



# **Industrial Concentration in the United States: 2002-2017**

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## **About the Authors and Acknowledgements**

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## I. Introduction

It has become widely accepted that the U.S. economy is plagued by rising and excessive industrial concentration.<sup>1</sup> In recent years, this view has become increasingly influential in policy discussions with both Democratic and Republican lawmakers raising concerns about industrial concentration and its economic implications.<sup>2</sup>

The focus on industrial concentration has intensified over the course of the last year as the Biden Administration has made “combat[ing] the excessive concentration of industry” the focal point of its approach to competition policy.<sup>3</sup> For instance, in July 2021, the Biden Administration released its “Executive Order on Promoting Competition in the American Economy” (Competition EO), which directed federal agencies and regulators to use antitrust enforcement to reduce industrial concentration and linked rising concentration to a host of ills, including higher prices,<sup>4</sup> sluggish growth<sup>5</sup> and stagnating wages.<sup>6</sup> More recently, in January 2022, the Department of Justice (DOJ) and Federal Trade Commission (FTC) jointly announced that the agencies would seek to “modernize” the Horizontal Merger Guidelines and issued a Request for Information on Merger

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<sup>1</sup> 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.”); 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.”).

<sup>2</sup> Jeanna Smialek, *Democrats Blast Corporate Profits as Inflation Surges*, THE NEW YORK TIMES (January 3, 2022) (available at <https://www.nytimes.com/2022/01/03/business/economy/inflation-democrats-corporations.html>); Martha C. White, *Momentum Is Building for Antitrust Reform. Here’s What That Means for Big Tech*, TIME (November 21, 2021) (available at <https://time.com/6116953/antitrust-reform-big-tech-congress-biden/>); Sally Hubbard, *Monopolies Are Killing the American Dream. We Must Keep Them in Check*, CNN (July 2, 2019) (available at <https://www.cnn.com/2019/07/01/perspectives/monopolies-candidates-antitrust/index.html>); Diane Bartz, *U.S. Senator Expresses Concern about Ag Tech Mergers*, REUTERS (August 17, 2016) (available at <https://mobile.reuters.com/article/amp/idUSKCN10S2DW>); Musadiq Bidar & Jack Turman, *Josh Hawley Proposes Ban to Curb Growth of Biggest U.S. Tech Companies*, CBS NEWS (April 13, 2021) (available at <https://www.cbsnews.com/news/josh-hawley-antitrust-legislation-mergers-acquisitions/>).

<sup>3</sup> 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/>) (hereafter “Competition EO”) (“This order affirms that it is the policy of my Administration to enforce the antitrust laws to combat the excessive concentration of industry, the abuses of market power, and the harmful effects of monopoly and monopsony[.]”).

<sup>4</sup> *Id.*

<sup>5</sup> *Id.* (“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.”).

<sup>6</sup> *Id.* (“Consolidation has increased the power of corporate employers, making it harder for workers to bargain for higher wages and better work conditions.”).

Enforcement<sup>7</sup> citing the proposition “that many industries across the economy are becoming more concentrated and less competitive” as the primary motivation.<sup>8</sup>

The notion that industrial concentration in the United States has reached excessive and harmful levels can be traced to three empirical studies discussed in detail below that use Economic Census data from the U.S. Census Bureau to analyze historical trends in industrial concentration. While these studies have been criticized by economists for focusing on industrial concentration – concentration within an industry as defined by the U.S. Census Bureau – rather than market concentration – concentration calculated using market shares in properly specified economic markets defined by consumer substitution patterns – the analyses nevertheless remain highly influential in policy circles. Thus, in this study, we set aside the (important) question of market definition and focus instead on investigating the underlying empirical foundations of the assertion that industrial concentration has risen to excessive levels in the U.S. economy.

The present concerns about industrial concentration in the United States are based on three empirical premises: (1) that industrial concentration is rising; (2) that industrial concentration is persistent – i.e., that concentrated industries tend to sustain existing levels of concentration or even become more concentrated; and (3) that industrial concentration is economically harmful. In this study, we use publicly available Economic Census data from 2002 to 2017 to investigate each of these premises.

Our methodological approach is designed to address several issues which have reduced the credibility of previous studies. First, we evaluate industrial concentration using the narrowest industry definitions available in the Economic Census data. Second, we use only the most reliable measures of industrial concentration available in the data. For the manufacturing sector, this is the Herfindahl-Hirschman Index (HHI), which is used by the DOJ and FTC in conducting merger reviews. For all other sectors, HHI is not available, and thus we use the four-firm concentration ratio (CR4), which represents the percentage of economic activity accounted for by the four largest firms within a given industry. Third, in characterizing overall trends in industrial concentration,

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<sup>7</sup> 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 “RFI”).

<sup>8</sup> United States Department of Justice, Office of Public Affairs, “Justice Department and Federal Trade Commission Seek to Strengthen Enforcement Against Illegal Mergers,” (January 18, 2022) (available at <https://www.justice.gov/opa/pr/justice-department-and-federal-trade-commission-seek-strengthen-enforcement-against-illegal>); Jonathan Kanter, “Modern Competition Challenges Require Modern Merger Guidelines,” United States Department of Justice, FTC Press Conference Announcing Call for Public Comment (January 18, 2022) at 2 (available at <https://www.justice.gov/opa/speech/assistant-attorney-general-jonathan-kanter-delivers-remarks-modernizing-merger-guidelines>) (“The Attorney General remarked earlier this month, ‘too many industries have become too consolidated over time.’ We need to understand why, and to think carefully about how our merger analysis tools can do better to prevent this problem from getting worse.”); United States Federal Trade Commission, “Remarks of Chair Lina M. Khan Regarding the Request for Information on Merger Enforcement,” Docket No. FTC-2022-0003 (January 18, 2022) at 1-2 (available at <https://www.ftc.gov/public-statements/2022/01/statement-chair-lina-m-khan-regarding-request-information-merger>) (“Evidence suggests that decades of mergers have been a key driver of consolidation across industries, with this latest merger wave threatening to concentrate or markets further yet.”).

we consider the entire universe of industries in the Economic Census data rather than selected samples of industries.

We also make five primary methodological contributions:

First, our analyses incorporate comprehensive data from the 2017 Economic Census, which were made public on a rolling basis from late 2018 to 2021,<sup>9</sup> and therefore not considered in many previous studies of trends in industrial concentration.

Second, we examine not only average trends in concentration which have been emphasized in previous economy-wide studies of industrial concentration, 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.

Third, we analyze whether trends in industrial concentration exhibit a tendency towards mean reversion. This analysis is particularly important as the DOJ and FTC consider whether to include analysis of trends in industrial concentration in the merger review process. To the extent such a tendency towards mean reversion exists, it implies that trends in industrial concentration may reflect transient economic shocks that dissipate over time rather than structural economic changes.

Fourth, several industry case studies demonstrate that rising industrial concentration may often be the direct result of increased market competition and entry by new firms.

Fifth, in evaluating the relationship between industrial concentration and economic growth, we consider both variables related to consumer welfare (output growth) and variables related to labor markets (job creation and employee compensation).

Our main findings are summarized as follows:

- There is no general trend towards increasing industrial concentration in the U.S. economy from 2002 to 2017.
  - In both the U.S. manufacturing sector and the broader U.S. economy, industrial concentration has been declining since 2007.
  - For manufacturing industries, average HHI fell from 821 in 2007 to 619 in 2017 – a decline of 203 points. As a result of this decline, the average HHI for manufacturing industries was 150 points below its 2002 level in 2017.
  - For the broader U.S. economy, average CR<sub>4</sub> fell from 36.9 percent in 2007 to 35.2 percent in 2017 – a decline of 1.7 percentage points. As a result of this decline, the average CR<sub>4</sub> for all industries was approximately equal to its 2002 level in 2017.

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<sup>9</sup> United States Census Bureau, “2017 Economic Census Planned Data Product Releases,” (available at <https://www.census.gov/programs-surveys/economic-census/about/release-schedules.html>).

- In both the U.S. manufacturing sector and the broader U.S. economy, the decreases in concentration were largest for the most concentrated industries. For instance, the 90<sup>th</sup> percentile of the HHI distribution for manufacturing industries fell from 1,904 in 2007 to 1,317 in 2017 – a decline of 586 points. Similarly, the 90<sup>th</sup> percentile of the CR<sub>4</sub> distribution for all industries fell from 71.0 percent in 2007 to 66.8 in 2017 – a decline of 4.2 percentage points.
- The evidence does not support the claim that high levels of industrial concentration have become a persistent structural feature of the U.S. economy.
  - Higher concentration industries tend to become less concentrated over time while lower concentration industries tend to become more concentrated.
  - Industrial concentration levels demonstrate a distinct tendency towards mean reversion suggesting that trends in concentration are influenced by transient economic shocks that dissipate in future periods.
  - The share of economic activity accounted for by the most concentrated industries declined from 2002 to 2017. For instance, the share of economic activity accounted for by the most concentrated industries, with a CR<sub>4</sub> of 90 percent or more, declined by more than 65 percent over this period.
- The evidence does not support the claim that rising industrial concentration is generally associated with poor economic outcomes.
  - Increases in industrial concentration are associated with output growth, job creation, and higher employee compensation.
  - Evidence from several case studies shows that rising industrial concentration can be a direct response to increasing market competition.

The remainder of this paper is organized as follows. In Section II, we briefly outline the organizational structure of the U.S. Census Bureau’s Economic Census data and discuss the metrics available in the data to measure industrial concentration. In Section III, we review the recent literature on trends in industrial concentration in the United States. In Section IV, we provide an overview of our methodology for analyzing trends in industrial concentration in the U.S. economy and describe the construction of our data from the 2002, 2007, 2012 and 2017 Economic Censuses. In Sections V, VI, and VII, we use the Economic Census data to investigate whether industrial concentration in the U.S. economy is: (1) increasing, (2) persistent, and (3) economically harmful. Section VIII concludes with a discussion of the implications of our findings for policymakers.

## II. Quantifying Trends in Industrial Concentration using Economic Census Data

### A. The Economic Census Data

The Economic Census is conducted at five-year intervals by the U.S. Census Bureau, and “serves as the most extensive collection of data related to business activity” in the U.S. economy.<sup>10</sup> The Economic Census represents a comprehensive snapshot of economic activity in the United States in each Economic Census year and is compiled from surveys of nearly four million business locations covering most industries.<sup>11</sup>

Since 1997, Economic Census data have been organized using the North American Industry Classification System (NAICS).<sup>12</sup> 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”<sup>13</sup> 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”).<sup>14</sup>

### B. Measuring Concentration

The Herfindahl-Hirschman Index (HHI) is the preferred measure of concentration among economists and is used by the DOJ and FTC in conducting merger reviews.<sup>15</sup> HHI is calculated by squaring the share of economic activity accounted for by each firm in an industry or market and summing across firms.<sup>16</sup> The result is a number between zero and 10,000, where 10,000 represents an industry or market monopolized by one firm. When applied to properly defined economic markets – which as discussed below are distinct from Census defined industries – the Horizontal Merger Guidelines classify markets with an HHI below 1,500 as “unconcentrated,” an HHI of 1,500 to 2,500 as “moderately concentrated,” and an HHI above 2,500 as “highly concentrated.”<sup>17</sup>

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<sup>10</sup> United States Census Bureau, “About the Economic Census,” (available at <https://www.census.gov/programs-surveys/economic-census/about.html>).

<sup>11</sup> *Id.*

<sup>12</sup> Executive Office of the President, Office of Management and Budget, “North American Industry Classification System, United States, 2017,” at 3 (available at [https://www.census.gov/naics/reference\\_files\\_tools/2017\\_NAICS\\_Manual.pdf](https://www.census.gov/naics/reference_files_tools/2017_NAICS_Manual.pdf)) (hereafter “NAICS Manual”); 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>).

<sup>13</sup> NAICS Manual at 15.

<sup>14</sup> *Id.* at 18.

<sup>15</sup> United States Department of Justice and Federal Trade Commission, “Horizontal Merger Guidelines,” (August 19, 2010) at 18 (available at <https://www.justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf>) (hereafter “Horizontal Merger Guidelines (2010)”).

<sup>16</sup> HHI as reported in Economic Census data is calculated “by summing the squares of the individual company percentages for the largest 50 companies or the universe, whichever is lower.” United States Census Bureau, “2002 Economic Census, Manufacturing Subject Series,” (May 2006) at 66, n. 3 (available at <https://www2.census.gov/library/publications/economic-census/2002/manufacturing-reports/subject-series/ec0231sr1.pdf>) (hereafter “Census Subject Series (2002)”).

<sup>17</sup> Horizontal Merger Guidelines (2010) at 18-19.



Concentration is also sometimes measured using four-firm, eight-firm, twenty-firm, or fifty-firm concentration ratios, typically denoted as “CR<sub>4</sub>,” “CR<sub>8</sub>,” “CR<sub>20</sub>” and “CR<sub>50</sub>,” respectively. CR<sub>4</sub>, for example, represents the percentage of economic activity accounted for by the four largest firms within a given industry or market; CR<sub>8</sub> represents the share of economic activity accounted for by the largest eight firms, etc.<sup>18</sup>

A notable limitation of measuring concentration using concentration ratios based on the shares of the top firms in an industry or market is that these measures do not account for differences in shares among the top firms. For instance, a market where the top four firms each have market shares of 20 percent, and a market where the top firm has a share of 77 percent and the three next largest firms have shares of one percent, both have a CR<sub>4</sub> of 80 percent. This limitation becomes even more problematic the greater the number of firms included in the concentration ratio. In contrast, HHI is preferred by economists because it recognizes that the former market is significantly less concentrated than the latter, as in the first case, the four top firms contribute  $20^2 + 20^2 + 20^2 + 20^2 = 1,600$  to HHI, while in the second case, the four top firms contribute  $77^2 + 1^2 + 1^2 + 1^2 = 5,932$  to HHI.

However, HHI is only available in the Economic Census data for manufacturing industries (six-digit NAICS industries beginning with “31,” “32” or “33”) prior to the 2017 Economic Census. Thus, studies seeking to evaluate trends in concentration across non-manufacturing as well as manufacturing industries using Economic Census data must rely on CR-based measures of concentration. Of the CR-based measures of concentration available in the Economic Census, it is generally recognized by economists that only CR<sub>4</sub> is potentially useful from an antitrust perspective.<sup>19</sup>

### **III. Recent Empirical Studies of Industrial Concentration in the United States**

#### **A. The Empirical Basis for Recent Concerns about Industrial Concentration**

The revival of concerns about industrial concentration in recent years can be traced back to three studies relying on Economic Census data: (1) an academic study published in 2014 by Sam Peltzman, a Professor of at the University of Chicago, examining trends in industrial concentration in the U.S. manufacturing sector;<sup>20</sup> (2) an economy-wide analysis conducted by *The Economist*

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<sup>18</sup> Census Subject Series (2002) at xi.

<sup>19</sup> See e.g., Carl Shapiro, *Antitrust in a Time of Populism*, 16 INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION 714-748, 723 (2018) (hereafter “Shapiro (2018)”).

<sup>20</sup> Sam Peltzman, *Industrial Concentration under the Rule of Reason*, THE JOURNAL OF LAW & ECONOMICS 101-120 (2014) (hereafter “Peltzman (2014)”).

published in March 2016;<sup>21</sup> and (3) an economy-wide analysis conducted by the Council of Economic Advisors (CEA) published in April 2016.<sup>22</sup>

Peltzman finds evidence of an upward trend in industrial concentration in the manufacturing sector for the periods from 1982 to 2002 and 1987 to 2007.<sup>23</sup> From 1982 to 2002, he finds that average concentration measured in terms of HHI increased by 180 points (from 747 to 926), with larger increases at the higher end of the concentration distribution. From 1987 to 2007, he finds that average concentration measured in terms of HHI increased by 236 points, again with larger increases at the higher end of the concentration distribution.

The March 2016 analysis by *The Economist* titled “Too Much of a Good Thing” examines trends in CR<sub>4</sub> in the U.S. economy from 1997 to 2012. Specifically, *The Economist* reports that of the 893 “industries”<sup>24</sup> they analyze, approximately two-thirds became more concentrated between 1997 and 2012 and that the revenue-weighted average share of the top four firms in each industry rose from 26 percent to 32 percent.<sup>25</sup>

The April 2016 report by the CEA titled “Benefits of Competition and Indicators of Market Power” reports a trend toward “increasing industry concentration,”<sup>26</sup> based on an analysis of changes in CR<sub>50</sub> across two-digit NAICS sectors from 1997 to 2012. Specifically, the CEA finds that CR<sub>50</sub> increased for 10 of the 13 two-digit NAICS sectors analyzed. The CEA interprets this result as supporting the conclusion that “competition appears to be declining in at least part of the economy.”<sup>27</sup>

## B. Critiques

A number of academic studies have argued that these analyses are of limited value from the perspective of evaluating competitive conditions in the U.S. economy.

As noted above, NAICS industries are defined by grouping firms which have similar production processes.<sup>28</sup> Competition policy, in contrast, is primarily concerned with identifying the set of products and locations over which competition between firms actually occurs, which in antitrust

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<sup>21</sup> *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>) (hereafter “The Economist (2016)”).

<sup>22</sup> Council of Economic Advisors, *Benefits of Competition and Indicators of Market Power*, (April 2016) (available at [https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160414\\_cea\\_competition\\_issue\\_brief.pdf](https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160414_cea_competition_issue_brief.pdf)) (hereafter “CEA (2016)”).

<sup>23</sup> Peltzman (2014), Tables 6 and 7.

<sup>24</sup> *The Economist* does not provide a detailed exposition of their methodology, nor does it provide any details about adjustments made to the underlying industry data. The number of industries they report analyzing is too large to represent only the set of “comparable industries” discussed below. It is also too small to represent the data available for all of the industries available in each Economic Census year analyzed.

<sup>25</sup> The Economist (2016) at 6. *The Economist* reports data from 1997 to 2007 where data for 2012 is unavailable.

<sup>26</sup> CEA (2016) at 4.

<sup>27</sup> *Id.*

<sup>28</sup> NAICS Manual at 3.

jurisprudence are referred to as “relevant markets.”<sup>29</sup> Relevant markets are, however, defined on the basis of demand-side substitution patterns, not on the basis of similarities in production processes.<sup>30</sup> Consequently, concentration metrics derived from Economic Census data are, in general, not reasonable proxies for calculating market concentration in properly defined economic markets.<sup>31</sup>

A few academic studies have sought to analyze overall trends in concentration in the U.S. economy by attempting to correct for the limitations of using economy-wide industry data to define markets. In general, these studies find that considering narrower markets (in terms of products or geography) or including competition from imports tends to result in evidence of flat or decreasing concentration.<sup>32</sup>

Furthermore, both the analyses by *The Economist* and the CEA base their conclusions on changes in concentration without considering concentration levels. A central tenet of antitrust economics is that increases in concentration in unconcentrated markets do not represent meaningful changes in competitive conditions, as the unconcentrated structure of the market implies that consumers have numerous alternatives from which to choose.<sup>33</sup> Thus, setting aside the difference between industries and markets, an increase in CR<sub>4</sub> from 26 percent to 32 percent as reported by *The Economist* raises scant concern from an antitrust perspective as it represents a small change in

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<sup>29</sup> Shapiro (2018) at 728 (“But, simply as a matter of measurement, the Economic Census data that are being used to measure trends in concentration do not allow one to measure concentration in relevant antitrust markets, i.e., for the products and locations over which competition actually occurs.”).

<sup>30</sup> Horizontal Merger Guidelines (2010) at 7 (“Market definition focuses solely on demand substitution factors, i.e., on customers’ ability and willingness to substitute away from one product to another in response to a price increase or a corresponding non-price change such as reduction in product quality or service.”). For a given product in a given location, the set of substitute products available in a geographic area that determine the competitive price represent a market. Dennis W. Carlton & Jeffrey M. Perloff, *MODERN INDUSTRIAL ORGANIZATION*, 4th ed. (Addison-Wesley, 2005) at 644.

<sup>31</sup> Indeed, the NAICS Manual itself explicitly states that the NAICS “groups producing units, not products or services... which is required for market-oriented analysis.” NAICS Manual 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 and quality, and in which the impact of agreements, mergers, and unilateral conduct are evaluated in competition law.”) (emphasis in original).

<sup>32</sup> See e.g., Esteban Rossi-Hansberg, Pierre-Daniel Sarte & Nicholas Trachter, *Diverging Trends in National and Local Concentration*, NBER Working Paper w25066 (September 2018) (available at <https://www.nber.org/papers/w25066>); Mary Amiti & Sebastian Heise, *U.S. Market Concentration and Import Competition*, Federal Reserve Bank of New York Staff Paper No. 968 (May 2021) (available at [https://www.newyorkfed.org/research/staff\\_reports/sr968](https://www.newyorkfed.org/research/staff_reports/sr968)); C. Lanier Benkard, Ali Yurukoglu & Anthony Lee Zhang, *Concentration in Product Markets*, NBER Working Paper 28745 (April 2021) (available at <https://www.nber.org/papers/w28745>); Dominic Smith & Sergio Ocampo, *The Evolution of U.S. Retail Concentration*, BLS Working Paper 526 (January 11, 2021) (available at <https://www.bls.gov/osmr/research-papers/2020/pdf/ec200080.pdf>).

<sup>33</sup> Horizontal Merger Guidelines (2010) at 18-19.

concentration in an unconcentrated market.<sup>34</sup> The changes in concentration reported by the CEA are also generally insignificant from an economic perspective. In eight of the 13 two-digit NAICS sectors analyzed by the CEA, the reported change in CR<sub>50</sub> between 1997 and 2012 was negative or showed an increase of less than five percentage points.<sup>35</sup> Moreover, in nine of the 13 two-digit NAICS sectors analyzed by the CEA, the CR<sub>50</sub> in 2012 was 30 percent or less.<sup>36</sup> The only sector which had a CR<sub>50</sub> above 50 percent was utilities, a sector already subject to high levels of state and federal regulation.

An even more serious problem with the CEA study has been identified by Carl Shapiro, former Deputy Assistant Attorney General at the Antitrust Division of the DOJ, who observes that because markets can be competitive with far fewer than fifty firms, changes in CR<sub>50</sub> are of little use for assessing changes in competitive conditions in the U.S. economy.<sup>37</sup> Similarly, he notes that two-digit NAICS sectors are “far too broad” for assessing trends in competition.<sup>38</sup> Thus, the combined use of CR<sub>50</sub> to measure concentration and two-digit NAICS sectors to define industries renders the CEA study unreliable for assessing trends in competitive conditions in the United States.<sup>39</sup>

To our knowledge, only one study other than ours, by Robert Atkinson and Filipe Lage de Sousa of the Information Technology & Innovation Foundation, has analyzed trends in industrial concentration using Economic Census data since the release of the 2017 Economic Census.<sup>40</sup> Atkinson and de Sousa reach similar conclusions regarding trends in industrial concentration to those presented in this study. For instance, they conclude that “Census data show U.S. industries have not become more concentrated”<sup>41</sup> and that “the more concentrated industries were in 2002, the more likely they were to become less concentrated by 2017.”<sup>42</sup> While there are important differences between our analyses and the analyses conducted by Atkinson and de Sousa, the

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<sup>34</sup> Shapiro (2018) at 729 (“What does the structure of a market with a CR<sub>4</sub> of 32% look like? As an illustration, think about a market with a CR<sub>4</sub> of 32% in which the top four firms have shares of 10%, 8%, 8% and 6%. There must be at least 11 more firms, since the largest any of these other firms can be is 6%, and they comprise 68% of the market. The HHI in this market is between 300 and 700. Industrial organization economists would generally describe this market as being unconcentrated. Since 1982, the Horizontal Merger Guidelines have considered markets with HHIs of less than 1000 to be unconcentrated.”).

<sup>35</sup> CEA (2016), Table 1.

<sup>36</sup> *Id.*

<sup>37</sup> Shapiro (2018) at 722-723 (“My objections to the CEA Table 1 are fundamental: (a) the fifty-firm concentration ratio (CR<sub>50</sub>) 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 (CR<sub>4</sub>.”) (emphasis in the original).

<sup>38</sup> *Id.* at 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).

<sup>39</sup> *Id.*; Gregory J. Werden & Luke M. Froeb, *Don’t Panic: A Guide to Claims of Increasing Concentration*, 33(1) ANTITRUST 74-79, 74 (2018) (“We agree with Carl Shapiro... that these [CEA] data are ‘not informative regarding the state of competition.’”).

<sup>40</sup> 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>) (hereafter “Atkinson & de Sousa (2021)”).

<sup>41</sup> *Id.* at 1.

<sup>42</sup> *Id.*

general agreement between our conclusions and theirs confirms the robustness of both studies' findings.

## IV. Methodology and Data

### A. Overview and Methodology

This study evaluates the empirical basis of the assertion that industrial concentration has risen to excessive and harmful levels in the United States using publicly available data from the 2002, 2007, 2012 and 2017 Economic Censuses. In particular, we investigate three questions: (1) do the data support the assertion that the U.S. economy has exhibited a general trend toward increasing concentration?; (2) do the data support the notion that industrial concentration is persistent?; and (3) are the data consistent with the proposition that increases in concentration, where observed, are indicative of harm to competition and the economy? We perform comprehensive analyses of trends in industrial concentration for the U.S. manufacturing sector using HHI (the only sector for which HHI data are consistently available) and for the broader U.S. economy using CR<sub>4</sub> – which, as discussed above, is the most reliable measure of concentration available for all Census industries. We also present case studies of trends in concentration in individual industries, focusing attention on sectors of the economy identified as warranting scrutiny in the Competition EO or of general policy interest.

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 nascent stages of growth 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.<sup>43</sup> Thus, to the extent antitrust policy during this period facilitated increased levels of industrial concentration, these effects will be captured in our analyses.

### B. Data Construction

Comprehensive data on concentration and other variables from the 2002,<sup>44</sup> 2007,<sup>45</sup> 2012<sup>46</sup> and

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<sup>43</sup> See e.g., Daniel A. Crane, *Has the Obama Justice Department Reinvigorated Antitrust Enforcement?* 65 STANFORD LAW REVIEW (July 2012).

<sup>44</sup> Data for the manufacturing sector including CR<sub>4</sub>, 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 CR<sub>4</sub>, receipts, employment, and payroll) downloaded separately by sector (“EC02XXSSSZ6.dat”).

<sup>45</sup> Data for the manufacturing sector including CR<sub>4</sub>, 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 CR<sub>4</sub>, receipts, employment, and payroll) downloaded separately by sector (“EC07XXSSSZ6.dat”).

<sup>46</sup> Data for the manufacturing sector including CR<sub>4</sub>, 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 CR<sub>4</sub>, receipts, employment, and payroll) downloaded separately by sector (“EC12XXSSSZ6.dat”).

2017<sup>47</sup> Economic Censuses are made available for download in electronic form by the Census Bureau. From these files, we retained data at the six-digit NAICS industry level for CR<sub>4</sub>, HHI (for manufacturing industries),<sup>48</sup> industry sales (total receipts), employment, and payroll. Industry sales and payroll were converted to 2017 dollars using the U.S. GDP Implicit Price Deflator.<sup>49</sup>

Our dataset includes data 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.<sup>50</sup> 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 only became available in the 2017 Economic Census, and thus there is not sufficient data for assessing changes in concentration over time in these sectors.

## V. Is Industrial Concentration Increasing?

### A. Trends in Concentration for Manufacturing Industries, 2002-2017

Our analysis of trends in industrial concentration begins with the U.S. manufacturing sector due to the availability of HHI data for these industries. Table 1 presents data on the distribution of HHI by Economic Census year from 2002 to 2017 for all six-digit NAICS manufacturing industries.

**TABLE 1:  
DISTRIBUTION OF HHI FOR MANUFACTURING  
INDUSTRIES, 2002-2017**

Year	Industries	Average	10th Pct	20th Pct	30th Pct	40th Pct	50th Pct	60th Pct	70th Pct	80th Pct	90th Pct
2002	443	769	139	232	319	458	614	739	946	1,218	1,704
2007	437	821	128	265	357	458	609	773	1,025	1,353	1,904
2012	355	800	126	235	328	441	555	709	919	1,273	1,724
2017	288	619	103	212	290	369	467	568	720	948	1,317
'02 v. '17		-150	-36	-21	-29	-89	-147	-171	-226	-271	-387
'07 v. '17		-203	-25	-53	-67	-89	-142	-205	-305	-405	-586

Sources: Economic Census data. Notes: Includes all available six-digit NAICS industries in the manufacturing sector (six-digit NAICS codes beginning with “31,” “32,” or “33”) with available HHI data.

As shown in Table 1, industrial concentration measured in terms of HHI has declined since reaching a peak in 2007. From 2007 to 2017, the average HHI for manufacturing industries fell by 203 points from 821 to 619. The 2017 average HHI of 619 represents a 150 point decline from the 2002 level of 769.

<sup>47</sup> CR<sub>4</sub>, HHI, total receipts, employment, and payroll for all available sectors in the 2017 Economic Census are provided in a single file, “EC1700SIZECONCEN.dat”.

<sup>48</sup> Prior to the 2017 Economic Census, HHIs were only provided for industries in the manufacturing sector.

<sup>49</sup> St. Louis Federal Reserve, “GDP Implicit Price Deflator in the United States,” (available at <https://fred.stlouisfed.org/series/USAGDPDEFSAISMEI>).

<sup>50</sup> 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.”).

As discussed above, increases in concentration in unconcentrated markets do not represent meaningful changes in competitive conditions. 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, in addition to assessing trends in average HHI, Table 1 also examines the distribution of HHI over time for the 10<sup>th</sup> to 90<sup>th</sup> percentiles of the concentration distribution. For example, Table 1 indicates that in 2002, 90 percent of industries had an HHI less than 1,704, 80 percent of industries had an HHI less than 1,218, and 70 percent of industries had an HHI less than 946, etc.

As shown in Table 1, while HHI is declining for all deciles of the distribution, the declines are largest for the most concentrated industries. For instance, from 2007 to 2017, the 90<sup>th</sup> percentile of the concentration distribution declined by 586 points from 1,904 to 1,317. Putting aside the distinction between industries and markets, this represents an economically significant decline in concentration as the Horizontal Merger Guidelines consider markets with an HHI between 1,500 and 2,500 to be “moderately concentrated” whereas markets below 1,500 are deemed “unconcentrated.”<sup>51</sup>

With each Economic Census, the NAICS is revised to provide the most accurate representation of economic activity in North America.<sup>52</sup> Although changes are typically minor, in 2012 many manufacturing industries were redefined and consolidated, leading to a decline in the total number of manufacturing industries as indicated in Table 1.<sup>53</sup> While some previous studies of trends in industrial concentration have limited attention to industries that maintained a consistent definition over time or have made other adjustments reducing the sample of industries considered,<sup>54</sup> such an approach is problematic for two reasons. First, to the extent the NAICS industry definitions represent useful proxies for economic markets, changes in the contours of competition should be reflected in assessing trends in concentration.

Second, exclusion of a significant amount of economic activity in assessing sector-wide and economy-wide concentration trends raises the possibility of sample selection bias. As shown in Appendix A, initial concentration levels are, in general, significantly lower for “comparable industries” – industries that maintained the same industry definition from 2002 to 2017 – than for the full sample of manufacturing industries and the universe of all industries. Due to the tendency of less concentrated industries to become more concentrated over time discussed in Section VI, considering only the less concentrated set of comparable industries will tend to bias the results towards finding a trend of increasing concentration.

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<sup>51</sup> Horizontal Merger Guidelines (2010) at 19.

<sup>52</sup> U.S. Census Bureau, “Comparing Historical Economic Census Data,” (available at [https://www.census.gov/programs-surveys/economic-census/guidance/historical-data.html?cq\\_ck=1474317700046#par\\_textimage\\_8](https://www.census.gov/programs-surveys/economic-census/guidance/historical-data.html?cq_ck=1474317700046#par_textimage_8)) (“Industry revisions are a regular feature of NAICS, occurring every 5 years.”).

<sup>53</sup> *Id.* (“The 2012 Economic Census introduces new NAICS categories for solar, wind, geothermal, and biomass electric power generation, but the most significant change is substantial consolidation of industries within the manufacturing sector[.]”).

<sup>54</sup> See e.g., Peltzman (2014) and Atkinson & de Sousa (2021). As discussed above, The Economist (2016) also appears to have limited its sample to achieve comparability but does not provide details on its methodology.

Thus, in examining trends in industrial concentration in this section, we have analyzed the full sample of manufacturing industries and, for the economy-wide results discussed below, the full universe of six-digit NAICS industries in the Economic Census data, to avoid making inferences about overall trends in concentration based on selected samples. In Section VI, which focuses on the persistence of industrial concentration, we turn from assessing trends for the entire statistical population to analyzing within-industry trends in industrial concentration. The analysis of persistence in Section VI therefore requires us to limit attention to comparable industries, unlike the analysis in this section, which focuses on characterizing overall trends in industrial concentration. However, as shown in Appendix A, limiting the analysis of manufacturing concentration in Table 1 to comparable industries demonstrates that the declining trend in industrial concentration for manufacturing industries cannot be attributed to the consolidation and redefinition of NAICS codes. Despite the lower levels of initial concentration, average HHI is also declining for the sample of comparable manufacturing industries, with the decline similarly being driven by falling concentration among the most concentrated industries.

## B. Economy-Wide Trends in Concentration, 2002-2017

Although HHI is not available on an economy-wide basis in the Economic Census data, CR<sub>4</sub> is available for all industries from 2002 to 2017 (except for those industries in the two-digit NAICS sectors noted in section IV.B, above, or in cases where individual industry concentration data was not reported). Table 2 presents data on the distribution of CR<sub>4</sub> by Economic Census year from 2002 to 2017 for all available six-digit NAICS industries.

**TABLE 2:  
DISTRIBUTION OF CR<sub>4</sub> FOR ALL  
INDUSTRIES, 2002-2017**

Year	Industries	Average	10th Pct	20th Pct	30th Pct	40th Pct	50th Pct	60th Pct	70th Pct	80th Pct	90th Pct
2002	991	35.1	7.5	13.9	20.3	24.6	30.9	38.7	45.8	55.0	67.6
2007	993	36.9	8.4	14.6	21.5	27.6	32.6	40.2	47.5	58.1	71.0
2012	885	35.2	9.1	14.5	20.1	25.8	31.1	37.8	44.6	55.0	67.8
2017	872	35.2	9.2	14.8	20.4	26.4	31.6	38.5	45.0	54.5	66.8
'02 v. '17		0.1	1.7	0.9	0.1	1.8	0.7	-0.2	-0.8	-0.5	-0.8
'07 v. '17		-1.7	0.8	0.2	-1.1	-1.2	-1.0	-1.7	-2.5	-3.6	-4.2

Sources: Economic Census data. Notes: Includes all available six-digit NAICS industries with available CR<sub>4</sub> data.

Despite the wider scope of industries and the reliance on CR<sub>4</sub> rather than HHI, a similar pattern is evident in the economy-wide industrial concentration data to that found in the manufacturing sector. As in the manufacturing sector, average economy-wide CR<sub>4</sub> peaked in 2007 at 36.9 percent and declined by 1.7 percentage points to 35.2 percent in 2017. Declines were largest for the most concentrated industries with the 70<sup>th</sup> percentile of the CR<sub>4</sub> distribution declining by 2.5 percentage points, the 80<sup>th</sup> percentile of the CR<sub>4</sub> distribution declining by 3.6 percentage points, and the 90<sup>th</sup> percentile of the CR<sub>4</sub> distribution declining by 4.2 percentage points from 2007 to 2017.

Due to the trend towards declining industrial concentration beginning in 2007, the average level of CR<sub>4</sub> in the U.S. economy in 2017 was approximately equal to the average level of CR<sub>4</sub> in 2002. Thus, there is no evidence that the growth of “Big Tech” or the antitrust policies of the Bush and Obama Administrations led to a general increase in industrial concentration in the U.S. economy.



### C. Case Studies: Information Technology, Alcoholic Beverage Manufacturing, and Consumer Banking and Credit

President Biden’s Competition EO cites several sectors of the economy as examples where concentration has allegedly become excessive, and competition has been weakened. Analysis of whether firms in an industry have engaged in anticompetitive conduct impairing competition to the detriment of consumers or whether competition in a market has decreased requires in-depth economic analysis beyond the scope of this paper. Nevertheless, given the Biden Administration’s focus on trends in industrial concentration, it is useful to consider whether industries in sectors of the economy highlighted in the Competition EO exhibit a uniform trend towards increasing concentration. Table 3 presents trends in CR<sub>4</sub> for eight six-digit NAICS industries associated with three industrial sectors identified as warranting increased scrutiny in the Competition EO: Information Technology,<sup>55</sup> Alcoholic Beverage Manufacturing,<sup>56</sup> and Consumer Banking and Credit.<sup>57</sup>

**TABLE 3:  
TRENDS IN CR<sub>4</sub> FOR SELECTED INFORMATION TECHNOLOGY, ALCOHOLIC BEVERAGE  
MANUFACTURING, AND CONSUMER BANKING AND CREDIT INDUSTRIES, 2002-2017**

Sector	NAICS Industry	2002	2007	2012	2017	ΔCR <sub>4</sub>
Information Technology	Software Publishers	39.5	38.9	41.4	32.4	-7.1
	Data Processing, Hosting, and Related Services	33.7	25.8	15.9	17.2	-16.5
Alcoholic Beverage Production	Breweries	90.8	89.5	87.8	68.6	-22.2
	Wineries	46.5	42.3	45.3	41.3	-5.2
	Distilleries	70.5	69.5	64.9	56.5	-14.0
Consumer Banking and Credit	Commercial Banking	29.5	31.8	25.6	24.6	-4.9
	Credit Card Issuing	75.8	79.2	77.6	56.2	-19.6
	Consumer Lending	59.6	61.2	52.3	50.7	-8.9

Sources: *Economic Census data.*

The Software Publishers industry and Data Processing, Hosting, and Related Services industry represent the two largest six-digit NAICS industries with data from 2002 to 2017 in the Information sector as defined by the Census Bureau (NAICS Sector 51). Both industries experienced declining concentration from 2002 to 2017, even as many “Big Tech” companies grew to maturity. Within Alcoholic Beverage Manufacturing, Breweries and Distilleries experienced relatively large declines in CR<sub>4</sub>. Wineries, the least concentrated industry among alcohol producing industries, also experienced the smallest decline. Finally, three of the primary six-digit NAICS industries related to Consumer Banking and Credit – Commercial Banking, Credit Card Issuing, and Consumer Lending –have experienced declining concentration since reaching a peak in 2007 and remained less concentrated in 2017 than they were in 2002. The decline in concentration was particularly significant for the Credit Card Issuing industry where CR<sub>4</sub> declined by 19.6 percentage points from 75.8 percent in 2002 to 56.2 percent in 2017.

<sup>55</sup> Competition EO, §1.

<sup>56</sup> *Id.*, §5(j).

<sup>57</sup> *Id.*, §1, 5(e), 5(t).

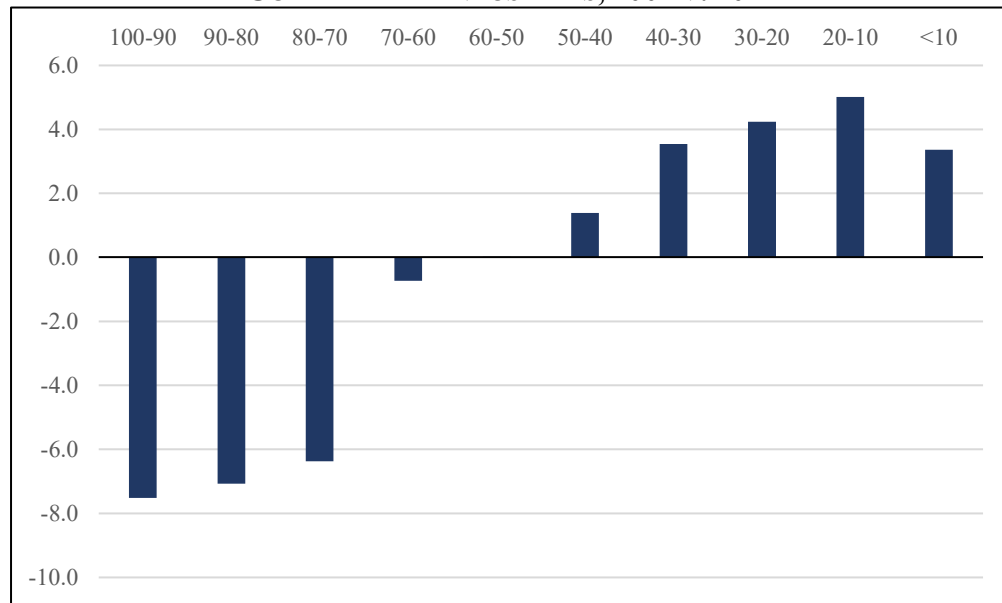
Table 3 is not meant to imply that all of the industries in sectors of the economy implicated in the Competition EO exhibited declining industrial concentration from 2002 to 2017. Indeed, some examples of industries exhibiting increasing concentration are discussed in Sections VI and VII. Nor should these examples be interpreted as evidence that these industries should be immune to antitrust scrutiny. Rather, these examples simply show that trends in industrial concentration should not be cited as a basis for increased antitrust enforcement in these industries.

## VI. Is Industrial Concentration Persistent?

### A. Trends in Concentration by Initial Concentration Level

To assess the question of whether industrial concentration is persistent, we begin by examining whether an industry’s initial level of concentration predicts future changes in concentration. Specifically, in Figure 1, each industry that maintained a consistent definition across Economic Census Years from 2002 to 2017 – or “comparable industry”<sup>58</sup> – is grouped according to its 2002 level of CR<sub>4</sub> in increments of ten (i.e., 100-90, 90-80, 80-70, etc.). For each group, Figure 1 then presents the difference between that group’s average level of concentration in 2002 versus 2017.

**FIGURE 1:  
CHANGE IN AVERAGE CR<sub>4</sub> BY 2002 CR<sub>4</sub> LEVEL,  
COMPARABLE INDUSTRIES, 2002 v. 2017**



Sources: Economic Census data.

<sup>58</sup> Specifically, a “comparable industry” is defined 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 iterations, were retained; (2) CR<sub>4</sub> data is available for the six-digit NAICS industry in each year from 2002 to 2017.

Figure 1 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 CR<sub>4</sub> of 90 percent or more in 2002 had an average CR<sub>4</sub> of 92.7 percent; by 2017, those same industries had an average CR<sub>4</sub> of 85.1 percent (a decrease of 7.6 percentage points). In contrast, at the lower end of the distribution, industries with a CR<sub>4</sub> between 10 and 20 percent in 2002 had an average CR<sub>4</sub> of 14.9 percent; by 2017, those same industries had an average CR<sub>4</sub> of 19.9 percent (an increase of 5.0 percentage points).

Figure 1 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 is also useful to consider whether, for the set of comparable industries analyzed in the previous section, the amount of economic activity accounted for by the most concentrated industries has declined or increased since 2002. Specifically, Table 4 groups industries by CR<sub>4</sub> and by year and calculates the share of economic activity accounted for by those industries.

**TABLE 4:**  
**SHARE OF ECONOMIC ACTIVITY BY CR<sub>4</sub> 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

Sources: Economic Census data.

Table 4 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 CR<sub>4</sub> of 90 percent or more towards industries with a CR<sub>4</sub> between 70 and 80 percent or between 80 and 90 percent. Overall, the share of economic activity accounted for by industries with a CR<sub>4</sub> 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 CR<sub>4</sub> between 60 and 70 percent to industries with a CR<sub>4</sub> of 60 percent or less. Thus, for the most concentrated industries, economic activity shifted from more concentrated to less concentrated industries.

### C. Case Studies: Pharmaceutical Manufacturing, Machinery and Electronic Products Manufacturing, and Freight Shipping

We now consider whether there is evidence of transitory concentration shocks dissipating over time in sectors of the economy targeted by the Competition EO. Table 5 presents trends in CR<sub>4</sub> for five six-digit NAICS industries not addressed in the previous section but also among the sectors of the economy identified as warranting increased antitrust scrutiny in the Competition EO or related industries: Pharmaceutical Manufacturing,<sup>59</sup> Machinery and Electronic Products Manufacturing,<sup>60</sup> and Freight Shipping.<sup>61</sup>

**TABLE 5:  
TRENDS IN CR<sub>4</sub> FOR SELECTED PHARMACEUTICAL MANUFACTURING, MACHINERY AND ELECTRONIC PRODUCTS MANUFACTURING, AND FREIGHT SHIPPING INDUSTRIES, 2002-2017**

Sector	NAICS Industry	2002	2007	2012	2017	ΔCR <sub>4</sub>
Pharmaceutical Manufacturing	Medicinal and Botanical Manufacturing	64.2	53.5	35.8	27.7	-36.5
	Biological Product (except Diagnostic) Manufacturing	42.0	51.9	37.8	39.5	-2.5
Machinery and Electronic Product Manufacturing	Farm Machinery and Equipment Manufacturing	57.6	59.0	61.1	53.8	-3.8
	Electronic Computer Manufacturing	75.5	86.9	50.9	58.0	-17.5
Freight Shipping	Deep Sea Freight Transportation	32.2	40.0	59.0	47.2	15.0

Sources: *Economic Census data.*

As shown in Table 5, the Medicinal and Botanical Manufacturing industry had a CR<sub>4</sub> above 60 percent in 2002, but concentration in the industry has fallen in every subsequent Economic Census year, with CR<sub>4</sub> falling below 30 percent by 2017. While Biological Product Manufacturing experienced an increase in CR<sub>4</sub> from 2002 to 2007, the industry experienced a sharp decline of 14.1 percentage points from 2007 to 2012, and its CR<sub>4</sub> in 2017 was 2.5 percentage points less than that its CR<sub>4</sub> in 2002. Farm Machinery and Equipment Manufacturing became slightly more concentrated from 2002 to 2012, with CR<sub>4</sub> increasing by 3.5 percent, but experienced a larger decline from 2012 to 2017 of 7.3 percentage points. Electronic Computer Manufacturing experienced an increase in CR<sub>4</sub> from 75.5 percent to 86.9 percent from 2002 to 2007, but declined by 36.0 percentage points from 2007 to 2012, with CR<sub>4</sub> remaining below 60 percent in 2017. Finally, from 2002 to 2012, CR<sub>4</sub> in the Deep Sea Freight Transportation industry increased by 26.8 percentage points from 32.2 percent to 59.0 percent. However, this positive concentration shock dissipated substantially from 2012 to 2017, with CR<sub>4</sub> dropping by 11.8 percentage points.

Again, this analysis is not meant to imply that firms within these industries should be immune from antitrust scrutiny. Rather, as with the examples discussed in Section V.C, these case studies simply show that even industries within the sectors targeted in the Competition EO have experienced transitory concentration shocks.

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<sup>59</sup> Competition EO, §1.

<sup>60</sup> *Id.*

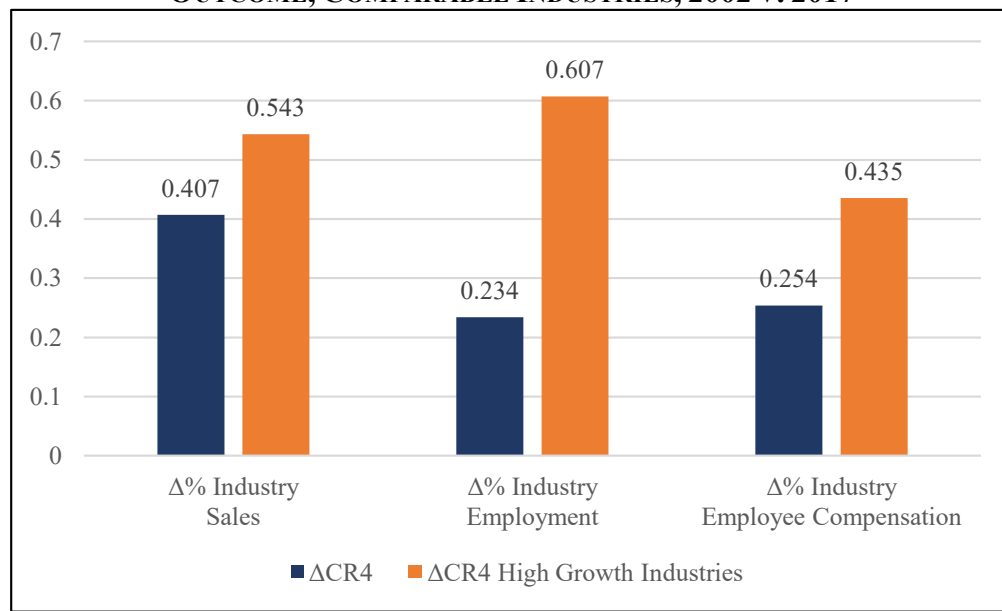
<sup>61</sup> *Id.*, §5(o).

## VII. Is Industrial Concentration Economically Harmful?

### A. Industrial Concentration and Economic Growth

To investigate the question of whether increases in industrial concentration are economically harmful, we examine the relationship between changes in industrial concentration and changes in three measures of economic growth. Specifically, Figure 2 assesses whether there is a correlation between within-industry changes in CR<sub>4</sub> from 2002 to 2017 and the percentage growth in industry sales, industry employment, and industry employee compensation (measured as payroll per employee).

**FIGURE 2:**  
**CORRELATIONS BETWEEN CHANGE IN CR<sub>4</sub> AND PERCENTAGE CHANGE IN ECONOMIC OUTCOME, COMPARABLE INDUSTRIES, 2002 v. 2017**



Sources: Economic Census data. 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.

A correlation coefficient is a measure of the strength of the relationship between two variables with a value of one representing a perfect positive relationship, a value of zero representing no relationship, and a value of negative one representing a perfect negative relationship.<sup>62</sup> Figure 2 presents the correlations between within-industry changes in CR<sub>4</sub> and each economic outcome, both on an economy-wide basis, and for “high growth industries” – industries whose growth rate is in the 90<sup>th</sup> percentile or higher for the economic outcome of interest. There is an economically significant positive correlation between changes in CR<sub>4</sub> and each outcome, and these relationships

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<sup>62</sup> Jay L. Devore & Kenneth N. Berk, MODERN MATHEMATICAL STATISTICS WITH APPLICATIONS, 2<sup>nd</sup> ed. (Springer, 2012) at 665 (defining the sample correlation coefficient as “a measure of how strongly related  $x$  and  $y$  are in the observed sample.”).

become even stronger for the fastest growing industries.<sup>63</sup> Thus, increasing industrial concentration is associated with output growth, job creation, and higher compensation for employees.<sup>64</sup>

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

While concentration has decreased on average since 2007, the analysis in the previous section emphasizes that trends for individual industries vary. One prominent sector of the economy that has experienced increasing concentration is retail. Table 6 compares trends in average and median retail concentration to trends in the rest of the economy.

**TABLE 6:  
RETAIL CR<sub>4</sub> v. NON-RETAIL CR<sub>4</sub> 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

*Sources: Economic Census data. Retail industries include all six-digit NAICS industries beginning with “44” or “45” with available CR<sub>4</sub> data.*

In contrast to the rest of the economy, average CR<sub>4</sub> rose by 4.6 percentage points for six-digit NAICS retail industries and median CR<sub>4</sub> rose by 8.1 percentage points from 2002 to 2017. Is this

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<sup>63</sup> Other studies have examined correlations between changes in concentration metrics and economic outcomes, also finding that increasing concentration is correlated with measures of 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](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.”).

<sup>64</sup> 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.

evidence of a trend towards excessive and economically harmful increases in concentration in the retail sector? Two patterns in the data suggest otherwise.

First, while retail concentration has risen, in 2002, average and median CR<sub>4</sub> were 4.5 percentage points and 8.5 percentage points below the levels prevailing in the rest of the economy. By 2017, average and median retail concentration were approximately equal to concentration in the rest of the economy. Thus, there is no evidence of “overconcentration” in the retail sector compared to the rest of the economy. Indeed, 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.

Second, 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 7 examines changes in concentration for the ten specialized retail industries that experienced the largest increases in CR<sub>4</sub> from 2002 to 2017.

**TABLE 7:  
TRENDS IN CR<sub>4</sub> FOR TOP TEN SPECIALIZED CONSUMER GOODS  
RETAIL INDUSTRIES, 2002-2017**

NAICS Industry	2002	2007	2012	2017	ΔCR <sub>4</sub>
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

*Sources: Economic Census data. Retail industries include all six-digit NAICS industries beginning with “44” or “45” with available CR<sub>4</sub> data.*

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.<sup>65</sup> This increase in market competition has created large benefits for consumers while simultaneously causing industrial concentration to increase.

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<sup>65</sup> 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).

### C. Case Study: Taxi Service

The Taxi Service industry provides another salient example demonstrating the potential for a strong relationship between rising industrial concentration and increasing market competition. Table 8 presents trends in CR<sub>4</sub> and industry sales for the six-digit NAICS Taxi Service industry.

**TABLE 8:  
TRENDS IN CR<sub>4</sub> AND INDUSTRY SALES FOR THE TAXI SERVICE  
INDUSTRY, 2002-2017**

NAICS Industry		2002	2007	2012	2017	$\Delta CR_4/\Delta$ Industry Sales
Taxi Service	CR <sub>4</sub>	17.6	10.6	11.8	77.2	59.6
	Industry Sales (Billions)	\$2.1	\$2.1	\$2.7	\$10.5	\$8.40

Sources: Economic Census data.

As shown in Table 8, 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.

The large increase in concentration observed in Table 8 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,<sup>66</sup> and Uber’s main competitor, Lyft, entered the market in August 2012.<sup>67</sup> Economic research has shown that the emergence of ride-hailing services increased competition by unraveling local taxi monopolies<sup>68</sup> and increased consumer surplus.<sup>69</sup> Thus, far from signaling a decline in competition, the large increase in industrial concentration associated with the Taxi Service industry was the direct result of new entry into the market.

## VIII. Conclusion

This study evaluates three questions regarding industrial concentration in the United States from 2002 to 2017: (1) is industrial concentration rising?; (2) is industrial concentration persistent?; and (3) is industrial concentration economically harmful? Regarding the first question, we find that the most recent data indicate that, overall, industrial concentration has been declining rather than increasing and that the economy was no more concentrated in 2017 than it was in 2002, despite the rise of “Big Tech” and assertions by some commentators that the antitrust laws were not

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<sup>66</sup> 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.”).

<sup>67</sup> *Id.* (“August 2012: Lyft, which is considered Uber’s main competitor, launches in San Francisco.”).

<sup>68</sup> 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.”).

<sup>69</sup> 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).



enforced strictly enough during the Bush and Obama Administrations. In terms of persistence, we find that more concentrated industries tend to become less concentrated over time, while less concentrated industries tend to become more concentrated. This evidence belies the claim that high levels of concentration have become an unyielding structural feature of the U.S. economy. Finally, regarding the third question, we find that increases in concentration within industries are associated with output growth, job creation, and higher employee compensation, and that rising industrial concentration can be a direct response to increased market competition.

These findings support four primary policy conclusions:

First, trends in industrial concentration should not be put forward by policymakers or antitrust enforcers as a basis for changing U.S. antitrust policy. The most recent Economic Census data simply do not support the claims that the U.S. has a “monopoly problem,” that industrial concentration has reached excessive and harmful levels, or that U.S. antitrust policy has failed. To the extent changes in antitrust policy are proposed, they should be based on rigorous economic analysis of competitive conditions and consumer welfare.

Second, pursuing deconcentration as an economic policy objective is unwarranted and risks causing significant economic harm. Rising concentration within industries is associated with benefits for consumers, labor markets, and workers. Focusing on reducing industrial concentration risks inhibiting the underlying competitive processes that drive economic growth without providing any offsetting benefits for consumers or the economy.

Third, while the Competition EO raises concerns that industrial concentration has had a negative impact on labor markets and workers, our results indicate that increasing industrial concentration is associated with beneficial labor market outcomes. Thus, our results invite strong skepticism that combatting industrial concentration is a useful tool for strengthening U.S. labor markets or increasing workers’ wages.

Fourth, the recently released DOJ/FTC Request for Information on Merger Enforcement 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?”<sup>70</sup> 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. Furthermore, as indicated by many of the case studies discussed above, rising industrial concentration is often a sign of increasing rather than decreasing market competition.

Our results 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. Rather, our study presents strong evidence that the current focus of policymakers on

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<sup>70</sup> RFI at 2.

industrial concentration is misguided and that many of the assumptions that are currently steering public policy debates regarding antitrust and regulation lack empirical support.

## Appendix A

As noted in Section V, the NAICS is revised between successive five-year intervals to accurately represent economic activity in North America. In some cases, six-digit NAICS industries are redefined, consolidated or redistributed. As a result, the number of manufacturing industries with available HHI data declined by 155 from 2002 to 2017 (Table 1), while the number of industries across all sectors of the economy with available CR<sub>4</sub> data declined by 119 (Table 2).<sup>71</sup>

While some previous studies of trends in industrial concentration have limited attention to six-digit NAICS industries that maintained a consistent definition over time or have made other adjustments reducing the sample of industries considered, this approach likely introduces sample selection bias – in particular, bias toward finding evidence of increasing industrial consolidation.

Table A.1 presents the distribution of HHI for comparable manufacturing industries – manufacturing industries that maintained a consistent definition from 2002 to 2017.

**TABLE A.1:  
DISTRIBUTION OF HHI FOR COMPARABLE MANUFACTURING  
INDUSTRIES, 2002-2017**

Year	Industries	Mean	10th Pct	20th Pct	30th Pct	40th Pct	50th Pct	60th Pct	70th Pct	80th Pct	90th Pct
2002	207	662	87	207	286	415	498	654	808	1,061	1,497
2007	207	658	109	216	307	364	458	578	760	1,042	1,449
2012	207	661	115	226	307	400	533	624	786	1,085	1,376
2017	207	619	132	238	323	381	509	620	752	986	1,299
'02 v. '17		-43	45	31	37	-33	11	-35	-56	-75	-199
'07 v. '17		-39	23	22	16	17	51	42	-8	-55	-150

Sources: *Economic Census data.*

Table A.1 shows that initial concentration levels are, in general, significantly lower for comparable manufacturing industries across the distribution of HHI than for manufacturing industries as a whole. For example, average HHI in 2002 for comparable manufacturing industries was 662, compared to 769 across all manufacturing industries. The 90<sup>th</sup> percentile of HHI for comparable manufacturing industries in 2002 was 1,497, versus 1,704 across all manufacturing industries. Nevertheless, Table A.1 shows that the declining trend in HHI in Table 1 cannot be attributed to the consolidation and redefinition of manufacturing industries. Like the data for all manufacturing industries, data for the comparable manufacturing industries subsample in Table A.1 show decreasing average concentration, driven by falling concentration at the higher end of the concentration distribution. However, the potential bias created by dropping a significant portion of the sample is evident as the declines in concentration reported in Table A.1 are generally lower than those reported in Table 1.

Table A.2 shows the distribution for CR<sub>4</sub> from 2002 to 2017 for all comparable industries across all available sectors of the U.S. economy. Like the comparable manufacturing industries subsample, the subsample of all comparable industries in Table A.2 displays lower levels of initial concentration than the concentration levels presented for all industries in Table 2. For example,

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<sup>71</sup> Thus, the reduction in industries in the manufacturing sector was offset by the addition of industries in the rest of the economy.

average concentration for all comparable industries was 32.1 percent in 2002, versus 35.1 percent across all industries. Again, the potential bias created by dropping a significant portion of the sample is evident, as limiting attention to comparable industries biases the results towards indicating a trend of increasing concentration.

**TABLE A.2:  
DISTRIBUTION OF CR<sub>4</sub> FOR ALL COMPARABLE  
INDUSTRIES, 2002-2017**

Year	Industries	Average	10th Pct	20th Pct	30th Pct	40th Pct	50th Pct	60th Pct	70th Pct	80th Pct	90th Pct
2002	751	32.1	6.4	11.1	17.8	23.0	27.7	34.8	41.9	51.0	63.8
2007	751	33.0	6.9	12.3	18.7	24.3	29.6	34.4	42.4	52.7	64.3
2012	751	33.9	8.3	13.9	19.3	24.8	29.9	36.8	43.5	53.2	65.3
2017	751	34.5	8.4	14.2	19.7	26.0	31.3	37.9	44.7	53.6	65.8
'02 v. '17		2.4	2.0	3.1	1.9	3.0	3.6	3.1	2.8	2.6	2.0
'07 v. '17		1.5	1.5	1.9	1.0	1.7	1.7	3.5	2.3	0.9	1.5

Sources: Economic Census data.