic activity in which competitive processes determine price

matter, industrial concentration metrics are commonly available to scholars and policymakers via data from the U.S. Census Bureau, while the data required to calculate concentration levels in relevant economic product and geographic markets is generally not. Further, while a high level of industrial concentration is neither a necessary nor a sufficient condition for excessive market concentration, it is possible that high levels of industrial concentration could, in some cases, indicate the existence of high levels of market concentration (and by consequence the potential for the exercise of monopoly power) in related economic markets.⁷

We use publicly available data from the U.S. Census Bureau's quinquennial Economic Censuses to examine trends in industrial concentration in the U.S. economy from 2002 to 2017. We find that, contrary to the popular narrative, industrial concentration is not rising and actually declined from 2007 to 2017. A notable difference between our methodology and previous studies using Economic Census data is that we use all available six-digit NAICS industries to conduct a cross-sectional analysis of industrial concentration levels in each Economic Census year, while previous studies have excluded industries subject to redefinition over time. When attention is restricted to only "comparable industries," we find, as with previous studies, that average concentration increased modestly from 2002 to 2017. We then show that restricting attention to comparable industries is problematic from a sample selection perspective as the sample of comparable industries exhibits substantially lower levels of concentration in 2002 than the set of industries later subject to redefinition in subsequent Economic Census years. The problematic nature of relying on the comparable industries sample to characterize economy-wide trends in concentration is confirmed by evidence that concentration levels in the comparable industries sample display significant mean reversion over time. Thus, finding a trend towards increasing concentration in this sample may, to a significant extent, reflect the role of transient economic shocks. Furthermore, to the extent changes in concentration are systematically related to competition and economic outcomes, we find that increases in concentration are correlated with increased output, increased employment, and higher wages. Case studies from the retail sector and the taxi industry provide examples of situations where increasing industrial concentration is the direct result of increasing market competition.

These findings give rise to three overarching conclusions:

- 1) Economic Census data do not support the contention that industrial concentration is rising on an economy-wide basis and should not be put forward as a basis for changes in antitrust enforcement.
- 2) For industries or subsets of industries where concentration is rising, increases in concentration may have no inherent economic significance or may even reflect increasing competition.
- 3) Given the highly ambiguous relationship between changes in concentration and competitive outcomes, the Agencies should be very cautious about basing enforcement decisions on industry-level concentration data.

and quality, and in which the impact of agreements, mergers, and unilateral conduct are evaluated in competition law.") (emphasis in original).

⁷ See Sam Peltzman, *Industrial Concentration under the Rule of Reason*, THE JOURNAL OF LAW & ECONOMICS 101-120, 110, fn. 17 (2014) ("[C]ensus industries are not defined in the same way as antitrust markets. It could be misleading to suggest otherwise by grafting antitrust categories onto census data, or vice versa. All that said, there has to be a correlation between antitrust markets and census industries, if even there is not a one-to-one correspondence; otherwise, analysis of census data would be uninteresting[.]").

Our methodology differs from oft-cited prior studies in several ways.⁸ First, using Economic Census data allows us to analyze trends in industrial concentration across the entire U.S. economy, as opposed to alternative data sources leveraged in other studies (such as Compustat, which is limited to publicly-traded firms).⁹

Second, as noted above, we analyze industrial concentration across all available industries in the Economic Census, as well as the subset of comparable industries. To our knowledge, no other studies using Economic Census data have examined trends in industrial concentration using the full sample of NAICS industries available in each Economic Census year.¹⁰ We note that many studies of industrial concentration limit their analyses to a set of comparable industries because they are primarily concerned with answering questions that require tracking changes in concentration within individual industries over time, as opposed to analyzing overall concentration levels across the economy. However, by doing so, they often overlook that the trends among subsets of industries are not necessarily representative of the economy as a whole. For example, Akcigit and Ates (2021) is amongst the most widely cited academic papers for the proposition that industrial concentration has been rising on an economy-wide basis in recent decades.¹¹ Their analysis of trends in industrial concentration is in turn based on analysis conducted by Autor *et al.* (2017) which is based on a subset of Economic Census data limited to industries with “time-consistent industry definitions.”¹² Comparing trends in concentration across the full sample of industries and the subset of comparable industries allows us to assess the extent to which trends differ based on the choice of sample.

Third, since other highly-influential studies documenting increasing concentration, including the Council of Economic Advisors’ 2016 report, “Benefits of Competition and Indicators of Market Power,”¹³ have been critiqued for relying on overbroad concentration

⁸ For a summary of recent articles reporting increasing concentration in the U.S. economy, see Akcigit & Ates (2021).

⁹ See, e.g., Gustavo Grullion, Yelena Larkin & Roni Michaely, *Are U.S. Industries Becoming More Concentrated?*, Swiss Finance Institute Research Paper Series N. 19-41 (2018), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2612047; Falk Brauning, Jose L. Fillat & Gustavo Joaquim, *Cost-Price Relationships in Concentrated Economy*, Federal Reserve Bank of Boston, Current Policy Perspectives (May 23, 2022), available at: <https://www.bostonfed.org/publications/current-policy-perspectives/2022/cost-price-relationships-in-a-concentrated-economy.aspx>. In addition to being limited to publicly-traded firms, commentators have identified other factors that make Compustat data “poorly suited for studying industry concentration.” See Ryan Decker, “A note on industry concentration measurement,” Board of Governors of the Federal Reserve System Note (February 3, 2023), available at: <https://www.federalreserve.gov/econres/notes/feds-notes/a-note-on-industry-concentration-measurement-20230203.html>.

¹⁰ We are aware of only one study other than ours, by Robert Atkinson and Filipe Lage de Sousa of the Information Technology & Innovation Foundation, that has analyzed trends in industrial concentration using Economic Census data since the release of the 2017 Economic Census. Though Atkinson and de Sousa limit their analyses to comparable industries with adjustments made to include some redefined industries with a high degree of overlap with their initial definitions, the inclusion of data from the 2017 Economic Census yields smaller increases in industrial concentration than prior studies examining older Economic Census data. Specifically, Atkinson and de Sousa find that average CR₄ increased by just one percentage point from 2002 to 2017 in their sample. See Robert D. Atkinson & Filipe Lage de Sousa, *No, Monopoly Has Not Grown*, Information Technology & Innovation Foundation (June 2021), available at: <https://itif.org/publications/2021/06/07/no-monopoly-has-not-grown>.

¹¹ Akcigit & Ates (2021) at 261.

¹² David Autor, David Dorn, Lawrence F. Katz, Christina Patterson & John Van Reenen, *Concentrating on the Fall of the Labor Share*, 107(5) AMERICAN ECONOMIC REVIEW: PAPERS & PROCEEDINGS (2017) 180-185, 185.

¹³ Council of Economic Advisors, *Benefits of Competition and Indicators of Market Power*, (April 2016), available at: _____ at: _____

metrics or defining industries too broadly,¹⁴ we utilize the most granular concentration data provided in the Economic Censuses (measuring concentration using the the four-firm concentration ratio (CR₄) in industries defined at the six-digit NAICS code-level).

Fourth, we examine not only average trends in concentration which have been emphasized in previous economy-wide studies of industrial concentration,¹⁵ but provide detailed analyses of changes across the entire concentration distribution. Examining the full concentration distribution allows us to investigate whether aggregate trends in concentration are driven by distinct underlying trends among more concentrated versus less concentrated industries.

Overall, our results cast doubt on the claim that industrial concentration has risen to excessive and harmful levels in the United States, while simultaneously indicating that policymakers should exercise a great deal of caution when utilizing industrial concentration metrics to guide antitrust enforcement.

The remainder of this paper is organized as follows. In Section II, we describe the construction of our data from the 2002, 2007, 2012 and 2017 Economic Censuses and discuss the measures of industrial concentration on which we rely. In Section III, we examine trends in industrial concentration over time across the full sample of industries and contrast those results with trends in industrial concentration among the subset of comparable industries. In Section IV, we examine the comparable industries sample in greater detail, demonstrating that while concentration among comparable industries increased from 2002 to 2017, the data also exhibit a strong tendency toward mean reversion. We also show that the share of economic activity occurring in the most concentrated industries declined from 2002 to 2017. In Section V, we extend our analysis of the comparable industries sample, examining the relationship between industrial concentration and economic outcomes by correlating changes in concentration with three measures of economic performance – output, job creation, and employee compensation. Finally, we provide two case studies, focusing on the retail sector and the taxi service industry, illustrating the link between increasing industrial concentration and increased market competition. Section VI concludes.

II. DATA AND MEASUREMENT

Our data are drawn from the U.S. Census Bureau’s Economic Censuses. Compiled at five-year intervals from surveys of nearly four million business locations covering most industries,¹⁶ the Economic Census “serves as the most extensive collection of data related to business activity” in the U.S. economy.¹⁷

https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160414_cea_competition_issue_brief.pdf.

¹⁴ Carl Shapiro, *Antitrust in a Time of Populism*, 16 INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION 714-748, 722-723 (2018) [hereafter Shapiro (2018)] (“My objections to the CEA Table 1 are fundamental: (a) the fifty-firm concentration ratio (CR₅₀) reported in Table 1 *is not informative regarding the state of competition*. Industrial organization economists generally believe that markets are normally quite competitive with far fewer than fifty firms, so we measure concentration using the Herfindahl Index (HHI) or perhaps the four-firm concentration ratio (CR₄.”) (emphasis in the original); *Id.*, 723 (“[T]he two-digit industry groupings in [CEA] Table 1 are *far too broad* to assess market power, so the trends observed may well reflect nothing more than the expansion of successful, efficient firms into related lines of business, to the benefit of consumers.”) (emphasis in the original).

¹⁵ See, e.g., *Too Much of a Good Thing*, THE ECONOMIST (March 26, 2016), available at: <https://www.economist.com/briefing/2016/03/26/too-much-of-a-good-thing>.

¹⁶ United States Census Bureau, “About the Economic Census,” available at: <https://www.census.gov/programs-surveys/economic-census/about.html>.

¹⁷ *Id.*

Comprehensive data from the 2002,¹⁸ 2007,¹⁹ 2012²⁰ and 2017²¹ Economic Censuses are available for download from the Census Bureau. From these files, we retained data at the six-digit NAICS industry level for concentration levels, industry sales (total receipts), employment, and payroll. Industry sales and payroll were converted to 2017 dollars using the U.S. GDP Implicit Price Deflator.²²

Our data includes the above variables of interest at the six-digit NAICS industry level for 15 out of 20 sectors of the U.S. economy. Of the five sectors not included in our data, two (“11 – Agriculture, Forestry, Fishing and Hunting,” and “92 – Public Administration”) are not covered as part of the Economic Census.²³ Concentration data for three other sectors (“21 – Mining, Quarrying, and Oil and Gas Extraction,” “23 – Construction,” and “55 – Management of Companies and Enterprises”) were not retained because data for these sectors are not available prior to the 2017 Economic Census.

To measure concentration, we rely on the four-firm concentration ratio (CR₄)—the share of economic activity accounted for by the four largest firms in a given industry.²⁴ While the Herfindahl-Hirschman Index (HHI) is generally preferred to the CR₄ by economists and is used by the DOJ and FTC in conducting merger reviews, HHI data are only available economy-wide beginning with the 2017 Economic Census. CR₄ data are available across industries for the entire 2002 to 2017 period.

The 2002 to 2017 time period is useful for analyzing trends in industrial concentration for several reasons. First, incorporating data from the 2017 Economic Census allows us to examine whether findings of rising industrial concentration reported in prior studies are reflected in the most recent data. Second, the period from 2002 to 2017 captures the rise of “Big Tech,” as now prominent companies like Facebook, Amazon, Twitter, Google, and Uber either did not yet exist or were in their incipency in 2002. Third, this time-period corresponds to an era alleged by some to be one of lax antitrust enforcement under the Bush and Obama Administrations.²⁵ Thus, to the extent antitrust policy during this period facilitated increased levels of industrial concentration, these effects will be captured in our analyses.

¹⁸ Data for the manufacturing sector including CR₄, HHI, and total receipts taken from “ECN_2002_US_31SR12_with_ann.csv”. Data on employment and payroll for the manufacturing sector taken from “EC0231SG102.dat”. Non-manufacturing data (including CR₄, receipts, employment, and payroll) downloaded separately by sector (“EC02XXSSSZ6.dat”).

¹⁹ Data for the manufacturing sector including CR₄, HHI, and total receipts taken from “ECN_2007_US_31SR12_with_ann.csv”. Data on employment and payroll for the manufacturing sector taken from “EC0731SG1.dat”. Non-manufacturing data (including CR₄, receipts, employment, and payroll) downloaded separately by sector (“EC07XXSSSZ6.dat”).

²⁰ Data for the manufacturing sector including CR₄, HHI, and total receipts taken from “EC1231SR2.dat”. Data on employment and payroll for the manufacturing sector taken from “EC1231SG1.dat”. Non-manufacturing data (including CR₄, receipts, employment, and payroll) downloaded separately by sector (“EC12XXSSSZ6.dat”).

²¹ CR₄, HHI, total receipts, employment, and payroll for all available sectors in the 2017 Economic Census are provided in a single file, “EC1700SIZECONCEN.dat”.

²² St. Louis Federal Reserve, “GDP Implicit Price Deflator in the United States,” available at: <https://fred.stlouisfed.org/series/USAGDPDEFSAISMEI>.

²³ United States Census Bureau, “Economic Census: NAICS Codes & Understanding Industry Classification Systems,” available at: <https://www.census.gov/programs-surveys/economic-census/guidance/understanding-naics.html>. (“There are twenty sectors included in the NAICS. All sectors, except for 11 and 92, are covered by the Economic Census.”)

²⁴ Of the CR-based measures of concentration available in the Economic Census, it is generally recognized by economists that only CR₄ is potentially useful from an antitrust perspective. *See e.g.*, Shapiro 2018 at 723.

²⁵ *See e.g.*, Daniel A. Crane, *Has the Obama Justice Department Reinvigorated Antitrust Enforcement?* 65 STANFORD LAW REVIEW (July 2012).

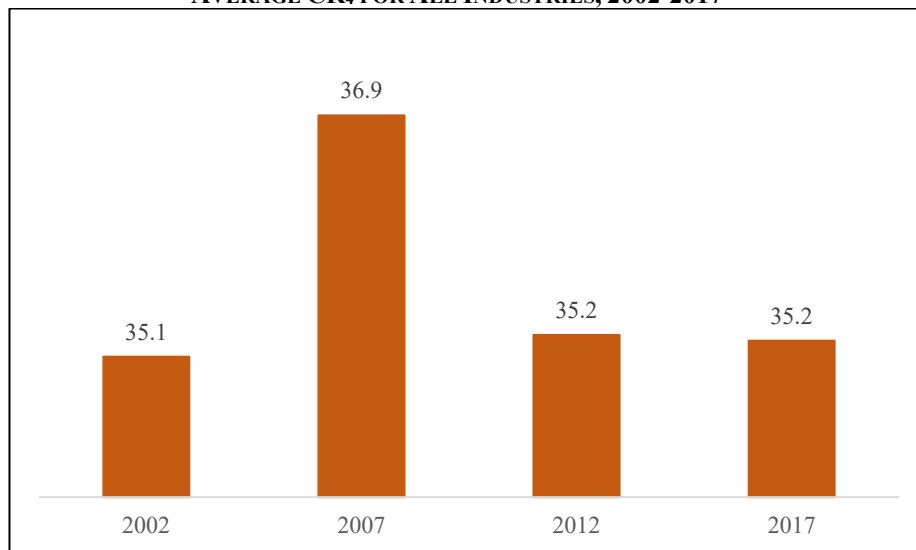
III. EXAMINING TRENDS IN INDUSTRIAL CONCENTRATION

We begin our analysis of trends in industrial concentration using the full sample of six-digit NAICS industries available in each Economic Census year for the NAICS sectors described in the previous section.²⁶ Contrary to the popular narrative, the data do not support the contention that concentration is increasing throughout the economy – instead, when all industries are considered, concentration has declined since peaking in 2007. As a result of this decline, industrial concentration levels in 2017 were essentially the same as in 2002. Further analysis indicates that the disconnect between our findings and previous studies that find evidence of increasing concentration stems from previous studies’ use of a selected sample of industries.

A. Trends in Concentration for All Industries, 2002-2017

We begin by examining trends in concentration across the full sample of six-digit NAICS industries. Figure 1 presents average CR₄ by Economic Census year from 2002 to 2017 for the full sample of NAICS industries.

FIGURE 1:
AVERAGE CR₄ FOR ALL INDUSTRIES, 2002-2017



As shown in Figure 1, the average level of industrial concentration in the U.S. economy has declined since reaching a peak in 2007. From 2007 to 2017, the average CR₄ fell by 1.7 points from 36.9 to 35.2. Due to this decline, the average level of CR₄ in the full sample of six-digit NAICS industries in 2017 was approximately the same as it was in 2002.

²⁶ To maintain comparability in terms of the economic sectors considered across years and with previous studies, the analyses presented in this section exclude the three NAICS sectors for which the Economic Census added coverage in 2017: Mining, Quarrying, and Gas Extraction, Construction, and Management of Companies and Enterprises. However, as these sectors are slightly less concentrated on average than the sectors included in the full sample, the results would not change if they were included.

Economic theory indicates that increases in concentration in unconcentrated markets do not typically represent meaningful changes in competitive conditions.²⁷ Thus, to the extent industrial concentration data are to be used to make inferences about competitive conditions, what is most relevant are the trends at the higher end of the concentration distribution. Therefore, Table 1 examines the distribution of CR₄ over time for the 10th to 90th percentiles of the concentration distribution.

**TABLE 1:
DISTRIBUTION OF CR₄ FOR ALL INDUSTRIES, 2002-2017**

Year	Industries	10th Pct	20th Pct	30th Pct	40th Pct	50th Pct	60th Pct	70th Pct	80th Pct	90th Pct
2002	991	7.5	13.9	20.3	24.6	30.9	38.7	45.8	55.0	67.6
2007	993	8.4	14.6	21.5	27.6	32.6	40.2	47.5	58.1	71.0
2012	885	9.1	14.5	20.1	25.8	31.1	37.8	44.6	55.0	67.8
2017	872	9.2	14.8	20.4	26.4	31.6	38.5	45.0	54.5	66.8
'07 v. '17		0.8	0.2	-1.1	-1.2	-1.0	-1.7	-2.5	-3.6	-4.2

As shown in Table 1, CR₄ declined for the 30th through 90th percentiles of the distribution, with the largest declines occurring among the most concentrated industries. For instance, from 2007 to 2017, the 90th percentile of the concentration distribution declined by 4.2 percentage points from 71.0 to 66.8, the 80th percentile declined by 3.6 percentage points from 58.1 to 54.5, the 70th percentile declined by 2.5 percentage points from 47.5 to 45.0, *etc.* Thus, examination of the full sample of industries in the Economic Census data demonstrates that industrial concentration did not increase from 2002 to 2017, that concentration declined from 2007 to 2017, and that concentration fell in all but two deciles of the concentration distribution, with the largest decreases occurring among the most concentrated industries.

B. Trends in Concentration for Comparable Industries, 2002-2017

The results from the previous section raise the question of why our findings differ from findings of increasing concentration reported in the previous literature. The main difference between our methodology and that used in previous studies using Economic Census data is that previous studies have excluded industries subject to redefinition.²⁸ Thus, in this section, we restrict attention to the sample of comparable industries and explore the reliability of this sample for making inferences about economy-wide trends in concentration.

Figure 2 shows average CR₄ by Economic Census year from 2002 and 2017 for the comparable industries sample.²⁹ As shown in Figure 2, CR₄ has been consistently

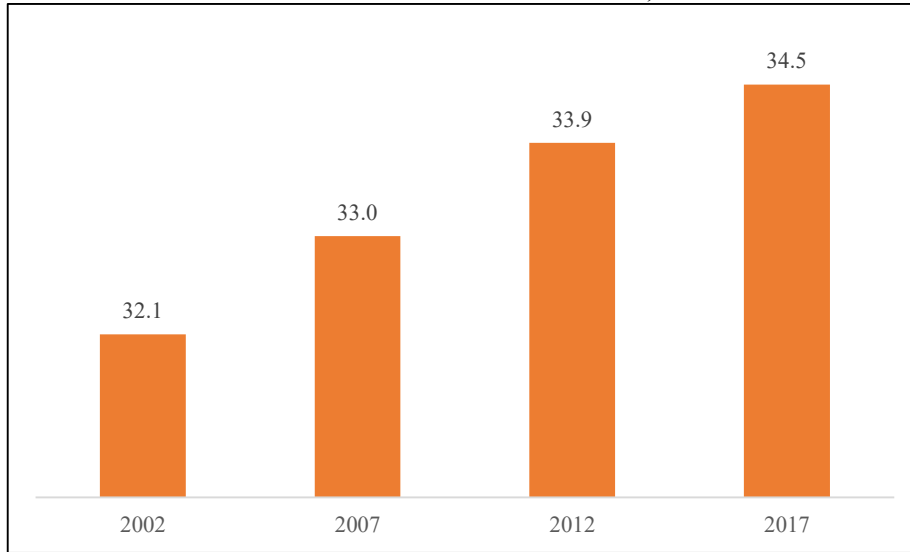
²⁷ United States Department of Justice and Federal Trade Commission, “Horizontal Merger Guidelines,” (August 19, 2010) at 18-19, available at: <https://www.justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf>.

²⁸ It is important to note that there are instances in which limiting attention to industries that are directly comparable over time is warranted. Analyses that focus on changes in concentration within industries, for example, may necessitate matching well-defined industries across successive Economic Censuses. However, as we show, the comparable industries sample is not a representative sample appropriate for drawing conclusions about economy-wide trends in concentration. Moreover, as discussed below, to the extent that NAICS-defined industries represent even a rough proxy for economic markets, markets that cannot be matched over time (such as new markets introduced between Censuses) should not inherently be excluded.

²⁹ We define the comparable industry sample based on two criteria: (1) the six-digit NAICS code can be traced directly across the 2002, 2007, 2012 and 2017 iterations of the Economic Census, unaffected by redistribution or consolidation. Thus, any six-digit NAICS industry that was redefined through the consolidation of (all or part) of existing NAICS codes, or any six-digit NAICS industry that was redistributed, in whole or in part, to other NAICS codes, was not included. NAICS codes that simply changed their six-digit designations, but could be traced directly across Economic Census

increasing across the subset of comparable industries, rising by 1.5 percentage points from 2007 to 2017 from 33.0 to 34.5 (in contrast to the decline of 1.7 percentage points across all industries over the same period) and rising by 2.4 percentage points from 2002 to 2017 from 32.1 to 34.5.

**FIGURE 2:
AVERAGE CR₄ FOR COMPARABLE INDUSTRIES, 2002-2017**



While Figure 2 indicates that concentration among comparable industries is increasing, it is also evident that initial concentration levels are, in general, lower for the subset of comparable industries than for the economy as a whole. Average CR₄ levels are lower among comparable industries than for the full sample in each year from 2002 to 2012, while reaching approximate convergence in 2017. Moreover, lower levels of initial concentration are evident throughout the concentration distribution in the comparable industries sample, with the average CR₄ level in each decile of the comparable industries distribution (Table 2) lower in 2002 than the CR₄ level in the corresponding decile for the full sample (Table 1).

**TABLE 2:
DISTRIBUTION OF CR₄ FOR COMPARABLE INDUSTRIES, 2002-2017**

Year	Industries	10th Pct	20th Pct	30th Pct	40th Pct	50th Pct	60th Pct	70th Pct	80th Pct	90th Pct
2002	751	6.4	11.1	17.8	23.0	27.7	34.8	41.9	51.0	63.8
2007	751	6.9	12.3	18.7	24.3	29.6	34.4	42.4	52.7	64.3
2012	751	8.3	13.9	19.3	24.8	29.9	36.8	43.5	53.2	65.3
2017	751	8.4	14.2	19.7	26.0	31.3	37.9	44.7	53.6	65.8
'07 v. '17		1.5	1.9	1.0	1.7	1.7	3.5	2.3	0.9	1.5

The contrast between declining concentration in the full sample and increasing concentration in the comparable industries sample indicates that restricting attention to the subset of comparable industries, thereby significantly reducing the number of industries considered, has a substantial impact on the apparent trend in concentration. Limiting the data to the subset of comparable industries reduces the total number of industries from 991 industries in 2002 (Table 1) to 751 industries (Table 2). The potential bias created by

iterations, were retained; (2) CR₄ data is available for the six-digit NAICS industry in each year from 2002 to 2017. While other papers adopt different methods for creating subsamples of comparable industries, a primary consequence of such adjustments is that a significant number of industries are excluded or rolled into other industries in the process.

dropping a significant portion of the sample is evident not only in the lower initial levels of concentration observed in the comparable industries sample, but also by contrasting the changes in concentration from 2007 to 2017 across the concentration distribution. While concentration declined for the 30th through 90th percentiles of the distribution between 2007 and 2017 in the full sample, in the comparable industries sample, concentration increased in each decile over the same period.

Researchers have likely chosen to focus on the comparable industries sample (or variations on the comparable industries sample) in assessing economy-wide trends in concentration because NAICS industry definitions are revised in every Economic Census year, and, as a result, the total number of industries decreased from 2002 to 2017.³⁰ While restricting attention to comparable industries may seem reasonable at first blush, the problem introduced by this approach is evident in comparing concentration levels in 2002, the initial year of the sample, for both samples. As shown in Figure 2, the comparable industries sample had an average CR₄ of 32.1 in 2002. In contrast, the remainder of the sample, *i.e.*, the subset of industries that would go on to be redefined, had an average CR₄ of 44.5 in 2002. Thus, because the excluded industries manifest substantially higher levels of initial concentration, it cannot be assumed that the experience of the comparable industries is representative of the experience of the remaining industries, in the absence of redefinition. Indeed, the problematic nature of relying on the comparable industries sample to characterize economy-wide trends is confirmed by evidence presented in the next section that concentration trends in the comparable industries sample display significant mean reversion.

This finding raises the question, to what extent should the full sample results be relied upon as indicative of economic trends in industrial concentration? If the purpose is to understand industrial concentration as a phenomenon in its own right using the most up to date industry definitions, then using the full sample is clearly preferable. However, if the question is, should the full sample be used to draw inferences about trends in market power, the fact that both samples have limitations represents another reason to be wary of using industrial concentration data to guide antitrust enforcement. However, if one believes that NAICS industry definitions are, at least to some extent, a proxy for economic markets, then there is little basis for excluding a significant part of the sample, particularly when the alternative means introducing sample selection bias.

IV. UNPACKING TRENDS IN CONCENTRATION IN THE COMPARABLE INDUSTRIES SAMPLE

The analysis in Section III demonstrates that economy-wide industrial concentration is not rising and has actually declined since 2007. However, the data also indicate that industrial concentration increased modestly in the comparable industries sample. Given that subsets of comparable industries have been the focus of previous research, we examine the comparable industries sample in greater detail below.

A. Evidence of Mean Reversion

Further examination of the comparable industries data indicates that the comparable industries sample exhibits evidence of mean reversion, such that more concentrated industries tend to become less concentrated over time, while less concentrated industries tend to become more concentrated. This evidence of mean reversion (coupled with the

³⁰ U.S. Census Bureau, “Comparing Historical Economic Census Data,” available at: https://www.census.gov/programs-surveys/economic-census/guidance/historicaldata.html?cq_ck=1474317700046#par_textimage_8. (“Industry revisions are a regular feature of NAICS, occurring every 5 years.”).

lower levels of initial concentration in the comparable industries sample) gives important context to the interpretation of trends in concentration in this sample.

As noted above, the average CR₄ increased by 1.5 percentage points between 2007 and 2017 among comparable industries. To assess whether this moderate increase represents a structural shift in the economy toward increasing concentration or a more transitory phenomenon, we examine the extent to which an industry's initial level of concentration predicts future changes in concentration.

Specifically, in Figure 3, each comparable industry that maintained a consistent definition across Economic Census years from 2002 to 2017 is grouped according to its 2002 level of CR₄ in increments of ten (*i.e.*, 100-90, 90-80, 80-70, *etc.*). For each group, Figure 3 then presents the difference between that group's average level of concentration in 2002 versus 2017.

**FIGURE 3:
CHANGE IN AVERAGE CR₄ BY 2002 CR₄ LEVEL,
COMPARABLE INDUSTRIES, 2002 V. 2017**

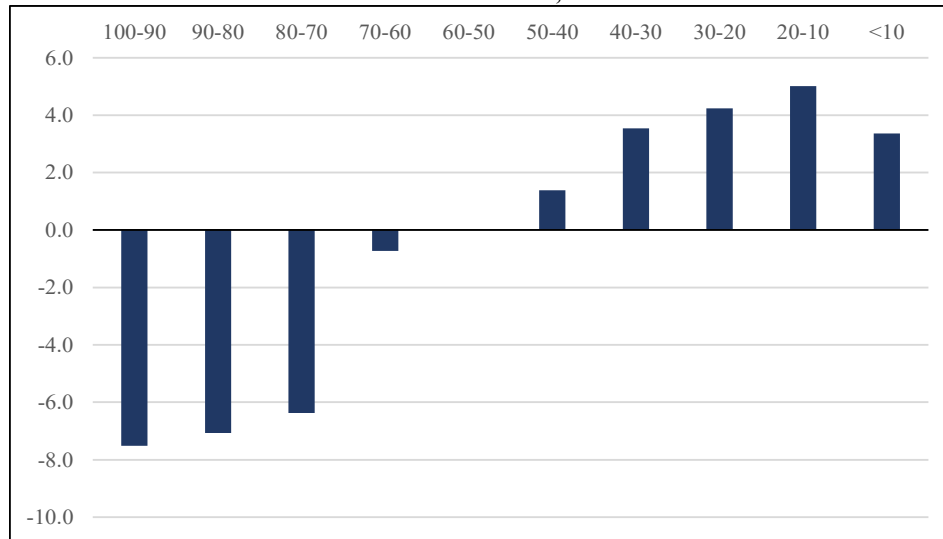


Figure 3 shows that the direction and magnitude of changes in concentration depend strongly on initial levels of concentration. The data demonstrate a distinct tendency towards mean reversion—industries at the higher end of the concentration distribution tend to become less concentrated over time while industries at the lower end of the concentration distribution tend to become more concentrated. For instance, industries with a CR₄ of 90 percent or more in 2002 had an average CR₄ of 92.7 percent; by 2017, those same industries had an average CR₄ of 85.1 percent (a decrease of 7.6 percentage points). In contrast, at the lower end of the distribution, industries with a CR₄ between 10 and 20 percent in 2002 had an average CR₄ of 14.9 percent; by 2017, those same industries had an average CR₄ of 19.9 percent (an increase of 5.0 percentage points).

Figure 3 suggests that trends in concentration are influenced by transient economic shocks that dissipate in future periods. That is, trends in industrial concentration do not necessarily reflect structural changes in the economy but may instead result from transitory fluctuations in economic activity without broader economic significance.

B. Trends in Economic Activity by Level of Concentration

Having established that more concentrated industries tend to become less concentrated over time, it could still be the case that while more concentrated industries are becoming less concentrated, a greater share of economic activity is accruing to industries at the higher end of the concentration distribution. Thus, to investigate this possibility, Table 3 groups industries by CR₄ and by year and calculates the share of economic activity accounted for by those industries.

**TABLE 3:
SHARE OF ECONOMIC ACTIVITY BY CR₄ AND ECONOMIC CENSUS YEAR,
COMPARABLE INDUSTRIES, 2002-2017**

Year	100-90	90-80	80-70	70-60	60-50	50-40	40-30	30-20	20-10	<10
2002	1.4	0.7	2.2	5.2	5.0	10.8	16.3	24.1	14.9	19.4
2007	0.1	1.8	1.6	3.5	7.6	10.4	24.1	17.8	15.9	17.1
2012	0.5	1.4	2.4	4.5	3.6	14.0	23.2	18.1	17.3	15.0
2017	0.5	1.4	2.8	3.2	7.6	10.7	22.2	18.2	15.3	18.3
'02 v. '17	-0.9	0.7	0.6	-2.0	2.6	-0.2	5.9	-5.9	0.4	-1.1

Table 3 shows that for industries at the high end of the concentration distribution, economic activity shifted from more concentrated to less concentrated industries. In particular, there was a net shift away from industries with a CR₄ of 90 percent or more towards industries with a CR₄ between 70 and 80 percent or between 80 and 90 percent. Overall, the share of economic activity accounted for by industries with a CR₄ of 90 percent or more decreased by over 65 percent from 2002 to 2017. Similarly, there was also an overall shift in economic activity away from industries with a CR₄ between 60 and 70 percent to industries with a CR₄ of 60 percent or less. Thus, for the most concentrated industries, economic activity shifted from more concentrated to less concentrated industries.

This evidence of mean reversion, in tandem with the lower levels of initial concentration observed in the comparable industries sample, indicate that the modest increase in concentration among comparable industries between 2002 and 2017 may have little broader economic significance even for the subset of industries being considered. Moreover, the evidence also indicates that rather than accounting for an increasing share of activity in the economy, more highly concentrated industries are seeing economic activity shift toward less highly concentrated industries. Therefore, scholars and policymakers should be skeptical when interpreting increases in industrial concentration in a given industry or subset of industries as evidence of increasing market power.

V. INDUSTRIAL CONCENTRATION AND ECONOMIC OUTCOMES IN THE COMPARABLE INDUSTRIES SAMPLE

Proponents of the “over-concentration” narrative often link high and/or increasing concentration to economic problems including declining competitiveness of markets, decreasing business dynamism, and stagnating wages.³¹ In this section, we utilize the

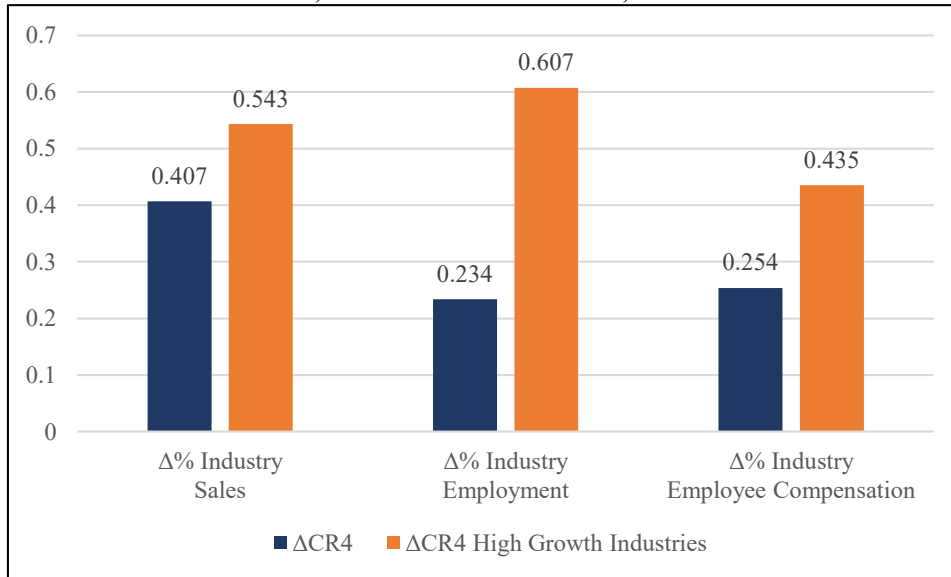
³¹ See, e.g., William A. Galtson & Clara Hendrickson, “A policy at peace with itself: Antitrust remedies for our concentrated, uncompetitive economy,” Brookings (January 5, 2018), available at: <https://www.brookings.edu/research/a-policy-at-peace-with-itself-antitrust-remedies-for-our-concentrated-uncompetitive-economy/>; ³¹ The White House, “Executive Order on Promoting Competition in the American Economy,” (July 19, 2021), §1, available at: <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/07/09/executive-order-on-promoting-competition-in-the-american-economy/>. (“We must act now to reverse these dangerous trends, which constrain the growth and dynamism of our economy, impair the creation of high-quality jobs, and threaten America’s standing in the world... Consolidation has increased the power of corporate employers, making it harder for workers to bargain for higher wages and better work conditions.”).

Economic Census data to investigate the relationship between changes in industrial concentration and economic welfare. In particular, we demonstrate that changes in concentration are positively correlated with three measures of economic performance – industry sales, industry employment, and employee compensation. In addition, we provide two case studies of specific areas of the economy where increasing concentration is clearly associated with increasing, not decreasing, market competition. While the sample selection and mean reversion effects discussed above indicate that observed fluctuations in concentration may often have no particular economic significance, to the extent that there is a systematic relationship in aggregate, increasing industrial concentration is associated with positive economic outcomes.

A. Relationship Between Concentration and Economic Outcomes

Below, we examine the relationship between changes in industrial concentration and changes in three measures of economic performance: industry sales (output), industry employment, and industry employee compensation. Specifically, Figure 4 assesses whether there is a correlation between within-industry changes in CR₄ from 2002 to 2017 and the percentage growth in industry sales, industry employment, and industry employee compensation (measured as payroll per employee).

FIGURE 4:
CORRELATIONS BETWEEN CHANGE IN CR₄ AND PERCENTAGE CHANGE IN ECONOMIC OUTCOME, COMPARABLE INDUSTRIES, 2002 V. 2017



Notes: The percentage change in industry sales correlations are weighted by 2017 industry sales. The percentage change in industry employment and employee compensation correlations are weighted by 2017 industry employment.

Figure 4 presents the correlations between within-industry changes in CR₄ and each economic outcome, both on an economy-wide basis, and for “high growth industries” – industries whose growth rate is in the 90th percentile or higher for the economic outcome of interest. There is an economically significant positive correlation between changes in CR₄ and each outcome, and these relationships become even stronger for the fastest

growing industries.³² Thus, increasing industrial concentration is associated with output growth, job creation, and higher compensation for employees.³³

Of course, these relationships do not imply a direct causal relationship between rising industrial concentration and beneficial economic outcomes. However, they do indicate that rising industrial concentration is often associated with, or a byproduct of, the underlying economic processes that drive economic growth.

B. Case Study: The Retail Sector

The retail sector is a prominent segment of the economy that exhibited increasing concentration from 2002 to 2017. Rather than pointing to a decline in competition in retail markets, the evidence indicates that the observed increases in concentration are associated with increasing competition among retailers and improved economic welfare.

The retail sector includes those six-digit NAICS industries beginning with “44” or “45,” comprised of “establishments engaged in selling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.”³⁴ Table 4 compares trends in average and median retail concentration to trends in the rest of the economy.

TABLE 4:
RETAIL CR₄ V. NON-RETAIL CR₄ BY ECONOMIC
CENSUS YEAR, 2002-2017

Year	Retail Average	Non-Retail Average	Retail Median	Non-Retail Median
2002	30.9	35.4	23.4	31.9
2007	34.7	37.1	30.9	33.1
2012	34.8	35.3	31.1	31.1
2017	35.5	35.2	31.4	31.7
'02 v. '17	4.6	-0.2	8.1	-0.3
'07 v. '17	0.7	-1.9	0.5	-1.5

As shown in Table 4, while average concentration rose by 4.6 percentage points among retail industries between 2002 and 2017 (and the median concentration level increased by 8.1 percentage points), the average and median CR₄ levels among retailers were 4.5 percentage points and 8.5 percentage points below the levels prevailing in the rest of the economy in 2002. By 2017, average and median retail concentration had risen to be approximately equal to concentration in the rest of the economy. Thus, there is no evidence of “over-concentration” in the retail sector compared to the rest of the economy. Indeed,

³² Other studies have examined correlations between changes in concentration metrics and economic outcomes, also finding that increasing concentration is correlated with measures of economic growth. See e.g., Sam Peltzman, *Productivity and Prices in Manufacturing During an Era of Rising Concentration*, (April 15, 2018) at 1, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3168877. (“[T]he consistent pattern is that high and rising concentration has been on average associated with better productivity growth. Rising concentration has also been on average associated with widening margins of price over input costs. On balance, the net price effects are trivial.”).

³³ By looking at within-industry correlations between industrial concentration and the percentage change in industry sales, we abstract from changes in aggregate price levels and thus can infer that the results are driven by rising output. The fact that industrial concentration is generally correlated with higher sales and higher employment also indicates that the results are driven by increases in output.

³⁴ U.S. Census Bureau, “Sector 44-45—Retail Trade,” available at: <https://www.census.gov/naics/?input=44&year=2017&details=44>.

due to the lower initial levels of concentration associated with the retail sector, the overall trend in retail may simply reflect a tendency towards mean reversion.

Moreover, examination of the data indicates that in many retail industries, rising concentration is a sign of increasing market competition. Large increases in concentration are particularly prevalent in retail industries selling specialized consumer goods – that is, retailers specializing in specific sets of related consumer products like hardware stores and furniture stores. Table 5 examines changes in concentration for the ten specialized retail industries that experienced the largest increases in CR₄ from 2002 to 2017.

**TABLE 5:
TRENDS IN CR₄ FOR TOP TEN SPECIALIZED CONSUMER GOODS
RETAIL INDUSTRIES, 2002-2017**

NAICS Industry	2002	2007	2012	2017	ΔCR ₄
Luggage and Leather Goods Stores	49.8	61.1	75.0	81.5	31.7
Sporting Goods Stores	18.1	29.3	32.6	42.9	24.8
Automotive Parts and Accessories Stores	30.7	34.8	45.1	48.9	18.2
Hardware Stores	13.4	19.5	25.9	31.4	18.0
All Other Home Furnishings Stores	39.1	48.8	59.8	56.8	17.7
Pharmacies and Drug Stores	52.8	63.0	69.5	69.4	16.6
Nursery, Garden Center, and Farm Supply Stores	12.1	14.5	21.6	27.8	15.7
Optical Goods Stores	44.1	50.8	57.2	58.6	14.5
Furniture Stores	8.1	13.7	17.3	21.5	13.4
Men's Clothing Stores	27.6	33.0	42.4	40.7	13.1

What all of these industries have in common is that the markets in which they compete have been disrupted by the rise of e-commerce platforms like Amazon and “big box” retailers like Walmart and Target. While industrial concentration has risen significantly in these industries, economic research has shown that competition increased dramatically in the markets served by these industries.³⁵ This increase in market competition has created large benefits for consumers while simultaneously causing industrial concentration to increase.

C. Case Study: The Taxi Service Industry

The Taxi Service industry provides another salient example demonstrating the potential for a strong relationship between rising industrial concentration, increasing market competition and increasing economic welfare. Table 6 presents trends in CR₄ and industry sales for the six-digit NAICS Taxi Service industry.

**TABLE 6:
TRENDS IN CR₄ AND INDUSTRY SALES FOR THE TAXI SERVICE
INDUSTRY, 2002-2017**

	2002	2007	2012	2017	ΔCR ₄ /ΔIndustry Sales
CR ₄	17.6	10.6	11.8	77.2	59.6
Industry Sales (Billions)	\$2.1	\$2.1	\$2.7	\$10.5	\$8.40

As shown in Table 6, industrial concentration exploded in the Taxi Service industry from 2002 to 2017, increasing by 59.6 percentage points, while output increased by over 650 percent.

³⁵ See e.g., Maris Goldmanis et al., *E-Commerce and the Market Structure of Retail Industries*, 120 THE ECONOMIC JOURNAL 651-682 (2010); Ali Hortacsu & Chad Syverson, *The Ongoing Evolution of U.S. Retail: A Format of Tug-of-War*, 29(4) JOURNAL OF ECONOMIC PERSPECTIVES 89-112 (2015).

The large increase in concentration observed in Table 6 occurs between 2012 and 2017, corresponding to the emergence of a new disruptive technology: ride-hailing platforms. Uber's "UberX" service debuted in July 2012,³⁶ and Uber's main competitor, Lyft, entered the market in August 2012.³⁷ Economic research has shown that the emergence of ride-hailing services increased competition by unraveling local taxi monopolies³⁸ and increased consumer surplus.³⁹ Thus, far from signaling a decline in competition, the large increase in industrial concentration in the Taxi Service industry was the direct result of new entry into the market.

In addition to the evidence presented in Section IV that increases in industrial concentration, where observed, may be transitory and subject to mean reversion, the evidence in this section further demonstrates that scholars and regulators should be wary of interpreting increases in industrial concentration as being indicative of harmful "over-concentration." To the contrary, our analyses indicate that increasing industrial concentration can be associated with beneficial economic outcomes and increases in welfare.

VI. SUMMARY AND CONCLUSIONS

This study demonstrates that debate surrounding the existence and magnitude of the U.S. economy's "over-concentration" problem is best told as a tale of two samples. Contrary to the popular "over-concentration" narrative, economy-wide industrial concentration has declined, not increased, when a comprehensive analysis of all available industry-level data is undertaken. To the extent that our study and other studies have found evidence of increasing concentration, these increases are found in subsets of the data that are not representative of economy-wide trends in concentration. We also show that among the subset of comparable industries where industrial concentration is increasing, there is a strong tendency toward mean reversion, indicating that increases in concentration, where observed, may be transitory phenomena rather than evidence of economically meaningful shifts toward higher concentration. Furthermore, to the extent that there is a systematic relationship between industrial concentration and economic outcomes in the comparable industries sample, we find that increasing industrial concentration is positively correlated with output growth, employment, and employee compensation, indicating that rising industrial concentration can be a direct response to increased market competition. This conclusion is bolstered by two industry-specific case studies demonstrating a direct connection between increasing market competition and increasing industrial concentration.

³⁶ Avery Hartmans & Paige Leskin, *The History of How Uber Went from the Most Feared Startup in the World to its Massive IPO*, BUSINESS INSIDER (May 18, 2019), available at: <https://www.businessinsider.com/ubers-history>. ("July 2012: Uber unveils its secret, low-cost 'UberX' project to the world. The service debuts at 35% less expensive than the original black cars, and features cars like the Prius and the Cadillac Escalade.")

³⁷ *Id.* ("August 2012: Lyft, which is considered Uber's main competitor, launches in San Francisco.")

³⁸ Judd Cramer & Alan B. Krueger, *Disruptive Change in the Taxi Business: The Case of Uber*, 106(5) AMERICAN ECONOMIC REVIEW: PAPERS & PROCEEDINGS 177-182, 177 (2016) ("The innovation of ride sharing services, such as Uber and Lyft, which use Internet-based mobile technology to match passengers and drivers, is providing unprecedented competition in the taxi industry.")

³⁹ See e.g., Peter Cohen, Robert Hahn, Jonathan Hall, Steven Levitt & Robert Metcalfe, *Using Big Data to Estimate Consumer Surplus: The Case of Uber*, (August 30, 2016); Abel Brodeur & Kerry Nield, *An Empirical Analysis of Taxi, Lyft and Uber Rides: Evidence from Weather Shocks in NYC*, 152 JOURNAL OF ECONOMIC BEHAVIOR AND ORGANIZATION 1-16, 15 (2018).

Our findings are germane to policymakers, particularly in light of the Agencies' recent proposal to revise enforcement guidelines, which asks: "How should the guidelines analyze whether there is a 'trend toward concentration in the industry,' and what impact should such a trend have on the analysis of an individual transaction?"⁴⁰ The evidence indicates that trends in industrial concentration do not provide a reliable basis for making inferences about the competitive effects of a proposed merger. Due to the tendency of transitory concentration shocks to dissipate over time, trends in concentration may simply reflect temporary fluctuations which have no broader economic significance. And, as discussed above, rising industrial concentration may also be a function of increasing market competition.

This study should not be interpreted as supporting either a more relaxed or a more stringent antitrust policy. Indeed, one of the primary implications of our findings is that industrial concentration data do not provide a reliable basis for assessing optimal levels of antitrust enforcement. To the extent changes in antitrust policy are proposed, they should be based on rigorous economic analysis of competitive conditions and consumer welfare. However, our findings demonstrate that the Census data do not support the popular "over-concentration" narrative and that many of the assumptions that are currently steering public policy debates regarding antitrust and regulation lack empirical support.

⁴⁰ Merger RFI at 2.