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Competition and monopoly in the U.S. economy: What do industrial concentration data tell?

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Abstract: A recent series of academic studies, think-tank reports, and news articles shows widespread attention to rising industrial concentration and market power in the U.S. economy. In this paper, we focus on concentration in the U.S. nonfinancial corporate sector to make three contributions to this literature. First, we trace the theoretical origins of the debate on industrial concentration, and show that there is a certain degree of ambiguity surrounding the expected consequences of concentration and monopolization for nonfinancial firms. Second, we use industry-level concentration data to describe recent trends in average concentration. We show that, while concentration increases across the majority of U.S. industries after the late 1990s, the retail and information-services sectors are particularly key for understanding recent trends in average industrial concentration. Third, we link our industry-level analysis with firm-level data to describe the relationship between industrial concentration and nonfinancial corporations' profitability, markups, and investment. Consistent with the ambiguities in the theoretical literature, we find that these relationships are not uniform: while some highly-concentrated industries confirm standard expectations with high markups, high profitability, and low investment rates, other highly-concentrated industries earn lower-than-average markups and profits, suggesting that – in some industries – increased concentration and intensified competition may go hand in hand.

Keywords: industrial concentration, market concentration, competition, monopolization, monopoly, oligopoly, antitrust, capital accumulation, investment, profitability

JEL classification codes: L0, L1, L5, D4, E2, B5

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1. Introduction

The issue of increased industrial concentration and monopolization in the U.S. economy has attracted significant attention from economists, think tanks as well as the press in the last few years.[1] Recent literature argues that average concentration ratios and market power have increased in the last two decades (e.g. CEA 2016, Grullon *et al.* 2018, Gutiérrez and Philippon 2017b, De Loecker and Eeckhout 2017), and that this increase is a significant factor behind a number of major macroeconomic trends, including rising corporate profits (e.g. Grullon *et al.* 2018); slowing corporate investment (e.g. Gutiérrez and Philippon 2017a); the declining labor share of income (e.g. Barkai 2016); and growing income and wealth inequalities (Kurz 2017). Rising concentration is variously explained as the result of lax enforcement of antitrust regulations in mergers and acquisitions (e.g. Grullon *et al.* 2018); developments in information technology systems (e.g. Bessen 2017, Kurz 2017); and the emergence of winner-take-all industries where superstar firms have brought significant productivity increases (Autor *et al.*2017a, b). Nonetheless, interpretations of the existing empirical evidence on the degree of competition are mixed. Shapiro (2018), for example, argues that the evidence presented is insufficient to make the case that competition has declined in many U.S. industries, and Crouzet and Eberly (2018) contend that, when excluding retail, the rising trend in aggregate concentration largely disappears. In the heterodox literature, competition and monopoly play a large role in various heterodox approaches, but empirical studies are scarce. As examples of recent theoretical contributions, Palermo (2017) presents a recent reappraisal of the role of competition within Marxian economics and compares it to neoclassical and Austrian conceptions of competition, and Pagano (2014) draws attention to the rise of "intellectual monopoly capitalism". On the empirical side, Lambert (2019) focuses on the decline in small business entrepreneurship, and Orhangazi (2019) shows that increased market power in some industries comes through the increased use of intangible assets.

In this paper, we make three contributions to the literature on concentration, focusing on the nonfinancial corporate sector in the U.S. economy. **First**, in Section 2, we trace the origins of the debate on industrial concentration and monopolization, and their impact on profitability and investment. We show that the mainstream thinking about industrial concentration shifted over time from focusing on enhancing market competition to focusing on the maximization of consumer (and social) welfare. In turn, post-Keynesian theory emphasizes imperfect competition and markup pricing, but is less specific on the value of competition. Within Marxian economics, competition and monopolization occupy a central place, with two general approaches to competition: one presupposing a secular trend towards increased concentration and monopolization under capitalism; and a second arguing that both excess competition and excess monopolization may harm the healthy operation of capitalism, such that – as competition results in monopolization – monopolization may, in turn, give way to increased competition. By

[1] As examples of think-tank reports, see American Antitrust Institute (2016), Jarsulic *et al.* (2016), Abernathy, N. *et al.* (2016), Baker (2017). For a few select examples from the press, see *The Economist* (2016a, 2016b, 2018), Francis and Knutson (2015), New York Times (2016), Stiglitz (2016).

comparing these theoretical approaches in Section 2, we show that theoretical issues are in fact not settled and that these main theoretical perspectives have a certain degree of ambiguity about both the dynamics and consequences of industrial concentration and monopolization. We do, however, identify a 'standard story', wherein high concentration is indicative of low competition, and allows firms to earn high profits, charge high markups, and perhaps even reduce investment expenditures. At the end of Section 2, we, also, provide a brief review of the earlier empirical literature on the effects of concentration, which focuses mostly on profitability and is largely inconclusive.

Second, in Section 3, we use industry-level concentration data from the U.S. Economic Census between 1997 and 2012 to investigate average concentration growth across the nonfinancial corporate sector; describe the set of industries that are highly concentrated; and explore whether the increase in average concentration has taken place across the economy or within a specific set of industries.[2] We begin by showing an increase in average concentration across the U.S. economy, robust to different measures of concentration and levels of industrial classifications. We show that 70% of industries become more concentrated between 1997 and 2012, such that there is an important within-industry dimension of rising concentration. In other words, a larger number of industries are highly concentrated in 2012 than in 1997. We, furthermore, establish an important sectoral dimension of rising concentration and point, in particular, to the key roles of the retail and information sectors in driving both the recent rise in, and the current level of, average concentration. Through the analysis in Section 3, we also identify a key problem with the existing literature, which often emphasizes the *percent change* in concentration, rather than the *level* of concentration. We argue that focusing on the percent change in concentration is often misleading: industries with high initial and final levels of concentration may record low concentration growth, whereas industries with low initial levels of concentration can record very high percentage point increases, even when they are still far from being highly concentrated. We, therefore, emphasize the *level* of industry-level concentration, and identify three groups of low-, mid-, and high-concentration industries as the basis for our analysis. In doing so, we show that mid- and high-concentration industries lie in different sectors of economic activity than low-concentration industries and, in particular, highlight the outsize roles of retail and information services among mid- and high-concentration industries.

Third, in Section 4, we link our industry-level analysis to firm-level data from Compustat to ask whether the profitability, markups, and investment rates of firms in highly-concentrated industries differ systematically from those of firms in mid- and low-concentration industries. We find that, while firms in above-average concentration industries have higher profit rates than firms in below-average concentration industries, firms in the most-concentrated industries have *lower* profit rates than those in the mid-concentration group. A similar picture appears with markups: among firms in high-concentration industries, only those in a few industries – mainly in information services – have higher-than-average

[2] This time frame is determined by data availability: a major change in industrial classifications in 1997 makes comparisons to the pre-1997 period difficult, and 2012 is the most recent year of Economic Census data.

markups. Finally, turning to investment rates, we show that a sharp fall in average investment took place among firms in mid-concentration industries in the early 2000s, which is the period when a large share of the overall increase in industrial concentration took place. However, firms in low-concentration industries do not have, on average, higher investment rates, although average investment among firms in the high-concentration group is lower than that of firms in the mid-concentration group since the early 2000s. Altogether, this analysis shows that the data do not display a straightforward relationship wherein firms in highly-concentrated industries have higher profit rates, higher markups, and lower investment. As such, our analysis runs in part against the common perception that more-concentrated industries have higher profitability and lower investment. Finally, in Section 5, we in turn explore if fixed-capital intensity or intangible-asset intensity helps clarify these trends, and suggest that, for some industries, that market power may be expressed through intangible assets even in the absence of industrial concentration.

All in all, the ambiguities in our findings run parallel to the vagueness in theory, as well as the inconclusive results in the earlier empirical literature. We discuss the implications of our findings in Section 6. We conclude that three general cases appear: **(i)** Industries with high (low) concentration and high (low) markups, high (low) profitability, and low (high) rates of investment, which confirm common expectations. We suggest information-services firms may be an example of this case. **(ii)** Industries, such as in those in the retail sector, that are highly concentrated, but have low markups, low profitability and average investment levels. This case implies that, in some industries, increased concentration may go hand in hand with intensified competition. **(iii)** Industries with medium-levels of concentration, high profitability, and above-average investment rates. This case suggests that industrial concentration is not the only reflection of market power, and firms with lower market shares may still acquire market power (for example, through intangible assets) to increase their markups and profitability, and yet continue to invest above average. There is still much room and, in fact, need for more theoretical and empirical studies to understand the current dynamics of industrial concentration, competition and monopolization in the U.S. economy, and we hope that this study provides a contribution to that end.

2. Approaches to competition and monopoly

The role of competition and its consequences occupy a central role in understanding the macroeconomic dynamics of the capitalist system, and have been central to different explanations of how capitalist systems work since classical economics. While we do not attempt to provide an exhaustive and comprehensive review of the literature, we outline the basic approaches to competition and monopoly in this section. To begin, the neoclassical approach is built around the case of perfect competition based on markets with a large number of firms, each with a small enough share that no single firm has the power to affect the market price. Firms, therefore, simply decide on the level of output, given the market price and their cost structure, to maximize profitability. Firms in perfectly competitive markets earn "normal" profits, defined as a return sufficient to pay all inputs at least their returns in alternative employment – i.e. their

opportunity cost. Monopoly is, in turn, juxtaposed against this ideal(ized) set up. In the case of monopoly, the output decision directly changes the total supply in the market and hence the market price. A monopoly limits output in order to increase the market price above marginal cost and earn "monopoly profits," or "rents," defined as returns to inputs in excess of the amount necessary to keep them in operation (Pepall *et al.* 2014). Perfect competition maximizes both consumer and producer surpluses, while monopoly leads to deadweight losses. Monopolies charge higher prices, limit output and reduce consumer welfare (Tirole 1988). In turn, imperfect competition describes the cases that fall between these two polar states. Under imperfect competition, both competitive and monopolistic forces are combined in determining market prices. Even in markets with rival producers, oligopolies or price-fixing cartels can charge higher prices without losing much in sales. Like monopolies, imperfect competition reduces the efficiency of resource allocation, and causes an increase in rent-seeking activities that is seen as wasteful.

The case of perfect competition is sometimes depicted as a Darwinian process in which firms are forced to innovate in order to remain competitive for survival. Against this claim, others argue that monopoly rents may be allocated to promote innovation, especially in cases where market power provides firms with incentives for research and development that promotes long-term economic growth. In particular, monopolistic firms' incentive for investment and innovation comes from the desire to protect and continue their monopoly rents. Proponents of the Darwinian approach would, in contrast, argue that survival is a stronger incentive than protecting monopoly rents, and that the lack of market discipline in monopolistic markets could lead to managerial slack and agency problems resulting in sub-optimal levels of investment and innovation. As such, different strands of the neoclassical approach each expect higher pricing power and profitability for monopolies, but whether the rate of investment is lower or higher in the context of monopoly power is a contested issue.

For the early post-war period, mainstream thinking and policy in the U.S. was dominated by a negative view of monopolies and industrial concentration. Promotion of competition was generally accepted as the best policy to increase social welfare, and has been a central tenet of antitrust laws since the Sherman Act (Stucke 2013). The consensus changed in the late 1970s, as Bork (1979) proposed a consumer-welfare metric for antitrust. This metric contends that – because the broad application of antitrust law to promote competition can, in fact, harm consumer welfare – antitrust enforcement should be limited to cases in which monopoly power reduces consumer welfare (Shapiro 2018). A recent note written by the U.S. government for the OECD clearly lays out this position, arguing that increased concentration:

> "… would not necessarily imply a failure of competition law or enforcement. Increasing concentration is apt to occur as a result of two distinct, albeit similar, natural forces. First, when success and failure are random events, markets become concentrated over time. Second, when success and failure are driven by relative degrees of innovation and efficiency, markets also become more concentrated. Firms that serve their customers' interests much better than rivals can gain substantial market share as a result of a healthy competitive process" (OECD 2018b: 6).

A recent OECD issue paper by its Secretariat makes a similar case:

> ". . . it remains unclear precisely what is driving the increase in market power. It is perfectly possible that in many markets this is the outcome of healthy competitive forces that allow 'superstar firms' to thrive and to build market power on the back of their recurring success. … [I]t is evident that [concentration story] is not a story that is limited to the technology giants and their digital platform business models. For example financial markets, and healthcare in the US, appear to drive some of the changes in the indicators. Nor is there much sign that the changes are driven by those industries that are most exposed to globalized trade. This suggests that globalization has not played a big role in these changes, and that we should not focus too much on the market shares of platform firms. Network effects, anticompetitive regulation, and better price discrimination may each also play a role." (OECD 2018a: 3).

When we turn to the post-Keynesian literature, we observe that oligopolistic competition is seen as a natural state of affairs under capitalism and there is limited discussion of its efficiency (or inefficiency), nor are there calls for promoting competition. Robinson (1933) developed a theory of imperfect competition early on, around the same time that Chamberlin developed his theory of monopolistic competition. Kalecki (1971) saw perfect competition as "a most unrealistic assumption not only for the present phase of capitalism but even for the so-called competitive capitalist economy of the past centuries: surely this competition was always in general very imperfect" (p. 158). Kalecki also argued that an increase in the average degree of monopoly could lead to a fall in the wage share and an increase in the income share of capital (pp. 22 and 63). In particular, in both Robinson and Kalecki, profit margins are determined by the intensity of competition, usually referred to as the degree of competition: the lower the degree of competition, the higher the profit margin. In turn, the degree of competition not only determines firms' profit margins but, at the aggregate level, also determines the share of income going to profits and wages.

Lavoie (2015) notes that, according to post-Keynesians, almost all markets have some sort of administered pricing, such that administered pricing need not necessarily indicate the existence of oligopolies, but can also hold in markets with intense competition if they have a limited number of competitors. Lavoie (2015), also, points out that competition does not necessarily occur through pricing, but can also take place when firms attempt to reduce their unit costs to achieve larger profit margins than their competitors (p. 127). Lee (2013) makes a similar point and argues that competitive activities around investment, advertising, research and development, production process and production decisions can lead to significant cost differences across firms, so much so that many are driven from the market (p. 169). As such, Lavoie (2015) emphasizes, "[c]ompetition is a dynamic process, not an end-state or a static situation" (p. 127) and that too much competition can easily be too risky for firms: "Thus the post-Keynesian position on the value of competition is rather ambiguous," but shares similarities with Schumpeter (1943) who states that "perfect competition is not only impossible but inferior, and has no title to being set up as a model of ideal efficiency" (p. 639). Finally, Melmiès (2016) argues that a branch

of the post-Keynesian approach regards profit margins not as correlated to the degree of market power, but instead as directly connected to the internal financing requirements for investment (p. 154). According to this approach, "managers choose a profit margin that takes market competition into account *but also* yields a targeted profit rate needed to finance the growth of the firm" (p. 156, emphasis in original).

The Marxian approach sees dynamics of competition as central to the workings of the capitalist system. In an often-cited passage in Capital, Marx (1867) argues that competition is the driving force of the system as:

> "… the development of capitalist production makes it necessary constantly to increase the amount of capital laid out in a given industrial undertaking, and competition subordinates every individual capitalist to the immanent laws of capitalist production, as external and coercive laws. It compels him to keep extending his capital, so as to preserve it, and he can only extend it by means of progressive accumulation" (p. 739).

However, competition is not a static process and leads to increased concentration[3] and centralization of capital: "The battle of competition is fought by the cheapening of commodities. The cheapness of commodities depends, all other circumstances remaining the same, on the productivity of labor, and this depends in turn on the scale of production. Therefore the larger capitals beat the smaller" (Marx 1867: 777). Competition leads to monopolization, which creates barriers to entry on the one hand and increased competition in the other industries on the other:

> "It will further be remembered that, with the development of the capitalist mode of production, there is an increase in the minimum amount of individual capital necessary to carry on a business under its normal conditions. The smaller capitals, therefore, crowd into spheres of production which large-scale industry has taken control of only sporadically or incompletely. Here competition rages in direct proportion to the number, and in inverse proportion to the magnitudes, of the rival capitals. It always ends in the ruin of many small capitalists, whose capitals partly pass into the hands of their conquerors, and partly vanish completely" (Marx 1867: 777).

In the U.S. context, the key works by Sweezy (1946) and Baran and Sweezy (1966) argued that the rise of giant corporations and the concomitant monopoly pricing power result in increased profits that cannot be re-invested profitably as monopolization leads to overaccumulation, chronic overcapacity and scarcity of outlets for profitable investment. This process generates a stagnation tendency as investment weakens

[3] In Marx, concentration signifies the already large capitals growing further as a result of accumulation process due to compound growth, which increases the existing scale differences, while centralization refers to separate capitals merging together and creating larger units of capital. The more general concept of monopoly is then used to denote the formation of large firms either through concentration or centralization processes.

with respect to total available funds for investment, and this tendency can only be averted by increased sales effort, military spending and financialization (Orhangazi 2008: 53-4). Along the same lines, Foster and McChesney (2012) argue that, in the 21st century, the tendency towards monopolization strengthened and helped increase corporate profitability. While this approach sees a continued decline in competitive intensity, Brenner (2006) argues that expanded and excess competition in the world markets, coming especially from German and Japanese firms, led to a decline in the profitability of the U.S. firms. In theoretical terms, both approaches expect a positive correlation between the degree of monopolization and profitability, while the monopoly capital approach also posits a negative relationship between the degree of monopolization and investment.

A more nuanced and dialectical approach within Marxian economics can also be identified (e.g. Dumènil and Lèvy 1993; Harvey 2002, 2014; Christophers 2016; Crotty 2017). While Dumènil and Lèvy (1993) argue that price-taking firms are "a fiction derived from the neoclassical analytical apparatus" (p. 76), Christopher (2016) argues that the notion of "monopoly stage of capitalism" is equally fictional, "albeit … emanating from a very different analytical source" (p. 11). These contributions recognize that both excess competition and excess monopolization can lead to problems for profitability and capital accumulation. While capitalism would lose its dynamism without an adequate degree of competition, excess monopoly power can also jeopardize investment and growth dynamics through scarcity of supply and limitations on investment and output.[4] Harvey (2002) argues that capitalism "organically" comes to such a balance, while not clearly explaining how, whereas Christophers (2016) argues that rules and regulations, and especially antitrust and intellectual property regulations, are the primary lever to that end:

> "When capital has become sufficiently overcentralized and monopolistic to threaten its own successful, profitable reproduction, antitrust law has been called upon to help restore the necessary degree of balance. This balance will never be perfect and at rest; in a dialectical relation, such as that between monopoly and competition, it never can be. When the dangerous excesses has been of competition, by contrast, IP law has come to the rescue" (pp. 11-2).

Crotty (2017) also emphasizes that "[f]or a core industry to remain viable and be dynamically efficient, its key firms must strike a balance between competition and cooperation. Too much competition can destroy the industry rather quickly, while too little will ensure its long-run decline" (p. 254). As such, he identifies two regimes of competition for the postwar U.S. economy: The corespective competition regime of 1950-1970, characterized by high profitability, low uncertainty, financial robustness and long-term

[4] While there seems to be some similarities with Schumpeter's approach, Schumpeter sees competition a dynamic process of differentiation among firms in which technological innovation plays the central role. Therefore, in Schumpeter, neither monopoly is associated with stagnation nor competition necessarily leading to dynamism. In fact, according to him monopolization may lead to an increase in innovation as a monopoly position needs to be defended.

investment strategies; and the coercive competition regime of the post-1980 era, characterized by lower profitability, stagnant aggregate demand and forced capital-deepening, labor-saving, cost-cutting investment. In analyzing investment in the U.S. in the 1980s, Crotty (2017) finds that investment (financed by debt) increased despite declining profitability due to intensified competition. In other words, it is possible to see high investment levels in both corespective and coercive regimes, but the type of investment may vary between capital widening and capital deepening types.

To summarize and highlight points significant for the following empirical parts of this paper, in mainstream approaches a decline in competitive intensity is associated with increased pricing power and higher profitability, while its impact on investment is left more ambiguous. While a similar ambiguity exists in post-Keynesian theories, competition is not necessarily captured by the degree of concentration; markups may depend on cost-structure competition; and increased profitability due to monopoly power may lead to further investment financed by these profits. In Marxian approaches, the monopoly capital school sees increased monopolization as associated with rising profits and falling investment rates, while other strands contend that, while monopolization may lead to higher profitability, excess monopolization may undermine the conditions of high profitability. Similarly, less intensified competition allows firms to invest in long-term capacity building whereas more intensified competition may lead to an increase in capital-saving investment. In short, all these approaches share a general expectation that declining competition is likely to lead to increased profits (at least for a while), whereas expectations regarding investment are more ambiguous.

The recent literature on concentration mostly reflects the tension in the mainstream view between competition and economic efficiency. On the one hand, some argue that the recent increase in concentration is associated not only with higher markups and lower investment (e.g. Gutierrez and Philippon 2017a), but that it also reduces consumer welfare and increases economic rents, decreases business dynamism, and harms resource allocation (e.g. DeLoecker and Eeckhout 2017). On the other hand, others argue that concentration may be the efficient byproduct of underlying technological changes as productivity differentials lead to the reallocation of demand towards the highest-productivity firms, and/or as rising productivity differences lead to concentration (e.g. Autor *et al.* 2017a, b).

The earlier empirical literature, in contrast, has focused largely on the link between the degree of competition and profitability, but has produced weak and often "paradoxical" results. Starting with Bain's (1951) study, which found that profit rates are higher in industries where the top eight firms' market share exceeds 70%, a number of studies have analyzed the relationship between market concentration and profitability. While studies such as Mann (1966), Collins and Preston (1969) and Weiss (1974) found a positive relationship between concentration and profitability, the empirical literature that followed found either a smaller and only weakly statistically significant, or even a negative relationship, between profitability and concentration (e.g. Khalilzadeh-Shirazi 1974, Hart and Morgan 1977, Ravenscraft 1983,

Gale and Branch 1982, Amato and Wilder 1985). Schmalensee (1988), in an extensive review of these earlier empirical studies, finds that the relationship between industrial concentration and profitability is statistically weak and economically small. Keil (2017a), furthermore, highlights that the relationship is unstable over time and space and sometimes disappears in multivariate studies, labeling this phenomenon "concentration-profitability paradox". In turn, Keil (2017a) identifies two potential explanations for this paradox from the industrial organization literature. First, high industrial concentration implies lack of competitive pressures, which may lead to "X-inefficiency" in terms of higher cost and lower productivity (e.g. Stigler 1976, Leibenstein 1966). Second, maintaining market power can be costly in terms of the excess capacity and low pricing strategies needed to discourage entry (e.g. Spence 1977). Melmiès (2016), similarly, highlights that the link between competition and profitability is usually not as strong empirically as it is theoretically, such that empirical studies often produced statistically weak results.[5] In turn, a more recent study by Keil (2018) finds some evidence of a negative effect of concentration on profitability, whereas Grullon *et al* (2018) show that firms in industries with the largest *growth* in product market concentration realize higher profit margins than firms in other industries.

3. Trends in industrial concentration since 1997

3.1 Data and definitions

In Sections 3, 4, and 5, we turn to our empirical analysis, in which we draw on two sources of data. First, to describe concentration, we use the U.S. Census Bureau's Economic Census for 1997, 2002, 2007, and 2012, which reports CR*n* ratios measuring the revenue share of the *n* largest firms in an industry. Industry definitions are based on the North American Industry Classification System (NAICS), which identifies each industry by a 6-digit code: the first two digits denote the broad sector (e.g. manufacturing or retail trade); the third digit denotes the subsector; and the fourth digit denotes the narrower industry group. We follow the literature on concentration, which generally defines industries at either the 3- or 4-digit level, but we focus primarily on 3-digit industrial definitions. This focus reflects that 4-digit definitions are arguably too narrow to capture concentration when firms sell products in multiple, closely-related markets.[6] Our main conclusions are not, however, sensitive to using 4-digit industrial classifications.[7] In our analysis we include all sectors for which the census publishes concentration data, except for finance

[5] Melmiès (2016) also notes that cross-country studies also give mixed results.

[6] For a discussion of this point, see Grullon *et al.* (2018: 6), who emphasize that large companies often have activities spanning more than one 4-digit classification. They highlight the case of leather and allied product manufacturing (NAICS 316), which consists of three 4-digit industries: leather and hide tanning and finishing (3161), footwear manufacturing (3162) and other leather products including handbags or luggage (3169). Companies like Coach Inc. have activities that easily span all three of these 4-digit categories. Similarly, Apple Inc. and HP Inc. are classified in the same 3-digit industry, but different 4-digit industries.

[7] We replicate the main tables and figures using 4-digit classifications in the online appendix.

and real estate (NAICS 52 and 53), which we exclude to focus on the nonfinancial corporate sector.[8] We, also, draw industry-level revenue and employment data from the census. We use the census data in Sections 3.2 and 3.3 to describe the evolution of concentration at the aggregate and industrial levels.

Second, we merge the census data with an annual panel of firm-level balance sheet and income statement data for U.S. publicly-traded corporations from Standard and Poor's Compustat database. To clean the Compustat data we eliminate duplicates; drop firms incorporated outside of the U.S.; and drop firms with negative values for sales, total assets, or capital stock. We also drop firms in finance and real estate, and in sectors without concentration data in the U.S. Census. Drawing on the discussion in Section 2, we use Compustat to calculate firm-level measures of the after-tax profit rate, markup, and investment rate, as well as capital intensity and intangible intensity. These variable definitions are summarized in Appendix Table A1. We link the census data with Compustat by assigning the concentration statistics from census to all firms in each 3-digit industry in the fiscal year in which the census was conducted (1997, 2002, 2007, or 2012), as well as to a two-year band before and after the census year (e.g. 1997 CR4 data is assigned to firms in 1997, as well as in 1995, 1996, 1998 and 1999).[9] Doing so yields an annual firm-level panel of 107,867 observations with census-based CR*n* ratios between 1995 and 2014. We use this sample to describe the relationship between concentration and profitability, markups, and investment (Section 4), and between concentration, and capital- and intangible-intensity (Section 5).

It is important to note that, even though census-based concentration measures are only available every five years, they have key advantages over (annual) concentration measures calculated with Compustat (Ali *et al.* 2008, Keil, 2017b). First, the census covers both public and private firms, whereas Compustat only includes publicly-listed corporations. Second, the census includes domestic sales of foreign companies. This feature is important, since foreign companies with significant domestic sales affect the degree of product market competition faced by domestic firms (Keil 2017b). The census, similarly, excludes foreign

[8] Our data covers thirteen 2-digit sectors: utilities (NAICS 21); manufacturing (31-33); wholesale trade (42); retail trade (48-49); information (51); professional, scientific and technical services (54); administrative and support and waste management services (56); educational services (61); health care and social assistance (62); arts, entertainment, and recreation (71); accommodation and food services (72); and other services, except public administration (81).

[9] Our findings are, also, robust to standardizing industrial classifications over time by revising NAICS codes in Compustat to their historical definitions using concordance files from the U.S. Census. While there are no large-scale classification changes between 1997 and 2012, there are a series of smaller changes, particularly in information. As a simplified example, telecommunications firms are classified in Compustat under their current code (517), but fell under 513 in 1997. Using the concordance files, we replace the missing 1997 CR*n* ratios with those from the historical industry (513), revising all cases for which the current code can be assigned to a unique historical code. By doing so we can assign CR*n* ratios to 2,113 of 5,749 observations with missing CR*n* data after the Compustat-census merge. Of the remaining observations with missing CR*n* data (3.4% of the sample), 75.1% lie in NAICS 511, for which the census did not publish 1997 CR*n* data, although it existed in its current classification.

sales of domestic companies. Third, because census measures are constructed on an establishment basis, whereas Compustat data are consolidated at the level of the corporation, the classification of conglomerates is more precise in the census, which groups the sales of each division with the standalone firms in that NAICS code (Grullon *et al.* 2018).

3.2 Average concentration

We begin by calculating simple means, weighted means and medians for the four measures of industrial concentration in 1997, 2002, 2007, and 2012 and present them in Table 1. Consistent with the wave of interest in industrial concentration and market power, these indicators suggest that a significant increase in average concentration took place in the 2000s and, in particular, during the early 2000s. The increase in average concentration has taken place across all CR*n* measures; whether we look at medians, simple means, or weighted means; and across both 3- and 4-digit industries. The average CR4 ratio across 3-digit industries and weighted by industry revenue, for example, increases 26.8%, from 14.6% in 1997 to 18.5% in 2012. Much of this increase takes place between 1997 and 2002, during which time the weighted-average CR4 ratio increases from 14.6% to 18.1%, then remaining relatively steady at an average of 18.3%. This trend is consistent with the recent literature on increased monopoly in the U.S. economy, which documents not only rising industrial concentration (e.g. Grullon *et al.* 2018), but also a peak in the number of U.S. public firms in 1997, followed by both a decline in new entry and an increase in delisting rates among seasoned firms (Decker *et al* 2016, Doidge *et al* 2017, Kahle and Stulz 2017).

<**Table 1:** Change in concentration ratios over time across 3- and 4-digit industries >

3.3 Where did concentration increase?

Next, we turn to describing the industries with high levels of concentration, and the set of industries in which concentration has increased most substantially. To do so, we, first, identify the set of industries with high, medium, and low levels of concentration, and describe the sectors in which these industries operate. Second, we ask whether the increase in average concentration reflects a widespread increase in concentration across industries, or is driven by specific sectors. We show that concentration has increased in a majority of industries, but that the retail and information technology sectors are particularly key for explaining both the current level of, and the recent increase in, concentration. Through this analysis, we add to the existing literature, which largely focuses on across-industry averages, but pays less attention to the specific industries or sectors in which concentration has increased. In this discussion, we focus primarily on the level of, rather than the change in, concentration for individual 3-digit industries. This choice is important: as we show below, 3-digit industries with the largest percent change in concentration often have low initial and final levels of concentration. Thus, while some of the literature focuses on concentration *growth*, this choice can be misleading.

To that end, we begin by classifying each 3-digit industry as having high, medium, or low levels of concentration. We define these categories in two steps. First, we categorize each 3-digit industry as having above- or below-average concentration in each of the four census years. We define the cutoff using the average CR4 ratio across all 3-digit industries in 2012, weighted by industry revenue (18.5%). Second, we account for the wide range of CR4 ratios among above-average concentration industries (from 19.4% to 88.0%) by distinguishing high- from mid- concentration industries using the midpoint of CR4 ratios within the above-average concentration group (53.7%). However, because the 2012 CR4 ratio for one 3-digit industry (hospitals) lies just below this cutoff (equal to 53.3%), followed by a substantial drop in the CR4 ratio of the next most-concentrated industry (to 46.3%), we adjust this cutoff to include hospitals in the high concentration group.

We, therefore, classify industries with CR4 ratios greater than or equal to 53.3% as *high-concentration industries*, and industries with CR4 ratios greater than or equal to 18.5% but less than 53.3% as *mid-concentration industries*. In turn, we define industries with below-average concentration (CR4 ratios less than 18.5%) as *low-concentration industries*.[10] Tables 2 and 3 list the three groups of high-, mid-, and low-concentration industries for 2012. These tables also include the 2-digit sector each industry falls within; each industry's CR4 and CR8 ratio; and the percent change in CR4 and CR8 from 1997 to 2012. Table 2 lists the 31 above-average concentration industries in descending order by CR4 ratio, also distinguishing the high-concentration group (Panel A) from the mid-concentration group (Panel B). Table 2 indicates that we classify seven of the 67 3-digit industries as highly concentrated in 2012. Of these seven industries, the top six, also, experienced concentration growth between 1997 and 2012. In turn, we classify twenty-five industries as mid-concentration, and thirty-five industries as low-concentration in Table 3.

<**Table 2:** Industries with above-average levels of concentration >

<**Table 3:** Industries with below-average levels of concentration>

Most interestingly, Tables 2 and 3 show that, in 2012, high- and low-concentration industries lie in different sectors of economic activity. To facilitate interpretation of these tables, Table 4 summarizes the sectoral composition of low-, mid-, and high-concentration industries by reporting the number of 3-digit industries within each concentration group (low, mid, or high) *and* 2-digit sector, as well as these industries' revenue share in the sample. Panel A presents these calculations for 2012; in turn, Panel B presents these calculations for 1997, which we return to below. To contextualize each 2-digit sector's size within the broader sample, Column 4 also presents this information for the full sample. For example,

[10] Clearly, these cutoffs can be defined in different ways. Importantly, however, the main conclusions are robust to alternative cutoffs. In Section 3, this robustness is clear from visual inspection, and in Sections 4 and 5 we include robustness analyses in the Appendix. The main qualitative conclusions are, similarly, not sensitive to moving hospitals to the mid-concentration group.

Column 1 of Panel A indicates that, of the 35 low-concentration industries in 2012, more than one third (thirteen) are in manufacturing, comprising 13.9% of total revenue. In turn, Column 4 shows there are a total of 21 3-digit manufacturing industries, earning 23.1% of revenue. As such, 60.1% of overall manufacturing revenue is earned in low-concentration industries.

<**Table 4:** Low, high and mid concentration industries in 2012 and 2007 by 2-digit sectors of activity>

Column 1 of the top panel in Table 4 highlights that *low-concentration industries* fall across many sectors of economic activity, with at least one 3-digit industry in each of the thirteen sectors in our data. In revenue terms, these industries lie primarily in manufacturing and wholesale, with almost 20% of total revenue across low-concentration industries deriving from manufacturing, and 42.2% from wholesale. These shares are, also, large relative to the size of the manufacturing and wholesale sectors: 60.1% of manufacturing revenue (as noted above) and 91.9% of wholesale revenue accrues to low-concentration industries. In addition, a large share of non-retail and non-information-based service activity takes place in low-concentration industries. Specifically, we classify all 3-digit industries in professional, scientific and technical services; administrative and support services; educational services; arts, entertainment and recreation; accommodation and food services; and other services as low concentration. The majority of revenue in both administrative and support services, and health care and social assistance, also, accrues to low-concentration industries.[11]

In contrast, in 2012, *above-average concentration industries* (Columns 2 and 3 in Table 4) primarily lie in four sectors: manufacturing; retail; transportation and warehousing; and information services. Closer examination points, however, to the particular importance of the retail and information sectors. First, retail comprises approximately one third of above-average concentration industries (10 of 31 industries), and 38.5% of their revenue. Narrowing in on the high-concentration industries in Panel A of Table 2, three of the seven highly-concentrated industries are in retail (see also Table 4, Column 3). These three highly-concentrated retail industries (general merchandise stores, health and personal care stores, and electronics and appliance stores) comprise half (52.6%) of the revenue of the highly-concentrated group of industries in 2012. A lot of well-known firms are in these industries. By way of example, general merchandise stores, which has the second-highest level of concentration in 2012 and is the largest high-concentration industry, includes Walmart, Target and Costco. In the mid-concentration group, Amazon.com is the top firm by total assets in non-store retailers (row 21 in Table 2).

[11] In the health care sector, the main outlier is hospitals (NAICS 622), which fall into the high concentration category (Row 7 of Table 2). (For-profit) hospitals are, however, a small industry, accounting for 0.4% of total revenue (just less than 10% of revenue in health care). While many hospitals are non-profit institutions, only taxable establishments are included in our sample.

Second, Table 2 and Table 4a highlight that the vast majority of information-services activity takes place in industries with above-average concentration. Specifically, in 2012, five of the six of information-related industries have above-average concentration: telecommunications (which includes both AT&T and Verizon); broadcasting; other information services (which includes the parent company of Google, Alphabet Inc, as well as Ebay); motion picture & sound recording industries (like Time Warner); and publishing industries (like Microsoft). While these five industries only account for 4.4% of total revenue in the sample, they constitute 92% of information-related revenue (together, the six information-related industries account for 5.0% of revenue). One information-services industry, telecommunications, lies in the high-concentration group, with a CR4 of 55.8% in 2012. Telecommunications is notable in that it accounts not only for almost half (43.8%) of information-services revenue, but also for almost one third (28.2%) of revenue among highly-concentrated industries. As we discuss below, telecommunications firms also stand out for high markups. Last, while one information-related industry falls in the low-concentration group in 2012 (data processing, hosting and related services), it ranks among the most concentrated industries in this group (row 3 of Table 3).

Table 4 also suggests both transportation and warehousing, and manufacturing play important roles among above-average concentration industries. At first glance, transportation and warehousing, in particular, stands out among high-concentration industries (see also Panel A of Table 2). Not only are two of the seven high-concentration industries in transportation and warehousing, but the airline industry registers a remarkable, and well-known, increase in concentration of 176.6% between 1997 and 2012. However, transportation and warehousing accounts for a small share of the total sample (2.9% of revenue), and only 5.2% of all above-average concentration industries' revenue. Finally, while approximately one quarter of above-average concentration industries are in manufacturing, a larger share of manufacturing activity falls within the low concentration group, in terms of both the number of 3-digit industries and revenue.

In short, Tables 2, 3 and 4 show that, in 2012, high- and low-concentration industries lie in different sectors of economic activity: among high-concentration industries both the retail and information-services sectors have a substantial weight, whereas low-concentration industries are relatively more spread across the thirteen broad sectors of economic activity. Of course, these high-, mid-, and low-concentration groups also have different weights within the economy. High-concentration industries constitute 7.8% of sample revenue, and mid-concentration industries constitute 22.4%, whereas the low-concentration group constitutes 69.8% of our sample. The small weight of highly-concentrated industries raises some doubts about whether concentration ratios themselves explain macroeconomic trends in terms of low investment, high markups, and high profitability. We explore these trends further in Sections 4 and 5, below.

The discussion up to now focuses on the *level* of concentration in 2012; the next natural question involves identifying whether there are important patterns in the set of industries responsible for the increase in average concentration. In other words, how widespread is the increase in concentration? Does it take place in specific sectors, or across the economy? We explore these questions, first, at the level of

individual 3-digit industries and, second, at the level of broader (2-digit) sectors of economic activity. Starting with individual 3-digit industries, Table 5 ranks all 3-digit industries in descending order by the percent change in their CR4 ratio between 1997 and 2012. Table 5 also lists each industry's 2-digit sector of activity; its CR4 ratio in 2012; and whether we categorize the industry as low-, mid-, or high-concentration in both 1997 and 2012. Consistent with the previous literature (see, for example, Grullon *et al.* 2018), Table 5 highlights a widespread increase in concentration across 3-digit industries: as measured by their CR4, more than 70% of 3-digit industries become more concentrated after 1997.[12] Furthermore, and in contrast to the small revenue share of high-concentration industries, the weight of industries with growing CR4 ratios is large, accounting for approximately two thirds (67.8%) of total revenue.

On closer inspection, however, Table 5 also raises an important caveat about analyzing the change in concentration at the level of individual 3-digit industries. As an example, consider the retail sector. All twelve 3-digit industries comprising retail become more concentrated after 1997, with CR4 growth ranging from 32.2% (general merchandise stores) to 212.5% (motor vehicle parts and dealers). Motor vehicle parts and dealers has, in fact, the *highest* percent CR4 growth across 3-digit industries. However, because of its low initial CR4 ratio (1.6% in 1997), it remains one of the *least* concentrated 3-digit industries in 2012 (row 31 of Table 3). In contrast, while general merchandise stores has the smallest percent change in CR4 among retail industries, it is the second-most-concentrated industry, in levels, in 2012. The reason lies in a much higher initial level of concentration (55.9%). To circumvent this issue, we also summarize Table 5 with an eye to capturing 'large' changes in concentration, proxied by switches from the low- to mid-concentration, or the mid- to high-concentration groups. In other words, rather than asking what share of industries are *more* concentrated, we ask what share of industries experience *large* increases in concentration. By this metric, 16 of 67 (23.8%) 3-digit industries register a large increase in concentration: twelve industries jump from the low- to mid-concentration category, and four industries jump from the mid- to high-concentration category.

< **Table 5:** Industries ranked by percent change in concentration ratio between 1997 and 2012>

These issues with analyzing concentration growth for individual 3-digit industries suggest that the sectoral level may yield a clearer description of the increase in average concentration. We, therefore, ask if concentration growth has taken place across all major sectors, or if it is limited to a specific set of sectors, and approach this question in two steps. First, Panel B of Table 4 summarizes the sectoral composition of low-, mid-, and high-concentration industries in 1997 by reporting the number of 3-digit industries within each group and 2-digit sector, and these industries' revenue share in the sample (i.e. reproduces the

[12] Accommodation (NAICS 721; Row 48 in Table 5) experienced a slightly positive rate of growth in concentration in the next decimal places, such that concentration grows in 48 of the 67 3-digit industries.

analysis shown for 2012 in Panel A for the first year of our sample period).[13] Second, Table 6 turns explicitly to the (2-digit) sector level, and records the change in average concentration within each sector, as well as a series of counterfactuals describing the change in average concentration when sequentially dropping 2-digit sectors.

Comparing Panel A and B of Table 4 highlights, first, that – consistent with the increase in average concentration after 1997 – the number of 3-digit industries classified as high- and mid-concentration increases between 1997 and 2012, from 3 to 7 and from 21 to 25 respectively. Second, Table 4 points to the retail and information-related industries, in this case for explaining not only the *level* of concentration in 2012 (from Panel A), but also the increasing incidence of highly-concentrated 3-digit industries after 1997. In the case of retail, not only is there is a net increase of three retail industries in the mid- or high-concentration groups, but the share of retail-related revenue accruing to industries with mid- or high-concentration rises from 48.6% to 66.1% in 2012 – even as the size of the retail sector remains relatively stable (falling slightly from 18.3% to 17.1% of revenue). In the case of information, there is an expansion in both the number and revenue share of 3-digit information-services industries in the mid- and high-concentration categories, from three in 1997 (with 3.3% of total revenue) to six by 2012 (with 5% of revenue).[14]

Thus, Table 4 suggests a key role for the retail and information sectors in driving increased concentration; however, it is difficult to narrow in on the relative importance of different sectors via the simple comparison between Panel A and Panel B of Table 4. To further clarify which sectors explain the increase in average concentration, we present two final sets of calculations in Table 6. In Panel A, we record the average change in concentration across the 3-digit industries in each 2-digit sector. Then, in Panel B, we calculate the percent change in the CR4 ratio between 1997 and 2012 when sequentially *excluding* each of the thirteen 2-digit sectors from the sample. Panel B allows us to consider each sector's contribution to the aggregate increase in concentration while accounting for that sector's change in concentration and size. We summarize this information in the final column of Panel B, which records the ratio of the percent change between 1997 and 2012 when excluding the sector (in the case of utilities, for instance, 27.4%) to the percent change for the full sample (26.8%, from Table 1). If this ratio is equal to one, it suggests the excluded sector does not exert significant pressure on average concentration (due

[13] Eight 3-digit industries, in the wholesale and information sectors, do not exist in their current classification in 1997. The wholesale sector, which is divided between durable and nondurable goods in 1997, is reorganized in 2002 to instead distinguish wholesale agents and brokers (NAICS 425) from merchant wholesalers (in durable, 423, or nondurable, 424, goods). In addition, the information sector is reorganized by 2012, to include 511 (publishing industries, except internet), 515 (broadcasting, except internet), 517 (telecommunications), 518 (data processing, hosting and related services), and 519 (other information services).

[14] Five of the six new 3-digit codes between 1997 and 2012 are in information services. For example, in 1997 telecommunications is classified with broadcasting under NAICS code 513. By 2012, these two industries are disaggregated into telecommunications (517) and broadcasting (515). Despite these code changes, it is notable that both telecommunications and broadcasting have increasing CR4 ratios over this period, from 31.9% in 1997 to 55.8% (telecommunications) and 43.0% (broadcasting) in 2012.

either to small size or because its change in concentration lies near the average). When the ratio is less than one, it indicates that the overall increase in average concentration shrinks when excluding the sector in question, such that the sector's *inclusion* yields a *larger* increase in average concentration. In other words, the excluded sector helps explain rising average concentration. On the other hand, if the ratio is greater than one, excluding the sector in question yields a bigger change in concentration than otherwise observed for the full sample, such that the excluded sector depresses the overall rise in average concentration.

< **Table 6:** What sectors drive the increase in concentration?>

Table 6 highlights three main points. First, the U.S. economy has experienced a broad-based increase in concentration, with the average CR4 ratio increasing across eight of thirteen sectors between 1997 and 2012. These calculations are consistent with the share of 3-digit industries experiencing CR4 growth in Table 5. In addition, the five sectors with declining concentration are both small in revenue terms (see Table 4), and experience small-scale declines in their CR4 ratios, particularly in comparison to sectors with rising concentration.

Second, Table 6 reinforces the importance of retail and information services for understanding rising average concentration. The average CR4 ratio across 3-digit retail industries, in particular, grows a striking 87.1%, from 19.1% in 1997 to 31.0% in 2012, followed by information (with a 69.2% increase in concentration), and transportation and warehousing (with an increase of 62.6%). Furthermore, the bottom panel of Table 6 highlights that, if we exclude retail, growth in average concentration falls from 26.8% (for the full sample) to 17.3%. The ratio of the percent change in the CR4 when excluding retail to the percent change in the CR4 across all sectors is, accordingly, substantially less than one (0.65). Put differently, by *including* retail in the sample, we observe a substantially greater increase in average concentration. As the size of the retail sector is quite stable, these calculations highlight an important increase in concentration *within* retail (rather than growth of an already-concentrated sector). Panel B, similarly, indicates that the information sector puts upward pressure on the overall change in concentration, although to a smaller extent than retail.

Third, Table 6 gives insight into sectors that offset the rise in average concentration. Of particular note is manufacturing: excluding manufacturing yields far greater growth in the average CR4 ratio (of 40.4%, as compared to 26.8% observed across the full sample). Manufacturing is, in fact, the only sector for which its exclusion yields a ratio in the final column of Table 6 substantially larger than one. Thus, while concentration in manufacturing *does* rise (as shown in Panel A), it rises *less quickly* than the average. Aside from retail, information and manufacturing, all remaining sectors have values in the final column close to one; in other words, they fail to exert substantial pressure on the full-sample trend.

In short, the discussion in this section highlights at least three main points. First, low- and high-concentration industries operate in different sectors of economic activity, with low concentration industries spread across sectors and relatively more dominated by manufacturing, and high concentration industries particularly concentrated in retail and information services. Second, we point to limitations of interpreting CR4 *growth* for individual 3-digit industries, such that – at the industry level – levels are more informative. Finally, we find that a broad-based increase in concentration has taken place across industries and sectors, but also that both retail and information services are particularly important for explaining the average trend, whereas manufacturing has become more concentrated relatively less quickly than average.

4. Concentration, profitability and investment

We now turn our attention to the evolution of profitability and investment over time and across concentration levels. Using firm-level data, we first ask in Section 4.1 whether firms in highly concentrated industries have relatively higher profit and markup rates as compared to firms in low-concentration industries. While theory predicts that higher concentration leads to higher profitability and markups, we show that the empirical evidence is less straightforward. Then in Section 4.2 we turn our attention to investment behavior and compare the investment rates of firms in different concentration groups. Again, in line with the ambiguity in theory, the link between investment rates and concentration also appears to be non-uniform.

4.1 Profitability and markups

We first look at whether firm-level profit rates vary systematically with industry-level concentration ratios. To do so, we follow the discussion in Section 3.3, and begin by dividing firms into two groups: firms in industries with above-average concentration ratios, and firms in industries with below-average concentration ratios. In Figure 1(a) we show the weighted-average profit rates across firms in each of these groups between 1995 and 2014. Disaggregating firms into these two categories shows the expected pattern wherein firms in more concentrated industries have, on average, higher profit rates than firms in less concentrated industries. However, Figure 1(b), which disaggregates the above-average-concentration industries into the mid- and high-concentration groups introduced in Section 3.3, shows that these two groups also mask important heterogeneity within the group of firms in above-average-concentration industries. Most importantly, Figure 1(b) highlights that firms in the most concentrated industries are not the firms with the highest average profit rates. Instead, the highest profit rates accrue to firms in the mid-concentration group, whereas the profitability of firms in the high-concentration group is quite similar to that of firms in low-concentration industries. As such, firms in the mid-concentration group are largely responsible for driving up the average profit rate for the above-average-concentration group.

<**Figure 1:** Average profit rates in low, mid and highly concentrated industries>

To further investigate this issue, we next calculate simple markup rates and compare them across firms in different concentration groups in Figure 2. The trends in markup rates are less regular than trends in the profit rate. Figure 2(a), again, begins by disaggregating firms into the below-average (low) concentration and above-average concentration groups, while Figure 2(b) then also distinguishes between mid- and high-concentration firms. Figure 2(a) suggests that firms in below-average concentration industries have consistently *higher* markups than firms in above-average-concentration industries. This pattern is reiterated by Figure 2(b), apart from the period between 2005 and 2009, during which time firms in high-concentration industries have the highest markups. This jump in the markup rate of the high-concentration group after 2004 reflects two new industries joining the high-concentration group in the 2007 census, both of which have higher-than-average markups: health and personal care stores, and telecommunications. Telecommunications, in particular, stands out with markups averaging 1.13 over the full sample period. Furthermore, while average markups in telecommunications are always high, it is notable that they also increase *within* telecommunications over time, as the industry becomes more concentrated, from an average of 0.95 from 1995 to 2004, to an average of 1.4 from 2005 to 2014.

It is, however, also important to note that – unlike the other figures in Sections 4 and 5 – the patterns shown in Figure 2 are sensitive to the specific cutoffs chosen to define low-, mid- and high-concentration industries, suggesting a non-uniform pattern in markups across the distribution of concentration ratios. To highlight this non-uniformity, we look at the weighted average markups across all firms in each decile and ventile of CR4 ratios in Figure 3. The top panel of Figure 3 highlights that the highest markup firms fall at the lower bound of the high-concentration group, with CR4 ratios between 50 and 60 percent. While this could be considered evidence of high markups among firms in high-concentration industries, we also observe the lowest markups among firms within the group where CR4 is greater than 80 percent, although it is important to note that only one industry (couriers and messengers) falls within this decile.[15] There is, also, a second cluster of high-markup firms in industries with CR4 ratios between 10 and 20 percent that drive up average markups among the low-concentration industries. Aside from these two groups, markups display a remarkably constant distribution across concentration levels. When we do the same analysis with finer increments and look at each ventile, we see a similar pattern in which the highest markups accrue to firms in industries with CR4 ratios between 55 and 60 percent and 15 and 20 percent.

Which industries are responsible for these high markups? Consistent with the discussion of Figure 2, above, high average markups across firms with concentration ratios between 55 and 60 percent are driven by two industries: health and personal care stores, and telecommunications. Thus, information services play a key role driving high markups within high-concentration industries. Similarly, while there is a larger and more heterogeneous group of industries with CR4 ratios between 15 and 20 percent, information

[15] There are 129 observations describing firms in industries with CR4 ratios between 80 and 90 percent, all in couriers and messengers. Note, also, that the highest C4 ratio in our sample is 89.9%, such that no industries have CR4 ratios above 90%.

services again stand out for driving high average markups among this group of firms.[16] In contrast, while many retail industries have above-average concentration, firms in retail tend to have slightly below-average markups. This evidence suggests that, even as markups do increase *within* most sectors over this time, the overall relationship between concentration and markups is strongly mediated by the specific industries that are, or are not, highly concentrated. In short, while we do not observe a uniform relationship between markups and industry concentration ratios, we find evidence of increasing average markups within specific industries, namely information services.

<**Figure 2:** Average markups in low, mid, and highly concentrated industries >

< **Figure 3**: Average markups across deciles of the CR4 ratio>

4.2 Investment

Next, we investigate whether investment rates are systematically lower for firms in high-concentration industries as compared to for firms in lower-concentration industries. Again, using the categories in Section 3.3, we first show the investment rate for firms in industries with above- and below-average concentration ratios in Figure 4(a). This figure shows that investment rates are in fact higher for firms in the above-average-concentration group, although there is a sharp decline in this rate in the early 2000s. Notably, as shown in Section 3.2, this early part of the sample period is when the bulk of the increase in concentration took place. In turn, average investment rates are lower for firms in the below-average-concentration group, but with the same trend. When we disaggregate the above-average-concentration group into high-concentration and mid-concentration groups in Figure 4(b), we observe an increase in the rate of investment for the firms in mid-concentration industries in the late 1990s, followed by a sharp decline in the early 2000s. For the rest of the period, the investment rates of firms in all industrial concentration groups largely move together, while they are higher for the firms in the high-concentration group in the 2000s and in the mid-concentration group in the 2010s.

< **Figure 4**: Average investment rates in low, mid, and highly concentrated industries>

5. Capital and intangible intensities

5.1 Capital intensity

[16] Three industries stand out in this group for their high mark-ups: publishing industries (except internet); data processing, hosting and related services; and electronic equipment, appliance and component manufacturing. The first two are in the information services sector and, while the third falls in manufacturing, it also has a technology orientation.

Section 4 shows that more concentrated industries do not necessarily have higher profit and markup rates or lower levels of investment. One potential explanation for comparatively lower levels of profitability in high-concentration industries could be their capital intensity. If these industries are more capital intensive, compared with the low- and mid-concentration industries, than their profitability could be pulled down by the large denominator. There is an economic logic to expect these industries to have higher capital intensity: Steindl (1952), for example, argues that firms in concentrated markets can maintain higher levels of excess capacity as a barrier to entry and the "average cost of larger equipment with excess capacity is smaller than average cost of smaller equipment with full capacity. So that long run cost curve declines" (p. 10). Could this mean that firms in our most-concentrated group have larger capital stocks, such that their profit rate, measured as profits relative to the capital stock, is lower? In Figure 5 we explore this possibility by comparing average capital intensity, defined as a firm's fixed capital stock divided by its output, across firms in low-, mid- and high-concentration industries.[17] Figure 5(a) shows that, contrary to the hypothesis laid out above, capital intensity in above-average concentration industries is lower than in below-concentration industries, and is declining over time. Figure 5(b), furthermore, shows that the mid-concentration group in general has lower capital intensity and, while the high-concentration group has rising capital intensity from 1995 to 2000, this group's capital intensity then falls sharply below the capital intensity of the low-concentration group.

<**Figure 5**: Average capital intensity in low, mid, and highly concentrated industries>

5.2 Intangible intensity

As capital intensity does not provide an explanation relatively lower profit rates in highly-concentrated industries, we then ask whether we can answer the question from the other side, by instead explaining the relatively higher profit rates of low- and mid-concentration industries. A potential explanation for higher profitability and sometimes higher markups in these industries could be that firms in these industries exercise some other form of market power. Pagano (2014) and Orhangazi (2019), for example, point out that firms have begun to use intangible assets, especially intellectual property rights (including patents, copyrights, trademarks, brand names etc.), to increase their market power and hence profitability. To explore this possibility, we use Compustat estimates of intangible assets net of goodwill as a percentage of fixed capital stock to describe intangible asset intensity, and analyze the evolution of intangible intensity over time for firms in industries with different levels of concentration. Figure 6(a) shows that intangible intensity is higher in the below-average concentration group than in the above-average concentration

[17] In Section 5, which looks at the evolution of stocks over time (stocks of capital, and of intangibles), we categorize each industry as low-, mid-, or high-concentration based on its CR4 ratio in 2012, and do not allow industries to switch categories over time. By doing so, we are able to explore how the level of concentration affects the evolution of the stocks of these assets over time.

group. In turn, Figure 6(b) shows that the intangible intensity of the high-concentration group declines in the 2000s relative to the low- and mid-concentration groups, and that by the end of the period the low-concentration group has on average become more intangible intensive, while the intangible intensity of the mid- and high-concentration groups is approximately constant. Therefore, it is quite possible that market power through the use of intangible assets may be leading to higher profits, even in the absence of market power through industrial concentration.

<**Figure 6**: Average intangible intensity across firms in low, mid, and highly concentrated industries>

6. Discussion and concluding remarks

A few concluding remarks are in order. **First**, an increase in average concentration has taken place across U.S. industries between 1997 and 2012, with the majority of this increase taking place in the late 1990s and the early 2000s. While this average increase in concentration has an important within-industry dimension, wherein a majority of U.S. industries have become more concentrated since the late 1990s, we also highlight that a notable share of concentration growth is driven by industries operating within the retail and information-services sectors. Turning, **second**, to the consequences of rising concentration, our theoretical discussion shows a certain degree of ambiguity regarding the expected relationship between concentration and profitability or investment. Our empirical findings, which do not show a clearly uniform relationship between the level of industrial concentration and profitability, markups, or investment rates, can be considered in line with this theoretical ambiguity. Our results regarding profitability, in particular, show that highly-concentrated industries are not the most profitable (instead, mid-concentration industries earn the highest profit rates) and, with a couple of sector-specific expectations – namely, in information services – they do not charge the highest markups.

Third, importantly, the absence of uniform, monotonic relationships between the level of industrial concentration and average profitability, markups, or investment, leads us to hypothesize the existence of three different cases. **(i)** First, it is possible to identify industries with behavior consistent with a 'standard' story in which firms in industries with high (low) levels concentration have high (low) profit rates, earn high (low) markups, and have low (high) rates of investment. In this case, high concentration is indicative of low competition, allowing firms in highly-concentrated industries to capture monopoly profits. The analysis in our paper suggests that information-services firms may fit within this case. **(ii)** In turn, there are highly-concentrated industries in which firms have, on average, low profitability, low markups, and average investment. Retail, as well as some highly-concentrated industries in the transportation sector (e.g. couriers and messengers or airlines) may fit in this scenario. In notable contrast to the 'standard' story, this scenario suggests that, in some cases, increased monopolization and intensified competition may go hand in hand. As such, while it has been argued that increased concentration can push down prices when rising

concentration derives from productivity increases, this case suggests that it is also quite possible that higher concentration pushes down prices by generating more intense competition among the dominant large firms. This possibility may be especially likely to play out in the absence of a co-respective competitive regime in these industries, such that firms compete intensely with each other to guarantee or increase their market shares, and/or to drive competitors out of the market. If, in particular, the threat of entry is high, then this state of intense competition can curtail high-concentration industries' markups and profitability. Furthermore, the irreversibility of investment, which makes exit costly, means that monopolization can trap firms with below-average profit rates. **(iii)** Finally, the set of low- and mid-concentration industries in which firms earn high profit rates and markups, suggest that industrial concentration is not the only form of market power. In these industries, firms with small market shares may still have market power, for instance through intangible assets, that allows them to increase their markups and profitability.

Finally, it is relevant to note that at least two shortcomings of the data may also be important in explaining the trends we observe. In turn, these limitations highlight important directions for future research. First, while the industry-level (census) data does account for the domestic market share of foreign firms, we do not explicitly consider the effects of international competition. If the degree of international competition is high in certain industries, then markups may not be high despite high domestic concentration, as higher imports may compensate for higher domestic concentration. In fact, rising international competition may also be responsible for driving increased domestic concentration, as smaller units may not be able to withstand to international competition. Similarly, demand-side constraints may prevent some firms in high-concentration industries from charging higher markups. Second, the industrial concentration data may not always delineate relevant markets from the perspective of competition, as these markets could be both regional or local, or product-based (rather than industry-based). In particular, firms in some mid-concentration industries that earn high markups and profit rates may have local monopolies when geography is considered. Similarly, while our analysis assigns each firm to one unique industry, large firms may be important players in multiple product markets that span more than one industrial classification. Industry-level measures of concentration ratios may, therefore, underestimate these firms' degree of market power.

All in all, this paper shows that there is still much space, and need, for theoretical and empirical studies to understand the current trends in industrial concentration and dynamics of competition and monopolization in the U.S. economy. As such, our study may be raising more questions than it answers and there is an obvious need for detailed industry level studies.

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TABLES

Table 1: Change in concentration ratios over time across 3- and 4-digit industries

	1997	2002	2007	2012	Percent change (1997–2012)
Panel A: 3-digit industries					
Median					
CR4	14.3	16.8	17.3	16.3	14.0
CR8	21.5	25.0	24.7	24.7	14.9
CR20	31.2	37.2	36.4	36.1	15.7
CR50	41.5	47.0	46.7	47.5	14.5
Simple mean					
CR4	18.7	21.7	22.4	22.5	20.6
CR8	25.6	29.1	30.1	30.4	18.6
CR20	35.6	39.5	40.4	41.0	15.0
CR50	45.8	49.5	50.4	50.8	11.1
Weighted mean					
CR4	14.6	18.1	18.2	18.5	26.8
CR8	20.6	24.8	25.1	26.1	27.1
CR20	29.6	34.1	34.5	36.0	21.9
CR50	39.3	43.4	44.0	45.6	16.1
Panel B: 4-digit industries					
Median					
CR4	19.9	21.2	22.0	22.7	14.1
CR8	27.6	30.5	30.0	31.6	14.5
CR20	40.6	44.1	44.2	44.4	9.4
CR50	54.5	58.6	58.4	58.8	7.9
Simple mean					
CR4	23.3	25.9	26.4	26.9	15.3
CR8	31.5	34.7	35.2	35.8	13.7
CR20	42.7	45.8	46.4	47.4	11.1
CR50	53.3	56.1	56.7	58.1	9.0
Weighted mean					
CR4	22.3	26.3	26.4	27.4	23.1
CR8	30.7	35.2	35.4	36.7	19.6
CR20	41.7	45.6	46.6	48.6	16.4
CR50	51.8	54.9	56.6	58.8	13.4

Source: Authors' calculations from the Census Bureau.

Note: Weighted means are across-industry averages weighted by industry-level revenue. For variable definitions, see Section 3.1.

Table 2: Industries with above-average levels of concentration
(Industries ranked by CR4 at 3-digit level)

	NAICS	Industry name	2-digit sector	CR4	CR8	% Δ in CR4 (1997-2012)	% Δ in CR8 (1997-2012)
Panel A: High concentration industries							
1.	492	Couriers & messengers	Transportation & warehousing	88.0	89.1	14.4	5.4
2.	452	General merchandise stores	Retail trade	73.9	84.9	32.2	14.6
3.	446	Health & personal care stores	Retail trade	60.0	63.1	53.5	30.6
4.	481	Air transportation	Transportation & warehousing	56.7	71.7	176.6	143.1
5.	517	Telecommunications*	Information	55.8	71.1	22.4	12.1
6.	443	Electronics & appliance stores	Retail trade	54.1	60.6	44.7	41.6
7.	622	Hospitals	Health care & social assistance	53.3	68.8	-19.6	-8.8
Panel B: Mid concentration industries							
8.	444	Building material, garden equipment & supplies dealers	Retail trade	46.3	50.7	163.1	135.8
9.	324	Petroleum & coal products manufacturing	Manufacturing	45.0	68.6	73.1	55.2
10.	515	Broadcasting (except internet)*	Information	43.0	61.4	4.4	7.0
11.	519	Other information services*	Information	41.9	53.1	36.5	18.3
12.	312	Beverage & tobacco product manufacturing	Manufacturing	41.3	62.0	-8.4	4.9
13.	483	Water transportation	Transportation & warehousing	37.9	51.7	22.7	26.1
14.	512	Motion picture & sound recording industries	Information	32.2	44.2	3.5	-3.9
15.	322	Paper manufacturing	Manufacturing	29.5	41.9	59.5	34.7
16.	336	Transportation equipment manufacturing	Manufacturing	29.0	42.2	-41.6	-27.0
17.	562	Waste management & remediation services	Administrative & Support	28.6	34.6	-22.5	-20.5
18.	445	Food & beverage stores	Retail trade	26.9	38.5	47.0	27.5
19.	511	Publishing industries (except internet)*	Information	26.0	32.2	42.1	25.3
20.	451	Sporting goods, hobby, musical instrument, book stores	Retail trade	25.6	40.2	11.8	29.3
21.	454	Non-store retailers	Retail trade	25.3	31.7	61.1	53.1
22.	425	Wholesale electronic markets & agents & brokers*	Wholesale trade	24.8	32.1	-8.1	5.2
23.	314	Textile product mills	Manufacturing	24.8	31.3	8.8	-1.9
24.	486	Pipeline transportation	Transportation & warehousing	24.3	44.5	-27.0	-10.8
25.	316	Leather & allied product manufacturing	Manufacturing	23.0	36.8	21.1	17.2
26.	453	Miscellaneous store retailers	Retail trade	21.7	27.5	19.9	24.4
27.	331	Primary metal manufacturing	Manufacturing	21.5	31.5	55.8	41.3
28.	313	Textile mills	Manufacturing	20.6	29.3	49.3	35.0
29.	485	Transit & ground passenger transportation	Transportation & warehousing	20.6	25.3	15.7	18.2
30.	493	Warehousing & storage	Transportation & warehousing	20.5	27.1	69.4	54.0
31.	448	Clothing & clothing accessories stores	Retail trade	19.9	27.3	11.2	4.2
32.	442	Furniture & home furnishings stores	Retail trade	19.4	26.0	198.5	154.9

Source: Authors' calculations from the Census Bureau.

Notes: The table lists 3-digit industries with above-average levels of concentration, ranked in descending order by CR4 ratio. If two industries have identical CR4 ratios, they are ranked in descending order by CR8 ratio. Average concentration is the weighted average across-industry CR4 ratio in 2012, with each industry weighted by total revenue. As described in Section 3.3, industries are included in this table if their CR4 ratio in 2012 exceeds or is equal to this across-industry average. High and mid CR industries are distinguished by the mid-point among above-average CR industries, adjusted to include hospitals in the high CR group. In addition to the name of the 3-digit industrial industry, the table lists the corresponding 2-digit sectors, the CR4 ratio, the CR8 ratio, and the percent change in both the CR4 and CR8 ratios between 1997 and 2002. Industries that do not exist in their current classification in 1997 are marked with an *, and their percent changes are calculated between 2002 and 2012. For other variable definitions and details describing the sample, see Section 3.1.

Table 3: Industries with below-average levels of concentration
(Industries ranked by CR4 at 3-digit level)

	NAICS	Industry name	2-digit sector	CR4	CR8	% Δ in CR4 (1997-2012)	% Δ in CR8 (1997-2012)
1	335	Electrical equipment, appliance, & component mfg.	Manufacturing	17.2	24.7	16.2	6.5
2	311	Food manufacturing	Manufacturing	16.3	24.2	14.0	10.0
3	518	Data processing, hosting, & related services*	Information	15.9	22.6	-52.0	-42.9
4	721	Accommodation	Accommodation, food services	15.7	23.4	0.0	7.8
5	323	Printing & related support activities	Manufacturing	15.3	19.3	59.4	37.9
6	221	Utilities	Utilities	15	25.7	2.0	12.2
7	333	Machinery manufacturing	Manufacturing	15	19.8	30.4	26.9
8	325	Chemical manufacturing	Manufacturing	14.7	24	23.5	31.9
9	447	Gasoline stations	Retail trade	13.3	21.1	98.5	95.4
10	487	Scenic & sightseeing transportation	Transportation & warehousing	13	20.7	3.2	5.6
11	337	Furniture & related product manufacturing	Manufacturing	12.6	19.7	12.5	11.9
12	339	Miscellaneous manufacturing	Manufacturing	11.7	17.9	58.1	57.0
13	334	Computer & electronic product manufacturing	Manufacturing	10.8	18.5	-43.5	-34.2
14	424	Merchant wholesalers, nondurable goods	Wholesale trade	10.6	18.4	21.8	29.6
15	623	Nursing & residential care facilities	Health care & social assistance	10.5	16.1	-21.1	-19.1
16	315	Apparel manufacturing	Manufacturing	10.3	15	-41.5	-35.3
17	812	Personal & laundry services	Other services	9.4	13.1	13.3	8.3
18	713	Amusement, gambling, & recreation industries	Arts, entertainment, recreation	9.3	13.6	-14.7	-12.8
19	327	Nonmetallic mineral product manufacturing	Manufacturing	9.2	15.9	1.1	-3.0
20	321	Wood product manufacturing	Manufacturing	9.2	14.9	-12.4	-10.8
21	423	Merchant wholesalers, durable goods	Wholesale trade	8.8	13.8	-40.5	-30.3
22	326	Plastics & rubber products manufacturing	Manufacturing	8.5	13.8	3.7	21.1
23	561	Administrative & support services	Administrative & Support	8.5	11	112.5	71.9
24	624	Social assistance	Health care & social assistance	8	10.5	-25.9	-23.9
25	484	Truck transportation	Transportation & warehousing	7.9	12.6	5.3	5.9
26	712	Museums, historical sites, & similar institutions	Arts, entertainment, recreation	7.9	12.4	-66.4	-58.9
27	611	Educational services	Educational services	6.9	10	25.5	19.0
28	722	Food services & drinking places	Accommodation, food services	6.3	9.9	-1.6	3.1
29	711	Performing arts, spectator sports, & related industries	Arts, entertainment, recreation	6	9.2	87.5	70.4
30	488	Support activities for transportation	Transportation & warehousing	5.9	10	-37.9	-25.4
31	441	Motor vehicle & parts dealers	Retail trade	5	8.1	212.5	211.5
32	621	Ambulatory health care services	Health care & social assistance	4.3	6.6	48.3	34.7
33	541	Professional, scientific, & technical services	Prof., sci. & technical services	4.1	7.1	-2.4	4.4
34	332	Fabricated metal product manufacturing	Manufacturing	3.9	6.5	11.4	12.1
35	811	Repair & maintenance	Other services	2.3	3.6	-37.8	-26.5

Source: Authors' calculations from the Census Bureau.

Notes: The table 3-digit lists industries with below-average levels of concentration, ranked in descending order by CR4 ratio. If two industries have identical CR4 ratios, they are ranked in descending order by CR8 ratio. As described in Section 3.3, average concentration is the weighted average across-industry CR4 ratio in 2012, with each industry weighted by total revenue. Industries are included in this table if their CR4 ratio in 2012 is less than this across-industry average. In addition to the name of the 3-digit industrial industry, the table lists the corresponding 2-digit sectors, the CR4 ratio, the CR8 ratio, and the percent change in both the CR4 and CR8 ratios between 1997 and 2002. Industries that do not exist in their current classification in 1997 are marked with a *, and their percent changes are calculated between 2002 and 2012. For other variable definitions and details describing the sample, see Section 3.1.

Table 4: Low, high and mid concentration industries in 2012 and 2007 by 2-digit sectors of activity (Industries defined at 3-digit level)

NAICS	2-digit sector	(1) Low CR4		(2) Mid CR4		(3) High CR4		(4) Full sample	
		N	% of rev	N	% of rev	N	% of rev	N	% of rev
Panel A: 2012									
22	Utilities	1	2.2%	0	–	0	–	1	2.2%
31-33	Manufacturing	13	13.9%	8	9.3%	0	–	21	23.1%
42	Wholesale	2	29.5%	1	2.6%	0	–	3	32.1%
44-45	Retail	2	5.8%	7	7.2%	3	4.1%	12	17.1%
48-49	Transportation & warehousing	3	1.4%	4	0.6%	2	1.0%	9	3.0%
51	Information	1	0.4%	4	2.4%	1	2.2%	6	5.0%
54	Prof., sci. & technical services	1	5.9%	0	–	0	–	1	5.9%
56	Administrative & support services	1	2.4%	1	0.3%	0	–	2	2.7%
61	Educational services	1	0.2%	0	–	0	–	1	0.2%
62	Health care & social assistance	3	3.7%	0	–	1	0.4%	4	4.1%
71	Arts, entertainment, recreation	3	0.8%	0	–	0	–	3	0.8%
72	Accommodation, food services	2	2.9%	0	–	0	–	2	2.9%
81	Other services	2	0.9%	0	–	0	–	2	0.9%
	Total, 2012	**35**	**69.8%**	**25**	**22.4%**	**7**	**7.8%**	**67**	**100%**
Panel B: 1997									
22	Utilities	1	3.1%	0	–	0	–	1	3.1%
31-33	Manufacturing	14	17.5%	7	11.0%	0	–	21	28.5%
42	Wholesale	2	30.2%	0	–	0	–	2	30.2%
44-45	Retail	5	9.4%	6	6.4%	1	2.5%	12	18.3%
48-49	Transportation & warehousing	5	1.5%	3	0.5%	1	0.3%	9	2.4%
51	Information	0	–	3	3.3%	0	–	3	3.3%
54	Prof., sci. & technical services	1	4.3%	0	–	0	–	1	4.3%
56	Administrative & support services	1	1.9%	1	0.3%	0	–	2	2.2%
61	Educational services	1	0.1%	0	–	0	–	1	0.1%
62	Health care & social assistance	3	2.8%	0	–	1	0.3%	4	3.1%
71	Arts, entertainment, recreation	2	0.6%	1	0.0%	0	–	3	0.6%
72	Accommodation, food services	2	2.6%	0	–	0	–	2	2.6%
81	Other services	2	1.2%	0	–	0	–	2	1.2%
	Total, 1997	**39**	**75.4%**	**21**	**21.6%**	**3**	**3.1%**	**63**	**100%**

Source: Authors' calculations from the Census Bureau.

Notes: Columns 1-3 list the number (N) and revenue share (% of rev) of all 3-digit industries within each broader 2-digit sector of economic activity for the groups of low, mid, and high concentration industries listed in Tables 2 and 3. Revenue share is total revenue of all 3-digit industries within both a particular concentration group and 2-digit sector relative to total revenue in the sample in 2012 (Panel A) and in 1997 (Panel B). Column 4 lists the total number of 3-digit industries and revenue share within each sector. The row totals for 'N' and '% of rev' in Columns 1-3 equal the values in Column 4. For other variable definitions and details describing the sample, see Section 3.1.

Table 5: Industries ranked by percent change in concentration ratio between 1997 and 2012
(Industries ranked by the percent change in CR4 at 3-digit level)

	NAICS	Industry name	2-digit sector	% Δ in CR4 (1997-2012)	CR4 (2012)	Low, mid, or high CR4 (1997)	Low, mid, high CR4 (2012)
1.	441	Motor vehicle & parts dealers	Retail trade	212.5	5	Low	Low
2.	442	Furniture & home furnishings stores	Retail trade	198.5	19.4	Mid	Low
3.	481	Air transportation	Transportation & warehousing	176.6	56.7	High	Mid
4.	444	Building material, garden equipment, supplies dealers	Retail trade	163.1	46.3	Mid	Low
5.	561	Administrative & support services	Administrative & Support	112.5	8.5	Low	Low
6.	447	Gasoline stations	Retail trade	98.5	13.3	Low	Low
7.	711	Performing arts, spectator sports, & related industries	Arts, entertainment, recreation	87.5	6	Low	Low
8.	324	Petroleum & coal products manufacturing	Manufacturing	73.1	45	Mid	Mid
9.	493	Warehousing & storage	Transportation & warehousing	69.4	20.5	Mid	Low
10.	454	Nonstore retailers	Retail trade	61.1	25.3	Mid	Low
11.	322	Paper manufacturing	Manufacturing	59.5	29.5	Mid	Low
12.	323	Printing & related support activities	Manufacturing	59.4	15.3	Low	Low
13.	339	Miscellaneous manufacturing	Manufacturing	58.1	11.7	Low	Low
14.	331	Primary metal manufacturing	Manufacturing	55.8	21.5	Mid	Low
15.	446	Health & personal care stores	Retail trade	53.5	60	High	Mid
16.	313	Textile mills	Manufacturing	49.3	20.6	Mid	Low
17.	621	Ambulatory health care services	Health care & social assistance	48.3	4.3	Low	Low
18.	445	Food & beverage stores	Retail trade	47.0	26.9	Mid	Low
19.	443	Electronics & appliance stores	Retail trade	44.7	54.1	High	Mid
20.	511	Publishing industries (except internet)*	Information	42.1	26	Mid	Low
21.	519	Other information services*	Information	36.5	41.9	Mid	Mid
22.	452	General merchandise stores	Retail trade	32.2	73.9	High	High
23.	333	Machinery manufacturing	Manufacturing	30.4	15	Low	Low
24.	611	Educational services	Educational services	25.5	6.9	Low	Low
25.	325	Chemical manufacturing	Manufacturing	23.5	14.7	Low	Low
26.	483	Water transportation	Transportation & warehousing	22.7	37.9	Mid	Mid
27.	517	Telecommunications*	Information	22.4	55.8	High	Mid
28.	424	Merchant wholesalers, nondurable goods*	Wholesale trade	21.8	10.6	Low	Low
29.	316	Leather & allied product manufacturing	Manufacturing	21.1	23	Mid	Mid
30.	453	Miscellaneous store retailers	Retail trade	19.9	21.7	Mid	Low
31.	335	Electrical equipment, appliance, component mfg.	Manufacturing	16.2	17.2	Low	Low
32.	485	Transit & ground passenger transportation	Transportation & warehousing	15.7	20.6	Mid	Low
33.	492	Couriers & messengers	Transportation & warehousing	14.4	88	High	High
34.	311	Food manufacturing	Manufacturing	14.0	16.3	Low	Low
35.	812	Personal & laundry services	Other services	13.3	9.4	Low	Low
36.	337	Furniture & related product manufacturing	Manufacturing	12.5	12.6	Low	Low
37.	451	Sporting goods, hobby, musical instrument, book stores	Retail trade	11.8	25.6	Mid	Mid
38.	332	Fabricated metal product manufacturing	Manufacturing	11.4	3.9	Low	Low
39.	448	Clothing & clothing accessories stores	Retail trade	11.2	19.9	Mid	Low
40.	314	Textile product mills	Manufacturing	8.8	24.8	Mid	Mid
41.	484	Truck transportation	Transportation & warehousing	5.3	7.9	Low	Low
42.	515	Broadcasting (except internet)*	Information	4.4	43	Mid	Mid
43.	326	Plastics & rubber products manufacturing	Manufacturing	3.7	8.5	Low	Low
44.	512	Motion picture & sound recording industries	Information	3.5	32.2	Mid	Mid
45.	487	Scenic & sightseeing transportation	Transportation & warehousing	3.2	13	Low	Low
46.	221	Utilities	Utilities	2.0	15	Low	Low
47.	327	Nonmetallic mineral product manufacturing	Manufacturing	1.1	9.2	Low	Low
48.	721	Accommodation	Accommodation, food services	0.0	15.7	Low	Low
49.	722	Food services & drinking places	Accommodation, food services	-1.6	6.3	Low	Low
50.	541	Professional, scientific, & technical services	Prof., sci., & technical services	-2.4	4.1	Low	Low
51.	425	Wholesale electronic markets & agents & brokers*	Wholesale trade	-8.1	24.8	Mid	Mid
52.	312	Beverage & tobacco product manufacturing	Manufacturing	-8.4	41.3	Mid	Mid
53.	321	Wood product manufacturing	Manufacturing	-12.4	9.2	Low	Low
54.	713	Amusement, gambling, & recreation industries	Arts, entertainment, recreation	-14.7	9.3	Low	Low
55.	622	Hospitals	Health care & social assistance	-19.6	53.3	High	High
56.	623	Nursing & residential care facilities	Health care & social assistance	-21.1	10.5	Low	Low
57.	562	Waste management & remediation services	Administrative & Support	-22.5	28.6	Mid	Mid
58.	624	Social assistance	Health care & social assistance	-25.9	8	Low	Low
59.	486	Pipeline transportation	Transportation & warehousing	-27.0	24.3	Mid	Mid
60.	811	Repair & maintenance	Other services	-37.8	2.3	Low	Low
61.	488	Support activities for transportation	Transportation & warehousing	-37.9	5.9	Low	Low
62.	423	Merchant wholesalers, durable goods*	Wholesale trade	-40.5	8.8	Low	Low
63.	315	Apparel manufacturing	Manufacturing	-41.5	10.3	Low	Low
64.	336	Transportation equipment manufacturing	Manufacturing	-41.6	29	Mid	Mid
65.	334	Computer & electronic product manufacturing	Manufacturing	-43.5	10.8	Low	Mid
66.	518	Data processing, hosting, & related services*	Information	-52.0	15.9	Low	Mid
67.	712	Museums, historical sites, & similar institutions	Arts, entertainment, recreation	-66.4	7.9	Low	Mid

Source: Authors' calculations from the Census Bureau.

Notes: The table lists industries ranked in descending order by the percent change in the CR4 ratio. In addition to the name of the 3-digit industrial industry, the table lists the corresponding 2-digit sectors, the level of the CR4 ratio in 2012, and whether we classify the industry as low, mid, or high concentration in 1997 and 2012 (see Section 3.3 for details). Industries that do not exist in current classification in 1997 are marked with an *, and their percent changes are calculated between 2002 and 2012. For other variable definitions and details describing the sample, see Section 3.1.

Table 6: What sectors drive the increase in concentration?
(Change in CR4 ratio over time across 3-digit industries when sequentially dropping sectors of economic activity)

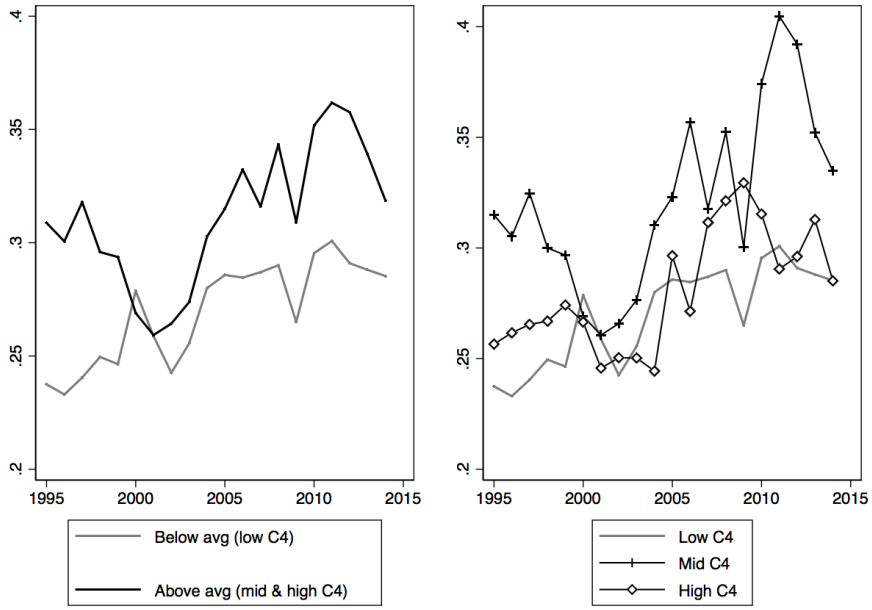
		Average CR4, 1997	Average CR4, 2012	Percent change (1997-2012)	(% change with sector excluded)/ (overall % change)
Panel A	**2-digit sector:**				
1.	Utilities	14.7%	15.0%	2.1%	–
2.	Manufacturing	19.8%	21.6%	14.5%	–
3.	Wholesale	7.9%	11.0%	17.9%	–
4.	Retail	19.1%	31.0%	87.1%	–
5.	Transportation & warehousing	21.8%	30.9%	62.6%	–
6.	Information	32.0%	41.7%	69.2%	–
7.	Prof., sci. & technical services	4.2%	4.1%	-0.7%	–
8.	Administrative & support services	8.4%	10.9%	16.9%	–
9.	Educational services	5.5%	6.9%	9.6%	–
10.	Health care & social assistance	10.6%	10.5%	-0.9%	–
11.	Arts, entertainment & recreation	8.0%	7.9%	-0.9%	–
12.	Accommodation & food services	9.0%	8.9%	-0.8%	–
13.	Other services	5.3%	5.0%	-2.4%	–
Panel B	**Excluded 2-digit sector:**				
1.	Utilities	14.6%	18.6%	27.4%	1.02
2.	Manufacturing	12.5%	17.6%	40.4%	1.51
3.	Wholesale	17.5%	22.1%	26.0%	0.97
4.	Retail	13.6%	16.0%	17.3%	0.65
5.	Transportation & warehousing	14.4%	18.2%	25.8%	0.96
6.	Information	14.0%	17.3%	23.5%	0.88
7.	Prof., sci. & technical services	15.1%	19.4%	28.9%	1.08
8.	Administrative & support services	14.8%	18.8%	27.1%	1.01
9.	Educational services	14.6%	18.6%	26.9%	1.00
10.	Health care & social assistance	14.7%	18.9%	28.1%	1.05
11.	Arts, entertainment & recreation	14.7%	18.6%	27.1%	1.01
12.	Accommodation & food services	14.8%	18.8%	27.5%	1.03
13.	Other services	14.7%	18.7%	26.7%	1.00
	All sectors	**14.6%**	**18.5%**	**26.8%**	

Source: Authors' calculations from the Census Bureau.

Notes: Panel A records the weighted average CR4 ratios across 3-digit industries in each 2-digit sector in 1997 and 2012, and the percent change in the CR4 ratio for each sector between 1997 and 2012. Panel B records the average CR4 ratio across 3-digit industries in all sectors, but *excluding* the listed sector, in 1997 and 2012, as well as the percent change between 1997 and 2012. The final column of Panel B records the ratio of the percent change between 1997 and 2012 when excluding the sector in question, to the percent change for the full sample. The weighted average CR4 across all 3-digit industries is shown in the bottom row for comparison. For other variable definitions and details describing the sample, see Section 3.1.

FIGURES

Figure 1: Average profit rates in low, mid and highly concentrated industries
(Industries defined at the 3-digit level)

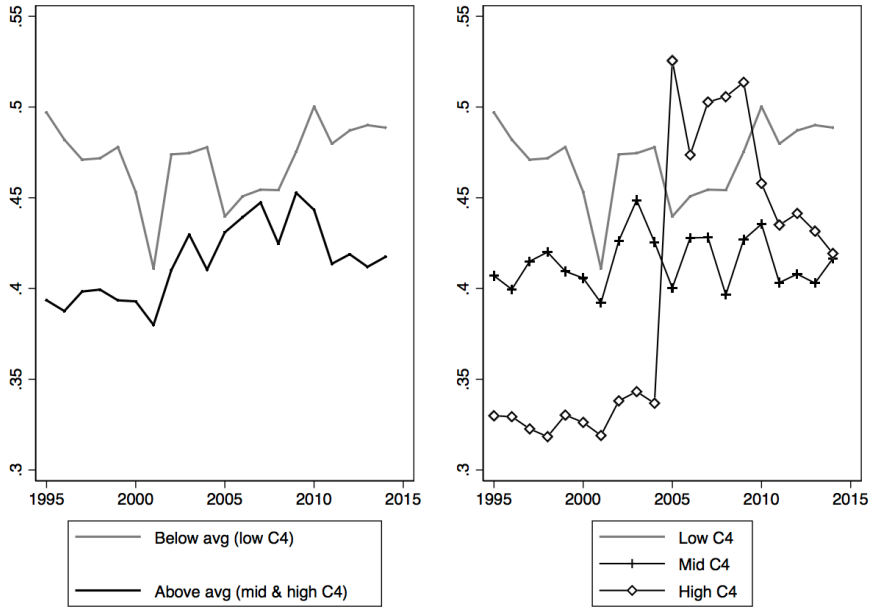


(a) **(b)**

Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average after-tax profit rate across firms in low, mid, and high concentration industries. The profit rate is defined as operating income before depreciation and after income taxes, relative to each firm's stock of fixed capital. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified as low, mid, or high concentration based on their CR4 ratio in each census year following the classification in Section 3.3 (see also Tables 2 and 3). The CR4 ratio from each census is applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure 2: Average markups in low, mid, and highly concentrated industries
(Industries defined at the 3-digit level)

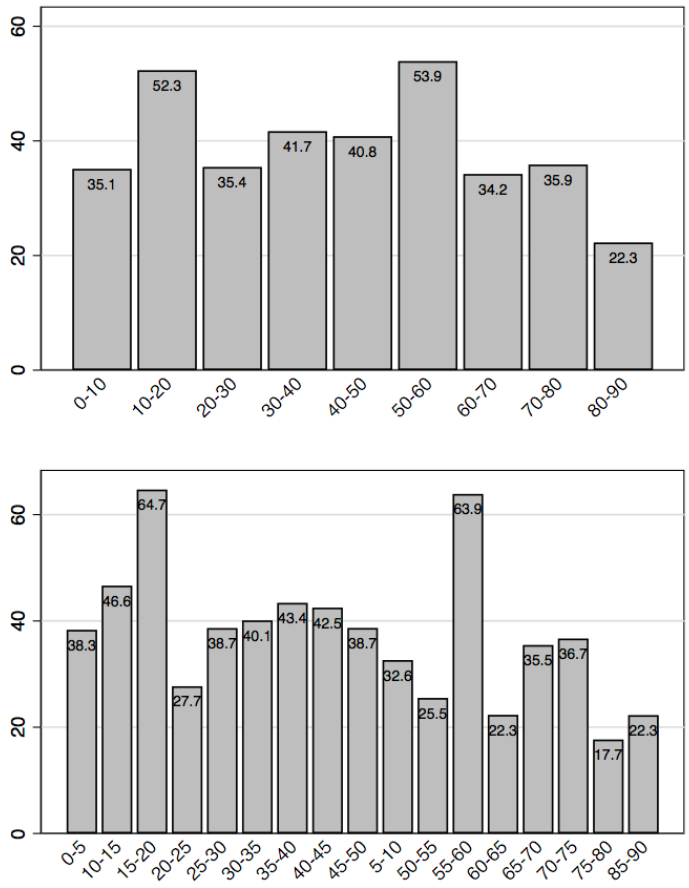


(a) **(b)**

Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average markup across firms in low, mid, and high concentration industries. The markup is defined as firm-level sales minus the cost of goods sold, relative to the cost of goods sold. Each series plots a weighted average, with each firm weighted by the cost of goods sold. Industries are classified as low, mid, or high concentration based on their CR4 ratio in each census year following the classification in Section 3.3 (see also Tables 2 and 3). The CR4 ratio from each census is applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

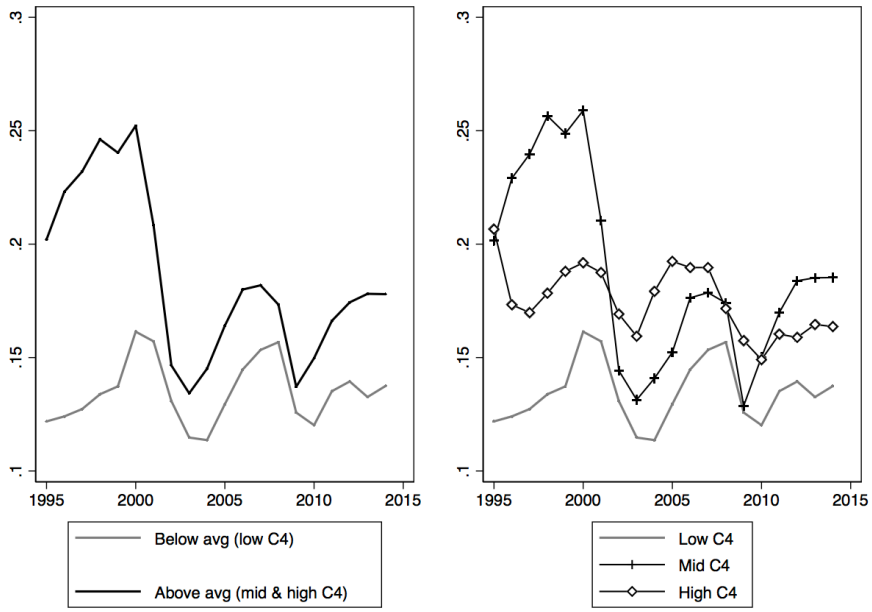
Figure 3: Average markups across deciles of the CR4 ratio
(Industries defined at the 3-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average markup by five and ten percentage point intervals of the CR4 ratio in 2012. The markup is defined as firm-level sales minus the cost of goods sold, relative to the cost of goods sold. Each bar shows the weighted average of all firms in industries with CR4 ratios in that interval, with each firm weighted by the cost of goods sold. The figure includes all firms in our sample for 1995-2014, aggregated across all years, with industries classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure 4: Average investment rates in low, mid, and highly concentrated industries
(Industries defined at the 3-digit level)

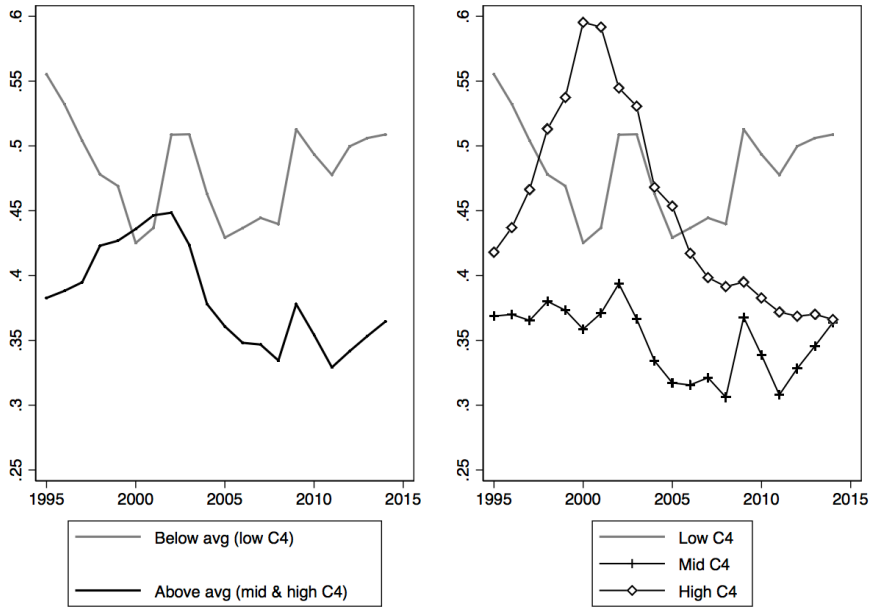


(a) **(b)**

Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average investment rate across firms in low, mid, and high concentration industries. The investment rate is defined as capital expenditures relative to the lagged capital stock. Each series plots a weighted average, with each firm weighted by its lagged capital stock. Industries are classified as low, mid, or high concentration based on their CR4 ratio in each census year following the classification in Section 3.3 (see also Tables 2 and 3). The CR4 ratio from each census is applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

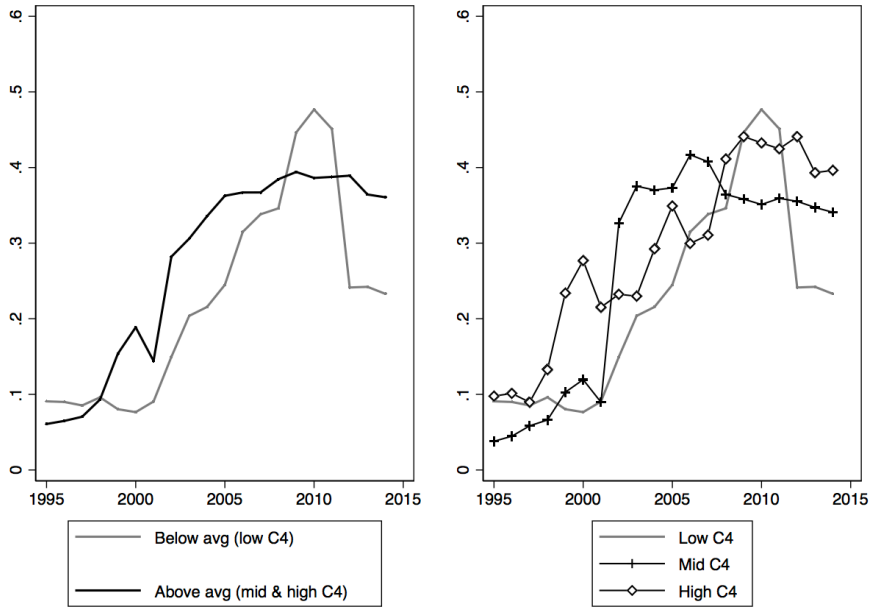
Figure 5: Average capital intensity in low, mid, and highly concentrated industries
(Industries defined at the 3-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average capital intensity across firms in low, mid, and high concentration industries. Capital intensity is defined as the capital stock relative to sales. Each series plots a weighted average, with each firm weighted by its sales. Industries are classified as low, mid, or high concentration based on their CR4 ratio in 2012. For other variable definitions and details describing the sample, see Section 3.1.

Figure 6: Average intangible intensity across firms in low, mid, and highly concentrated industries
(Industries defined at the 3-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average intangible intensity across firms in low, mid, and high concentration industries. Intangible intensity is defined as total intangibles less goodwill, relative to the capital stock. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified as low, mid, or high concentration based on their CR4 ratio in 2012. For other variable definitions and details describing the sample, see Section 3.1.

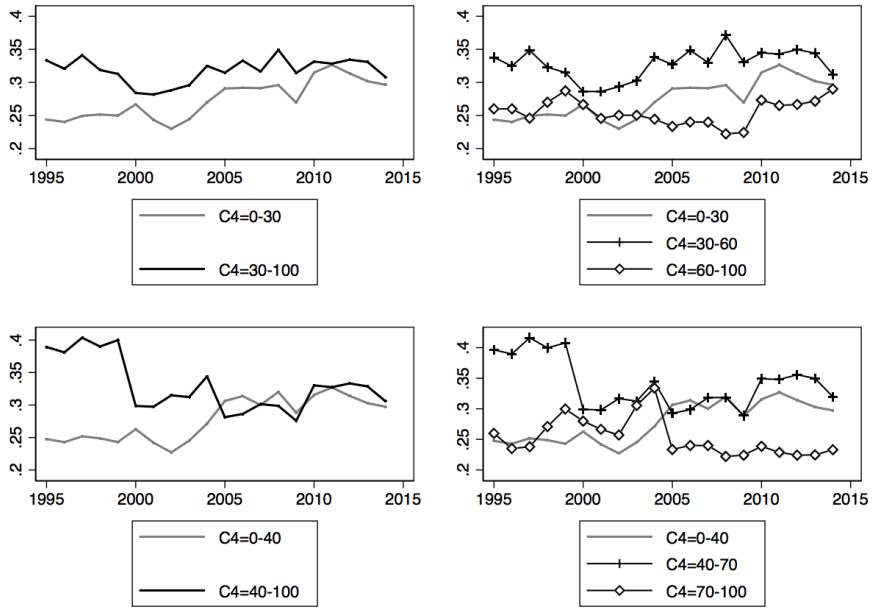
APPENDIX A:

Table A1: Variable definitions for firm-level data

Variable name	Definition	Compustat data codes
After-tax profit rate	Operating income before depreciation and after corporate income taxes, relative to the capital stock. The capital stock is defined as the net stock of property, plant and equipment.	$(OIBDP_t - TXT_t)/PPENT_t$
Markup (primary definition)	Sales minus the cost of goods sold, relative to the cost of goods sold.	$(SALE_t - COGS_t)/COGS_t$
	Alternative definition: Sales minus the cost of goods sold and after depreciation, relative to the sum of the cost of goods sold and total depreciation.	$(SALE_t - COGS_t - DP_t)/(COGS_t + DP_t)$
Investment rate	Capital expenditures relative to the capital stock. The capital stock is defined as the net stock of property, plant and equipment, and is lagged by one period.	$CAPX_t/PPENT_{t-1}$
Capital intensity	The capital stock relative to sales. The capital stock is defined as the net stock of property, plant and equipment.	$PPENT_t /SALE_t$
Intangible intensity	Stock of intellectual property products (total intangible assets less goodwill) relative to the capital stock. The capital stock is defined as the net stock of property, plant and equipment.	$(INTAN_t - GDWL_t)/PPENT_t$

Notes: This table summarizes the definitions and variable names of all firm-level variables used in this paper, all of which are drawn from the Compustat database.

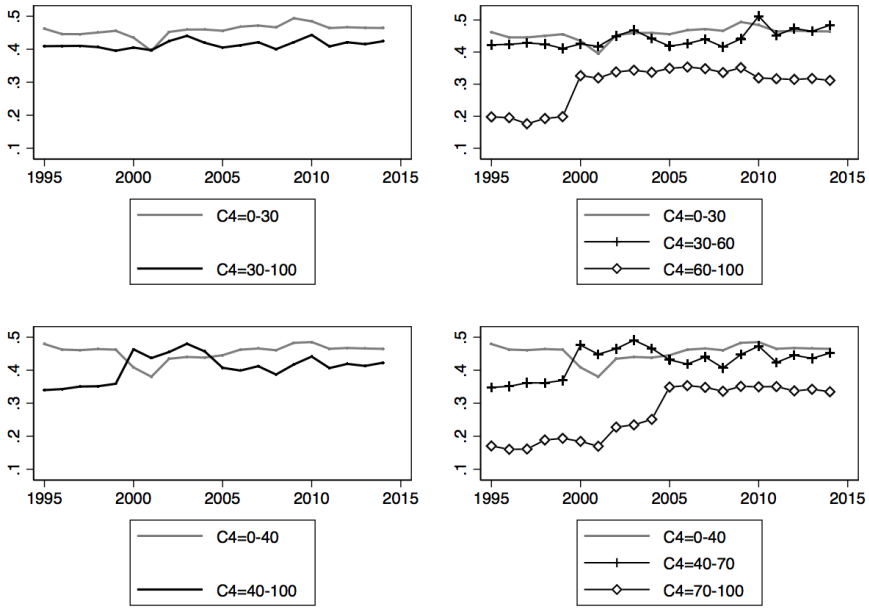
Figure A1: Average profit rate across firms, alternative cutoffs for low- mid- and high- concentration groups (Industries defined at the 3-digit level)



Source: Authors' calculations from the Census Bureau.

Notes: The figure shows the average after-tax profit rate across firms in different groupings of low, mid, and high concentration industries. The profit rate is defined as operating income before depreciation and after income taxes, relative to each firm's stock of fixed capital. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and +/- a 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

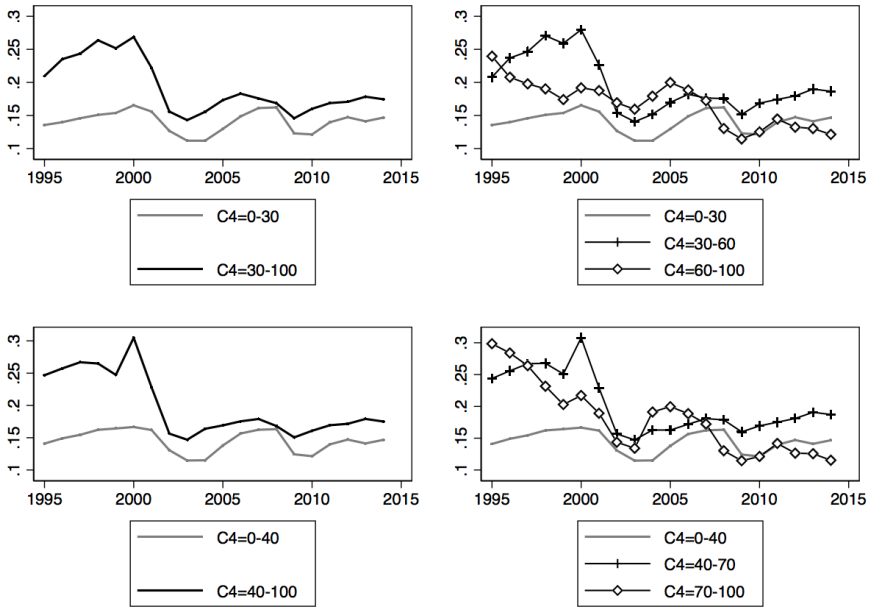
Figure A2: Average markups for alternative definitions of low, mid, and high concentration industries (Industries defined at the 3-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average markup across firms in different groupings of low, mid, and high concentration industries. The markup is defined as firm-level sales minus the cost of goods sold, relative to the cost of goods sold. Each series plots a weighted average, with each firm weighted by the cost of goods sold. Industries are classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and +/- a 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

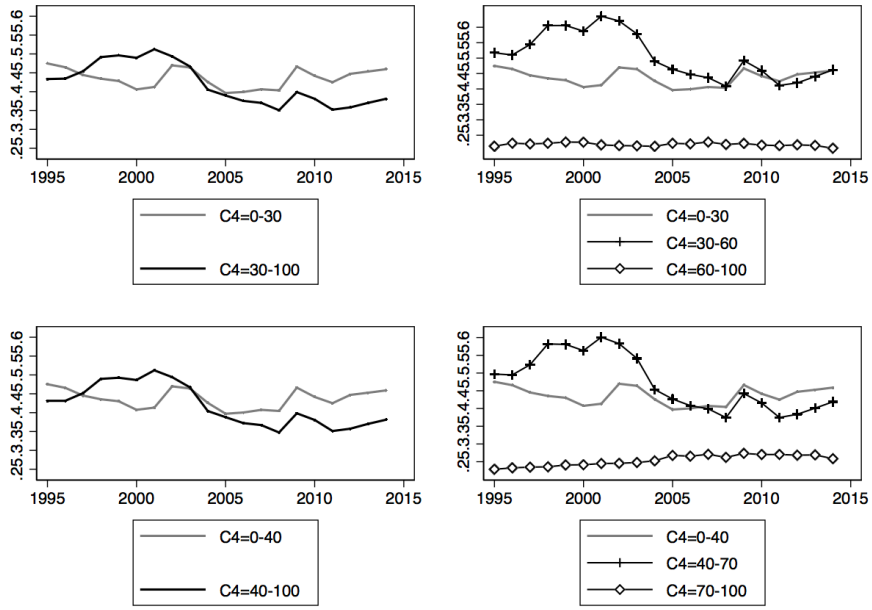
Figure A3: Average investment rates across firms, alternative cutoffs for low- mid and high concentration groups (Industries defined at the 3-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average investment rate across firms in different groupings of low, mid, and high concentration industries. The investment rate is defined as capital expenditures relative to the lagged capital stock. Industries are classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

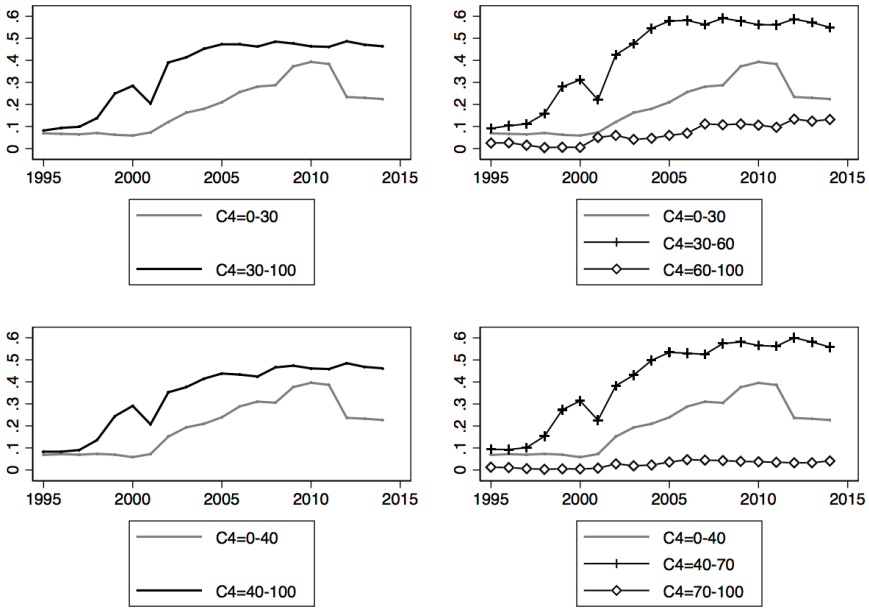
Figure A4: Average capital intensity in low, mid, and highly concentrated industries (Industries defined at the 3-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average capital intensity across firms in different groupings of low, mid, and high concentration industries. Capital intensity is defined as the capital stock relative to sales. Each series plots a weighted average, with each firm weighted by its sales. Industries are classified as low, mid, or high concentration based on their CR4 ratio in 2012. For other variable definitions and details describing the sample, see Section 3.1.

Figure A5: Average intangible intensity in low, mid, and highly concentrated industries
(Industries defined at the 3-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average intangible intensity across firms in different groupings of low, mid, and high concentration industries. Intangible intensity is defined as total intangibles less goodwill, relative to the capital stock. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified as low, mid, or high concentration based on their CR4 ratio in 2012. For other variable definitions and details describing the sample, see Section 3.1.

APPENDIX B: Replication of main tables and figures using 4-digit industrial classifications

Table B1: 4-digit industries with above-average levels of concentration

(Industries ranked by 2012 CR4 at 4-digit level)

	NAICS	Industry name	2-digit sector	CR4	CR8	% Δ in CR4 (1997-2012)	% Δ in CR8 (1997-2012)
Panel A: High concentration industries							
1.	4921	Couriers & express delivery services	Transportation & warehousing	92.5	93.7	9.6	2.1
2.	5172	Wireless telecom carriers (except satellite)*	Information	89.1	95.2	44.4	16.5
3.	3122	Tobacco manufacturing	Manufacturing	87.8	93.6	5.3	0.3
4.	4529	Other general merchandise stores	Retail trade	82.7	92.8	24.2	17.6
5.	4521	Department stores	Retail trade	73.2	94.7	17.9	12.5
6.	4512	Book stores & news dealers	Retail trade	66.1	73.4	67.3	47.4
7.	3352	Household appliance manufacturing	Manufacturing	64.5	75.8	20.3	16.6
8.	6221	General medical & surgical hospitals	Health care & social assistance	64	79	-12.9	-4.2
9.	7131	Amusement parks & arcades	Arts, entertainment, recreation	63.7	77.9	10.4	11.0
10.	4811	Scheduled air transportation	Transportation & warehousing	62.7	79.3	145.9	116.7
11.	6222	Psychiatric & substance abuse hospitals	Health care & social assistance	62	68.8	42.5	20.7
12.	3364	Aerospace product & parts manufacturing	Manufacturing	61	73.9	-2.1	-5.4
13.	3361	Motor vehicle manufacturing	Manufacturing	60.8	81.1	-26.2	-11.7
14.	4461	Health & personal care stores	Retail trade	60	63.1	53.5	30.6
Panel B: Mid concentration industries							
15.	5152	Cable & other subscription programming*	Information	58.9	83.2	-7.8	7.1
16.	3365	Railroad rolling stock manufacturing	Manufacturing	58	72.5	1.4	0.8
17.	4869	Other pipeline transportation	Transportation & warehousing	56.7	80.4	23.0	13.1
18.	3161	Leather & hide tanning & finishing	Manufacturing	54.7	72.5	11.4	9.0
19.	7223	Special food services	Accommodation, food services	54.6	61.7	33.5	13.2
20.	4851	Urban transit systems	Transportation & warehousing	54.1	65.9	49.4	34.2
21.	4431	Electronics & appliance stores	Retail trade	54.1	60.6	44.7	41.6
22.	4441	Building material & supplies dealers	Retail trade	53.8	57.6	163.7	130.4
23.	6223	Specialty (exc. psychiatric/substance abuse) hospitals	Health care & social assistance	52	61.5	-28.2	-22.3
24.	4852	Interurban & rural bus transportation	Transportation & warehousing	51.5	60.8	-16.9	-13.6
25.	5171	Wired telecommunications carriers*	Information	51.3	72.9	-14.1	-9.9

26.	4832	Inl& water transportation	Transportation & warehousing	51.1	67.7	34.8	29.7
27.	5122	Sound recording industries	Information	51	69.8	-4.0	-7.4
28.	3369	Other transportation equipment manufacturing	Manufacturing	50.7	67	33.8	20.3
29.	3112	Grain & oilseed milling	Manufacturing	50.6	64	11.7	8.3
30.	3311	Iron & steel mills & ferroalloy manufacturing	Manufacturing	49	65.8	53.6	28.0
31.	3131	Fiber, yarn, & thread mills	Manufacturing	49	64.5	64.4	51.4
32.	3121	Beverage manufacturing	Manufacturing	48.9	59.6	19.6	14.4
33.	4532	Office supplies, stationery, & gift stores	Retail trade	48.8	55.2	13.2	19.0
34.	3366	Ship & boat building	Manufacturing	48.6	56.3	26.6	11.0
35.	5174	Satellite telecommunications	Information	48.1	61.2	39.0	24.4
36.	3346	Mfg., reproducing magnetic, optical media*	Manufacturing	47.3	55.6	87.7	35.3
37.	4831	Deep sea, coastal, & great lakes water transportation	Transportation & warehousing	46.9	61.7	36.7	33.5
38.	6243	Vocational rehabilitation services	Health care & social assistance	46.5	58.1	58.7	66.0
39.	4861	Pipeline transportation of crude oil	Transportation & warehousing	45.7	69.3	-5.8	-2.9
40.	3162	Footwear manufacturing	Manufacturing	45.1	65.3	62.8	54.0
41.	3241	Petroleum & coal products manufacturing	Manufacturing	45	68.6	73.1	55.2
42.	3379	Other furniture related product manufacturing	Manufacturing	45	56.6	30.8	27.2
43.	3274	Lime & gypsum product manufacturing	Manufacturing	44.6	69.9	-17.4	6.9
44.	3336	Engine, turbine, power transmission equipment mfg.	Manufacturing	44.4	56.9	4.5	-1.6
45.	4879	Scenic & sightseeing transportation, other	Transportation & warehousing	44.1	57.5	86.1	48.6
46.	4242	Drugs & druggists' sundries merchant wholesalers*	Wholesale trade	43.5	54.8	2.1	-4.9
47.	5622	Waste treatment & disposal	Administrative & Support	43.3	61.2	-9.8	12.1
48.	2213	Water, sewage & other systems	Utilities	42.8	54.4	45.6	35.7
49.	3313	Alumina & aluminum production & processing*	Manufacturing	42.6	56.2	-16.3	-8.3
50.	3116	Animal slaughtering & processing	Manufacturing	42.6	53.9	21.7	13.5
51.	5621	Waste collection	Administrative & Support	42.6	47.7	-5.3	-7.0
52.	3221	Pulp, paper & paperboard mills	Manufacturing	41.9	57.6	49.6	26.0
53.	5191	Other information services*	Information	41.9	53.1	36.5	18.3
54.	5112	Software publishers	Information	41.4	49	46.8	37.6
55.	4854	School & employee bus transportation	Transportation & warehousing	41.4	47.4	16.9	20.0
56.	3256	Soap, cleaning compound, toilet preparation mfg.	Manufacturing	41.3	53.2	22.6	16.4
57.	3253	Pesticide, fertilizer, other agricultural chemical mfg.	Manufacturing	40.9	57.1	49.3	24.7
58.	3331	Agriculture, construction, mining machinery mfg.	Manufacturing	40.2	48.7	6.3	6.6
59.	5151	Radio & television broadcasting*	Information	39.8	55.6	1.8	3.7
60.	4812	Nonscheduled air transportation	Transportation & warehousing	39.8	47.2	156.8	100.9
61.	4231	Motor vehicle/parts, supplies merchant wholesalers*	Wholesale trade	38.5	52.6	-28.2	-22.0
62.	3141	Textile furnishings mills	Manufacturing	38.2	48.4	12.0	2.1
63.	3262	Rubber product manufacturing	Manufacturing	37.9	49.3	3.0	6.2
64.	3151	Apparel knitting mills	Manufacturing	37.1	51.9	63.4	56.8

65.	4422	Home furnishings stores	Retail trade	36.4	42.9	219.3	156.9
66.	5121	Motion picture & video industries	Information	34.9	48.4	7.4	8.0
67.	4862	Pipeline transportation of natural gas	Transportation & warehousing	34.5	58.7	-19.6	-10.4
68.	4482	Shoe stores	Retail trade	34.3	50.6	-9.3	3.1
69.	3159	Apparel accessories & other apparel manufacturing	Manufacturing	34.3	44.8	141.5	94.8
70.	6214	Outpatient care centers	Health care & social assistance	33	39	30.4	15.0
71.	5179	Other telecommunications*	Information	32.6	45.5	3.8	-3.8
72.	3324	Boiler, tank, & shipping container manufacturing	Manufacturing	32.4	42.5	6.6	-7.6
73.	4871	Scenic & sightseeing transportation, l&	Transportation & warehousing	32.1	42.1	27.9	4.5
74.	3322	Cutlery & h& tool manufacturing	Manufacturing	32	42.5	74.9	50.7
75.	3113	Sugar & confectionery product manufacturing	Manufacturing	31.6	43.1	-24.6	-23.6
76.	3341	Computer & peripheral equipment manufacturing	Manufacturing	31.5	46	-14.9	-11.7
77.	3254	Pharmaceutical & medicine manufacturing	Manufacturing	31.2	44.2	-3.4	-7.7
78.	4247	Petroleum products merchant wholesalers*	Wholesale trade	30.3	43.9	10.6	8.9
79.	4413	Automotive parts, accessories, & tire stores	Retail trade	30.3	40.7	138.6	112.0
80.	3343	Audio & video equipment manufacturing	Manufacturing	30.2	44.3	1.3	-15.5
81.	3111	Animal food manufacturing	Manufacturing	30.2	40.7	30.7	17.3
82.	4541	Electronic shopping & mail-order houses	Retail trade	30.2	37.8	23.8	18.1
83.	4451	Grocery stores	Retail trade	29.8	42.6	49.7	29.5
84.	4882	Support activities for rail transportation	Transportation & warehousing	29.8	41.9	-28.0	-22.3
85.	3342	Communications equipment manufacturing	Manufacturing	29.6	41.7	-18.9	-15.4
86.	3119	Other food manufacturing	Manufacturing	29.5	37.4	-15.0	-12.4
87.	3325	Hardware manufacturing	Manufacturing	29.4	43.6	69.0	57.4
88.	3255	Paint, coating, & adhesive manufacturing*	Manufacturing	29.3	44.3	-3.3	1.6
89.	4245	Farm product raw material merchant wholesalers*	Wholesale trade	29.3	41.6	-13.6	-3.3
90.	3252	Resin, synthetic rubber and fibers & filaments mfg.	Manufacturing	29	40.9	8.6	8.5
91.	3251	Basic chemical manufacturing	Manufacturing	28.5	40.1	82.7	39.7
92.	4542	Vending machine operators	Retail trade	28.2	32.6	45.4	39.9
93.	3353	Electrical equipment manufacturing	Manufacturing	27.9	39.7	8.6	-1.2
94.	7113	Promoters of performing arts, sports, similar events	Arts, entertainment, recreation	27.8	36.6	239.0	154.2
95.	3351	Electric lighting equipment manufacturing	Manufacturing	27.7	38.5	-21.5	-21.7
96.	4511	Sporting goods, hobby, & musical instrument stores	Retail trade	27.4	42.1	3.8	29.9
97.	6215	Medical & diagnostic laboratories	Health care & social assistance	27.1	31.1	-3.9	-4.0
98.	4883	Support activities for water transportation	Transportation & warehousing	27	37.8	23.9	24.8
99.	4481	Clothing stores	Retail trade	27	36.6	5.9	6.7

Source: Authors' calculations from the Census Bureau.

Notes: The table lists 4-digit industries with above-average levels of concentration, ranked in descending order by CR4 ratio. If two industries have identical CR4 ratios, they are ranked in descending order by CR8 ratio. As described in Section 3.3, average concentration is the weighted

average across-industry CR4 ratio in 2012, with each industry weighted by total revenue (26.4%). High and mid CR industries are distinguished by the mid-point among above-average CR industries (59.75%). In addition to the name of the 4-digit industrial industry, the table lists the corresponding 2-digit sectors, the CR4 ratio, the CR8 ratio, and the percent change in both the CR4 and CR8 ratios between 1997 and 2002. Industries that do not exist in their current classification in 1997 are marked with an *, and their percent changes are calculated between 2002 and 2012. For other variable definitions and details describing the sample, see Section 3.1.

Table B2: 4-digit industries with below-average levels of concentration

(Industries ranked by 2012 CR4 at 4-digit level)

	NAICS	Industry name	2-digit sector	CR4	CR8	% Δ in CR4 (1997-2012)	% Δ in CR8 (1997-2012)
1.	3334	Ventilation, heating, air-condit, refrigeration mfg	Manufacturing	26.4	38.4	-11.1	-3.5
2.	3372	Office furniture (including fixtures) manufacturing	Manufacturing	26.4	34.9	-8.0	-2.8
3.	3362	Motor vehicle body & trailer manufacturing	Manufacturing	26	37.2	16.1	21.2
4.	8123	Dry cleaning & laundry services	Other services	26	33.8	92.6	71.6
5.	3132	Fabric mills	Manufacturing	25.8	34.8	62.3	48.1
6.	6117	Educational support services	Educational services	25.7	33.3	105.6	93.6
7.	5612	Facilities support services	Administrative & Support	25.6	38.2	19.6	24.0
8.	4483	Jewelry, luggage, & leather goods stores	Retail trade	24.9	30.9	44.8	37.9
9.	3212	Veneer, plywood, engineered wood product mfg.	Manufacturing	24.8	36.5	-7.8	-10.5
10.	4251	Wholesale electronic markets & agents & brokers*	Wholesale trade	24.8	32.1	-8.1	5.2
11.	3114	Fruit & vegetable preserving, specialty food mfg.	Manufacturing	24.7	33.7	-7.1	-5.3
12.	6233	Continuing care & assisted living facilities	Health care & social assistance	24.3	31.6	133.7	137.6
13.	3314	Nonferrous metal production & processing	Manufacturing	24.1	35.9	-0.8	3.5
14.	3118	Bakeries & tortilla manufacturing	Manufacturing	24.1	35.1	-15.7	-12.5
15.	3272	Glass & glass product manufacturing	Manufacturing	23.9	40.8	-22.9	-11.9
16.	5412	Accounting, tax preparation, payroll services	Prof., sci. & technical services	23.6	35.6	18.0	-1.1
17.	6239	Other residential care facilities	Health care & social assistance	23.5	33.5	1.3	12.8
18.	3279	Other nonmetallic mineral product manufacturing	Manufacturing	23.1	34	-30.8	-19.4
19.	3117	Seafood product preparation & packaging	Manufacturing	22.9	35.9	84.7	71.8
20.	4539	Other miscellaneous store retailers	Retail trade	22.9	25.6	112.0	88.2
21.	3222	Converted paper product manufacturing	Manufacturing	22.7	33.1	89.2	54.0
22.	7114	Agents/managers for artists, athletes, entertainers	Arts, entertainment, recreation	22.3	29	-5.1	0.3
23.	3115	Dairy product manufacturing	Manufacturing	22.2	33	34.5	26.9
24.	7111	Performing arts companies	Arts, entertainment, recreation	22.1	26.5	160.0	122.7
25.	6232	Residential mental health, substance abuse facilities	Health care & social assistance	21.9	25.5	148.9	107.3
26.	3332	Industrial machinery manufacturing	Manufacturing	21.6	26.2	60.0	40.1
27.	5613	Employment services	Administrative & Support	21.1	27.2	101.0	61.9
28.	7213	Rooming & boarding houses	Accommodation, food services	21	28.2	311.8	261.5
29.	4236	Household appliances, electronic goods merchants	Wholesale trade	21	27.6	56.7	45.3
30.	3344	Semiconductor, other electronic component mfg.	Manufacturing	20.9	30.2	-39.1	-29.4
31.	6219	Other ambulatory health care services	Health care & social assistance	20.8	29.6	-32.5	-19.8

32.	3169	Other leather & allied product manufacturing	Manufacturing	20.6	33.1	-22.3	-6.2
33.	5616	Investigation & security services	Administrative & Support	20.6	28	5.6	-3.4
34.	4931	Warehousing & storage	Transportation & warehousing	20.5	27.1	69.4	54.0
35.	4249	Miscellaneous nondurable goods wholesalers	Wholesale trade	20.3	27.7	37.2	24.8
36.	2212	Natural gas distribution	Utilities	20	33.3	-41.3	-31.2
37.	6242	Community food/housing, emergency relief serv.	Health care & social assistance	19.6	31.2	-14.8	0.0
38.	3391	Medical equipment & supplies manufacturing	Manufacturing	19.3	29.3	18.4	22.1
39.	3315	Foundries	Manufacturing	19	28.3	41.8	34.1
40.	3345	Navigational, electromedical manufacturing	Manufacturing	18.8	31.6	-22.0	-4.8
41.	4248	Beer, wine, distilled alcoholic beverage merchants	Wholesale trade	18.6	25.9	56.3	50.6
42.	4442	Lawn & garden equipment & supplies stores	Retail trade	18.4	21.4	68.8	31.3
43.	8122	Death care services	Other services	18.4	20.3	-24.0	-24.0
44.	2211	Electric power gen, transmission & distribution	Utilities	18.3	31.6	28.0	29.5
45.	3271	Clay product & refractory manufacturing	Manufacturing	18.1	30.3	34.1	34.7
46.	3312	Steel product manufacturing from purchased steel	Manufacturing	17.7	27.7	6.0	8.2
47.	3371	Household, institutional furniture & cabinet mfg.	Manufacturing	17.7	24.9	28.3	27.7
48.	8112	Electronic, precision equip. repair & maintenance	Other services	17.7	24.8	46.3	38.5
49.	4237	Hardware, plumbing, heating equip., merchants	Wholesale trade	17.5	25	124.4	101.6
50.	4241	Paper & paper product merchant wholesalers	Wholesale trade	17.4	26.3	4.2	3.5
51.	6115	Technical & trade schools	Educational services	17.4	24.4	-8.4	6.1
52.	5418	Advertising, public relations, & related services	Prof., sci., & technical services	17.4	23.1	68.9	47.1
53.	4421	Furniture stores	Retail trade	17.3	24.9	86.0	81.8
54.	3329	Other fabricated metal product manufacturing	Manufacturing	16.7	27.5	70.4	68.7
55.	3273	Cement & concrete product manufacturing	Manufacturing	16.7	22.3	81.5	43.9
56.	4872	Scenic & sightseeing transportation, water	Transportation & warehousing	16.4	24.6	-18.0	-10.9
57.	7211	Traveler accommodation	Accommodation, food services	16.2	24.2	-0.6	8.0
58.	3363	Motor vehicle parts manufacturing	Manufacturing	16.1	23.1	-61.3	-53.1
59.	5182	Data processing, hosting, & related services*	Information	15.9	22.6	-52.8	-42.9
60.	5615	Travel arrangement & reservation services	Administrative & Support	15.8	24.8	-22.9	-2.0
61.	5415	Computer systems design & related services	Prof., sci., & technical services	15.6	22	0.6	15.8
62.	4889	Other support activities for transportation	Transportation & warehousing	15.3	24.5	-77.4	-65.3
63.	3231	Printing & related support activities	Manufacturing	15.3	19.3	59.4	37.9
64.	4234	Prof., commercial equip., supplies wholesalers	Wholesale trade	15.2	22.5	5.6	8.2
65.	3149	Other textile product mills	Manufacturing	15	20.8	41.5	21.6
66.	3259	Other chemical product & preparation mfg.	Manufacturing	14.8	22.7	-41.7	-29.3
67.	4235	Metal & mineral (except petroleum) merchants	Wholesale trade	14.7	23	25.6	36.1
68.	4244	Grocery & related product merchant wholesalers	Wholesale trade	14.5	22.9	62.9	50.7
69.	7132	Gambling industries	Arts, entertainment, recreation	14.5	22.8	-8.2	-6.6
70.	4859	Other transit & ground passenger transportation	Transportation & warehousing	14.5	18.2	15.1	6.4

71.	8129	Other personal services	Other services	14.4	21.6	-32.4	-31.2
72.	4855	Charter bus industry	Transportation & warehousing	14.3	18.4	116.7	72.0
73.	3328	Coating, engraving, heat treating, & allied activities	Manufacturing	14.2	23.8	39.2	52.6
74.	4881	Support activities for air transportation	Transportation & warehousing	14.2	23.1	-38.8	-31.3
75.	6231	Nursing care facilities (skilled nursing facilities)	Health care & social assistance	14.2	20	-13.4	-18.4
76.	5111	Newspaper, periodical, book, directory publishers*	Information	14	24.2	2.9	-0.8
77.	3326	Spring & wire product manufacturing	Manufacturing	13.9	19.7	-4.8	-3.4
78.	5416	Management, sci., technical consulting services	Prof., sci., & technical services	13.9	18.4	24.1	18.7
79.	6244	Child day care services	Health care & social assistance	13.9	15.5	-6.7	-15.8
80.	4243	Apparel, piece goods, notions merchants	Wholesale trade	13.6	20	47.8	48.1
81.	4471	Gasoline stations	Retail trade	13.3	21.1	98.5	95.4
82.	3133	Textile & fabric finishing & fabric coating mills	Manufacturing	13.2	20.6	-24.1	-21.7
83.	4232	Furniture & home furnishing merchants	Wholesale trade	13.1	17.5	13.9	7.4
84.	3359	Other electrical equipment & component mfg.	Manufacturing	12.8	22.7	11.3	23.4
85.	3219	Other wood product manufacturing	Manufacturing	12.7	19.4	0.0	4.3
86.	4533	Used merchandise stores	Retail trade	12.7	16.3	32.3	43.0
87.	4246	Chemical & allied products merchant wholesalers	Wholesale trade	12.5	20.4	-6.0	5.2
88.	3321	Forging & stamping	Manufacturing	12.4	18.9	57.0	57.5
89.	4922	Local messengers & local delivery	Transportation & warehousing	12.4	17.4	-14.5	-3.3
90.	4841	General freight trucking	Transportation & warehousing	12.3	19.4	3.4	5.4
91.	4238	Machinery, equipment, & supplies merchants	Wholesale trade	11.9	14.8	50.6	48.0
92.	6216	Home health care services	Health care & social assistance	11.8	18	-31.8	-24.4
93.	4233	Lumber & other construction materials merchants	Wholesale trade	11.7	18.1	0.0	8.4
94.	5417	Scientific research & development services	Prof., sci. & technical services	11.5	18.6	-61.0	-46.4
95.	5629	Remediation & other waste management services	Administrative & Support	11.4	16.4	-58.2	-50.6
96.	3211	Sawmills & wood preservation	Manufacturing	11.3	18.4	-22.1	-8.5
97.	4543	Direct selling establishments	Retail trade	11.2	16.8	20.4	24.4
98.	3152	Cut & sew apparel manufacturing	Manufacturing	11.1	15.9	-45.0	-39.3
99.	4885	Freight transportation arrangement	Transportation & warehousing	11	16.5	71.9	63.4
100.	3333	Commercial & service industry machinery manufacturing	Manufacturing	10.9	18.8	-63.9	-47.3
101.	5614	Business support services	Administrative & Support	10.9	17	-26.4	-21.3
102.	8121	Personal care services	Other services	10.9	12.3	39.7	29.5
103.	5413	Architectural, engineering, & related services	Prof., sci. & technical services	10.3	14.8	27.2	22.3
104.	5619	Other support services	Administrative & Support	10.3	13.7	110.2	73.4
105.	4453	Beer, wine, & liquor stores	Retail trade	10.1	15.2	40.3	34.5
106.	4239	Miscellaneous durable goods merchant wholesalers	Wholesale trade	10.1	14.9	-3.8	-5.1
107.	8114	Personal & household goods repair & maintenance	Other services	10.1	11.3	-46.3	-45.1
108.	3399	Other miscellaneous manufacturing	Manufacturing	9.4	14.3	64.9	43.0

109.	7139	Other amusement & recreation industries	Arts, entertainment, recreation	9.2	13.5	10.8	20.5
110.	3339	Other general purpose machinery manufacturing	Manufacturing	8.9	14.6	39.1	28.1
111.	4853	Taxi & limousine service	Transportation & warehousing	8.3	12.2	16.9	1.7
112.	5419	Other professional, scientific, & technical services	Prof., sci. & technical services	8.3	11.8	-31.4	-31.0
113.	3335	Metalworking machinery manufacturing	Manufacturing	8	12.1	9.6	13.1
114.	4884	Support activities for road transportation	Transportation & warehousing	8	11.6	31.1	41.5
115.	7121	Museums, historical sites, & similar institutions	Arts, entertainment, recreation	7.9	12.4	-66.4	-58.9
116.	6116	Other schools & instruction	Educational services	7.9	11.2	3.9	7.7
117.	5617	Services to buildings & dwellings	Administrative & Support	7.6	10.5	-13.6	-20.5
118.	6114	Business schools, computer, management training	Educational services	7.4	10.8	-5.1	-11.5
119.	3261	Plastics product manufacturing	Manufacturing	7.3	12.1	87.2	75.4
120.	4412	Other motor vehicle dealers	Retail trade	6.4	9.5	82.9	82.7
121.	7112	Spectator sports	Arts, entertainment, recreation	6.2	11.4	14.8	18.8
122.	3323	Architectural & structural metals manufacturing	Manufacturing	6	9.2	36.4	24.3
123.	4842	Specialized freight trucking	Transportation & warehousing	6	9.2	-10.4	-6.1
124.	4452	Specialty food stores	Retail trade	5.9	8.6	7.3	0.0
125.	4411	Automobile dealers	Retail trade	5.9	8.6	293.3	309.5
126.	6213	Offices of other health practitioners	Health care & social assistance	5.9	7.2	-10.6	-14.3
127.	7225	Restaurants & other eating places	Accommodation, food services	5.6	8		
128.	7212	RV (recreational vehicle) parks, recreational camps	Accommodation, food services	5.6	8	21.7	19.4
129.	6211	Offices of physicians	Health care & social assistance	5.4	7.2	45.9	60
130.	8113	Commercial & industrial machinery maintenance	Other services	4.9	8.8	-31.9	-11.1
131.	6241	Individual & family services	Health care & social assistance	4	5.8	-34.4	-34.1
132.	5411	Legal services	Prof., sci. & technical services	2.6	4.6	44.4	58.6
133.	5414	Specialized design services	Prof., sci. & technical services	2.5	3.8	4.2	5.6
134.	7224	Drinking places (alcoholic beverages)	Accommodation & food services	2.5	3.6	316.7	260
135.	8111	Automotive repair & maintenance	Other services	2.4	3.6	4.3	12.5
136.	3327	Machine shops	Manufacturing	2.3	3.8	-39.5	-29.6
137.	5611	Office administrative services	Administrative & Support	2.1	3.8	-55.3	-38.7
138.	7115	Independent artists, writers, & performers	Arts, entertainment, recreation	2	3.5	-64.3	-53.9
139.	6212	Offices of dentists	Health care & social assistance	2	3.2	185.7	255.6
140.	4531	Florists	Retail trade	1.6	2.5	-30.4	-19.4

Source: Authors' calculations from the Census Bureau.

Notes: The table lists 4-digit industries with below-average levels of concentration, ranked in descending order by CR4 ratio. If two industries have identical CR4 ratios, they are ranked in descending order by CR8 ratio. As described in Section 3.3, concentration is the weighted average across-industry CR4 ratio in 2012, with each industry weighted by total revenue (26.4%). Industries are included in this table if their CR4 ratio in 2012 is less than this across-industry average. In addition to the name of the 4-digit industrial industry, the table lists the corresponding 2-digit sectors, the CR4 ratio, the CR8 ratio, and the percent change in both the CR4 and CR8 ratios between 1997 and 2002. Industries that do not exist in current classification in 1997 are marked with an *, and their percent changes are calculated between 2002 and 2012. For other variable definitions and details describing the sample, see Section 3.1.

Table B3: Low, high and mid concentration industries in 2012 and 2007, sorted by 2-digit sectors of activity

(Industries defined at 4-digit level)

NAICS	2-digit sector	(1) Low CR4		(2) Mid CR4		(3) High CR4		(4) Full sample	
		N	% of rev	N	% of rev	N	% of rev	N	% of rev
Panel A: 2012									
22	Utilities	2	2.1%	1	0.0%	0	–	3	2.2%
31-33	Manufacturing	43	8.9%	39	11.9%	4	2.2%	86	22.9%
42	Wholesale	15	19.7%	4	12.4%	0	–	19	32.1%
44-45	Retail	12	6.7%	11	6.7%	4	3.8%	27	17.2%
48-49	Transportation & warehousing	12	1.5%	13	0.5%	2	0.9%	27	3.0%
51	Information	2	0.9%	9	3.3%	1	0.9%	12	5.0%
54	Prof., sci. & technical services	9	5.9%	0	–	0	–	9	5.9%
56	Administrative & support services	9	2.5%	2	0.2%	0	–	11	2.7%
61	Educational services	4	0.2%	0	–	0	–	4	0.2%
62	Health care & social assistance	12	3.3%	4	0.5%	2	0.4%	18	4.1%
71	Arts, entertainment, recreation	7	0.6%	1	0.1%	1	0.1%	9	0.7%
72	Accommodation, food services	5	2.7%	1	0.2%	0	–	6	2.9%
81	Other services	8	0.9%	0	–	0	–	8	0.9%
	Total, 2012	**140**	**55.8%**	**85**	**35.8%**	**14**	**8.2%**	**239**	**100%**
Panel B: 1997									
22	Utilities	1	2.0%	2	1.1%	0	–	3	3.1%
31-33	Manufacturing	41	12.7%	40	12.5%	3	2.8%	84	28.0%
42	Wholesale	17	26.3%	1	4.0%	0	–	18	30.2%
44-45	Retail	20	13.9%	5	1.9%	2	2.5%	27	18.3%
48-49	Transportation & warehousing	16	1.6%	8	0.4%	3	0.3%	27	2.4%
51	Information	0	–	8	3.8%	0	–	8	3.8%
54	Prof., sci. & technical services	8	4.1%	1	0.2%	0	–	9	4.3%
56	Administrative & support services	8	1.9%	3	0.3%	0	–	11	2.2%
61	Educational services	4	0.1%	0	–	0	–	4	0.1%
62	Health care & social assistance	12	2.6%	4	0.2%	2	0.3%	18	3.1%
71	Arts, entertainment, recreation	8	0.6%	1	0.1%	0	–	9	0.6%
72	Accommodation, food services	6	2.5%	1	0.1%	0	–	7	2.6%
81	Other services	8	1.2%	0	–	0	–	8	1.2%
	Total, 1997	**149**	**69.6%**	**74**	**24.5%**	**10**	**5.8%**	**233**	**100%**

Source: Authors' calculations from the Census Bureau.

Notes: Columns 1-3 list the number (N) and revenue share (% of rev) of all 3-digit industries within each broader 2-digit sector of economic activity for the groups of low, mid, and high concentration industries listed in Tables B1 and B2. Revenue share is total revenue of all 3-digit industries within both a particular concentration group and 2-digit sector relative to total revenue in the sample in 2012 (Panel A) and in 1997 (Panel B). Column 4 lists the total number of 3-digit industries and revenue share within each sector. The row totals for 'N' and '% of rev' in Columns 1-3 equal the values in Column 4. For other variable definitions and details describing the sample, see Section 3.1.

Table B4: What sectors drive the increase in concentration?

(Change in CR4 ratio over time across 4-digit industries when sequentially dropping sectors of economic activity)

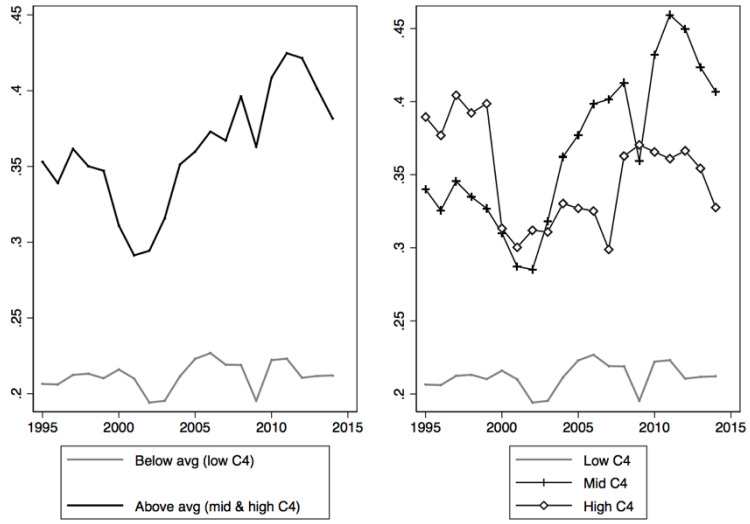
		Average CR4, 1997	Average CR4, 2012	Percent change (1997-2012)	(% change with sector excluded)/ (overall % change)
Panel A	**2-digit sector:**				
1.	Utilities	21.1%	19.2%	-8.7%	–
2.	Manufacturing	30.0%	33.1%	16.0%	–
3.	Wholesale	17.6%	23.7%	25.4%	–
4.	Retail	21.8%	33.9%	54.5%	–
5.	Transportation & warehousing	25.9%	35.6%	43.6%	–
6.	Information	39.4%	48.3%	41.0%	–
7.	Prof., sci. & technical services	10.7%	12.1%	6.3%	–
8.	Administrative & support services	15.6%	17.5%	8.6%	–
9.	Educational services	10.8%	13.0%	10.1%	–
10.	Health care & social assistance	14.8%	15.9%	4.6%	–
11.	Arts, entertainment & recreation	14.4%	15.7%	5.6%	–
12.	Accommodation & food services	12.1%	11.5%	-2.5%	–
13.	Other services	9.7%	9.5%	-1.0%	–
Panel B	**Excluded 2-digit sector:**				
1.	Utilities	22.3%	27.6%	23.7%	1.03
2.	Manufacturing	19.2%	25.7%	33.6%	1.45
3.	Wholesale	24.3%	29.1%	19.9%	0.86
4.	Retail	22.4%	26.0%	16.4%	0.71
5.	Transportation & warehousing	22.2%	27.1%	22.5%	0.97
6.	Information	21.6%	26.3%	21.8%	0.94
7.	Prof., sci. & technical services	22.8%	28.3%	24.5%	1.06
8.	Administrative & support services	22.4%	27.7%	23.5%	1.02
9.	Educational services	22.3%	27.4%	23.1%	1.00
10.	Health care & social assistance	22.5%	27.9%	24.0%	1.04
11.	Arts, entertainment & recreation	22.3%	27.5%	23.2%	1.00
12.	Accommodation & food services	22.5%	27.9%	23.7%	1.03
13.	Other services	22.4%	27.6%	23.0%	1.00
	All sectors	**22.3%**	**27.4%**	**23.1%**	

Source: Authors' calculations from the Census Bureau.

Notes: Panel A records the weighted average CR4 ratios across 4-digit industries in each 2-digit sector in 1997 and 2012, and the percent change in the CR4 ratio for each sector between 1997 and 2012. Panel B records the average CR4 ratio across 4-digit industries in all sectors, but *excluding* the listed sector, in 1997 and 2012, as well as the percent change between 1997 and 2012. The final column of Panel B records the ratio of the percent change between 1997 and 2012 when excluding the sector in question, to the percent change for the full sample. The weighted average CR4 across all 4-digit industries is shown in the bottom row, for comparison. For other variable definitions and details describing the sample, see Section 3.1.

Figure A1: Average profit rate in low, mid and highly concentrated industries

(Industries defined at the 4-digit level)

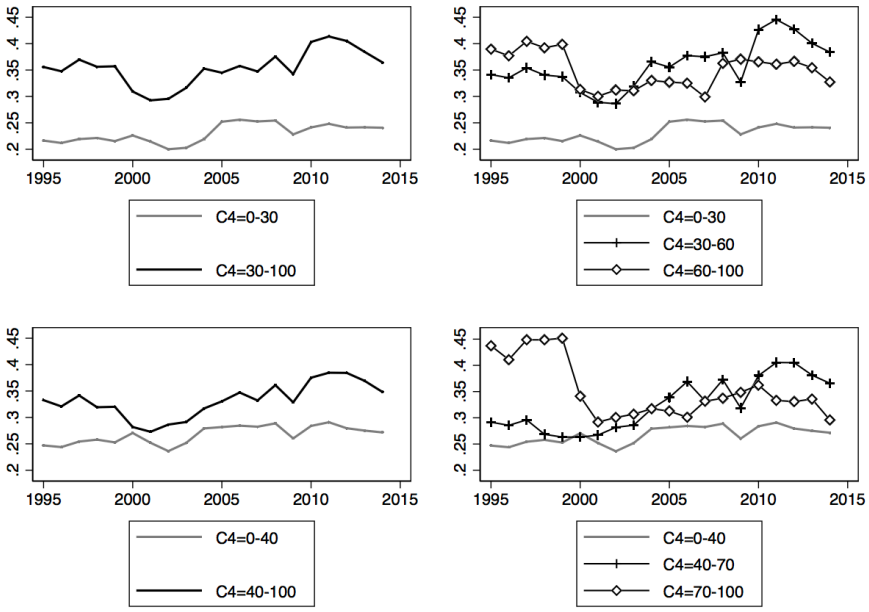


Source: Authors' calculations from the Census Bureau.

Notes: The figure shows the average after-tax profit rate across firms in low, mid, and high concentration industries. The profit rate is defined as operating income before depreciation and after income taxes, relative to each firm's stock of fixed capital. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified as low, mid, or high concentration based on their CR4 ratio in each census year, following the classification in Section 3.3 (see Tables B1 and B2). The CR4 ratio from each census year is applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure A2: Average profit rate across firms, alternative cutoffs for low, mid, and high concentration groups

(Industries defined at the 4-digit level)

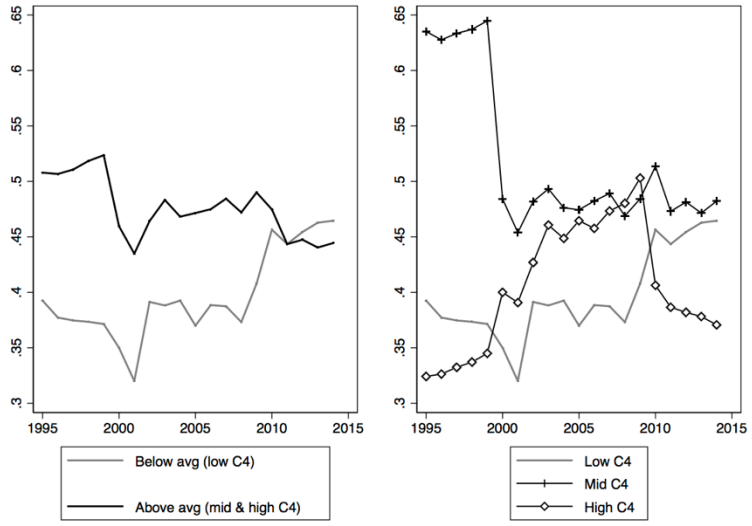


Source: Authors' calculations from the Census Bureau.

Notes: The figure shows the average after-tax profit rate across firms in different groupings of low, mid, and high concentration industries. The profit rate is defined as operating income before depreciation and after income taxes, relative to each firm's stock of fixed capital. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified according to their CR4 ratio in each census year, with the CR4 from each census year applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure A3: Average markups across firms in low, mid and highly concentrated industries

(Industries defined at the 4-digit level)

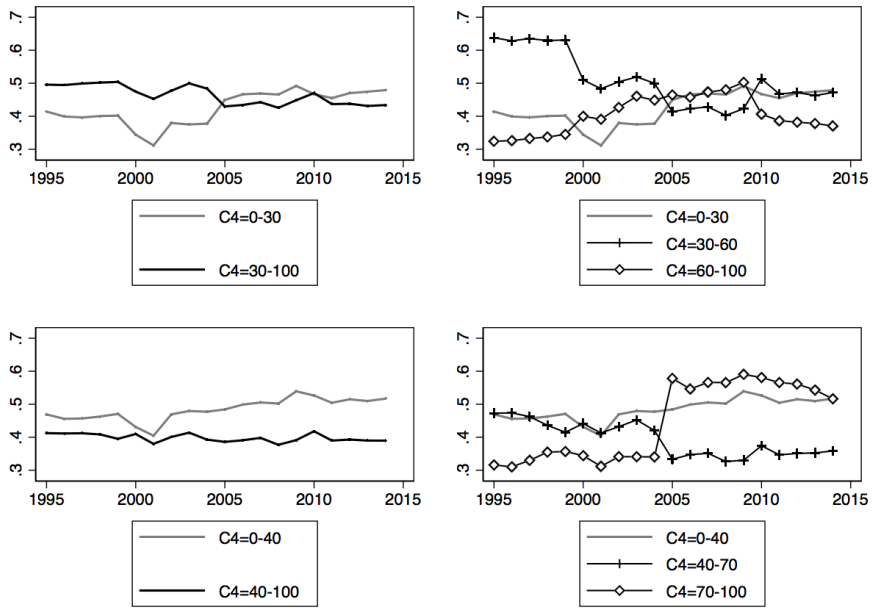


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average markup across firms in low, mid, and high concentration industries. The markup is defined as firm-level sales minus the cost of goods sold, relative to the cost of goods sold. Each series plots a weighted average, with each firm weighted by the cost of goods sold. Industries are classified as low, mid, or high concentration following the classification in Section 3.3 (see also Tables B1 and B2). The CR4 ratio from each census is applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure A4: Average markups across firms, for alternative definitions of low, mid, and high concentration groups

(Industries defined at the 4-digit level)

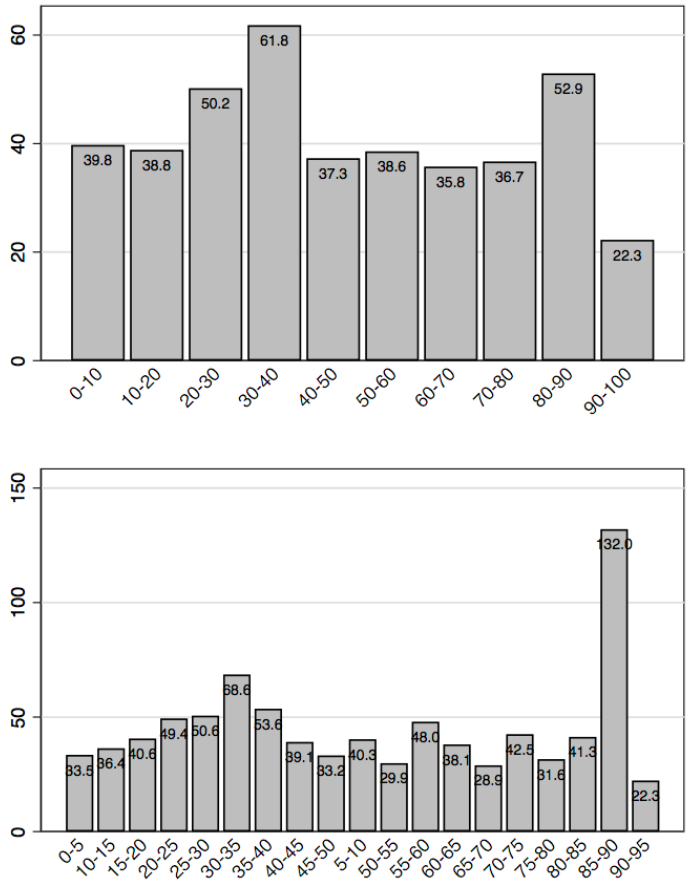


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average markup across firms in different groupings of low, mid, and high concentration industries. The markup is defined as firm-level sales minus the cost of goods sold, relative to the cost of goods sold. Each series plots a weighted average, with each firm weighted by the cost of goods sold. Industries are classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure A5: Average markups across firms in deciles of the CR4 ratio

(Industries defined at the 4-digit level)

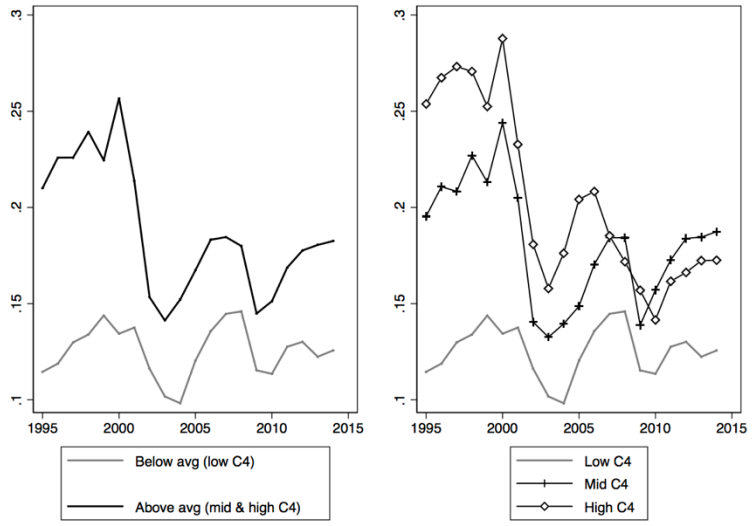


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average markup by five and ten percentage point intervals of the CR4 ratio in 2012. The markup is defined as firm-level sales minus the cost of goods sold, relative to the cost of goods sold. Each bar shows the weighted average of all firms in industries with CR4 ratios in that interval, with each firm weighted by the cost of goods sold. The figure includes all firms in our sample for 1995-2014, aggregated across all years, with industries classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure A6: Average investment rates across firms in low, mid, and highly concentrated industries

(Industries defined at the 4-digit level)

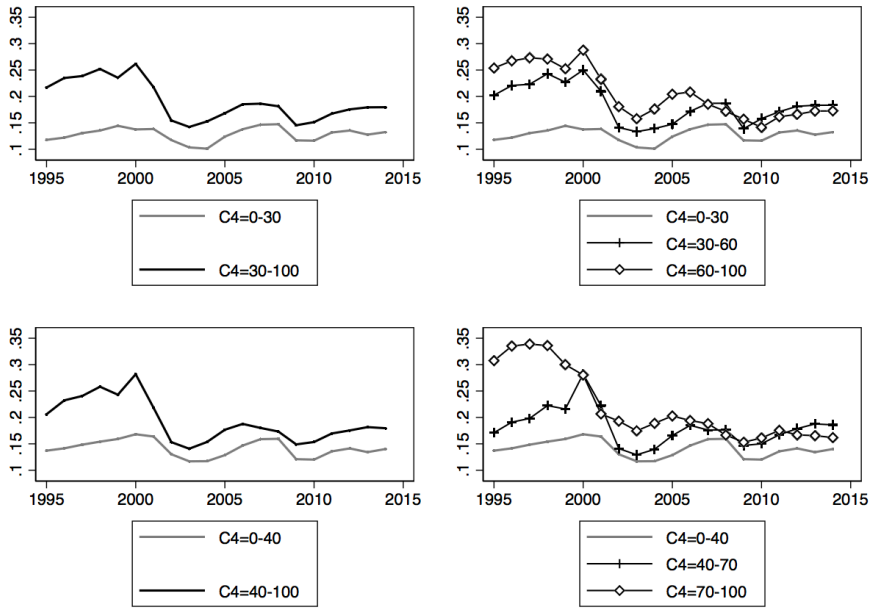


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average investment rate across firms in low, mid, and high concentration industries. The investment rate is defined as capital expenditures relative to the lagged capital stock. Each series plots a weighted average, with each firm weighted by its lagged capital stock. Industries are classified as low, mid, or high concentration based on their CR4 ratio in each census year following the classification in Section 3.3 (see also Tables B1 and B2). The CR4 ratio from each census is applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure A7: Average investment rates across firms, alternative cutoffs for low, mid, and high concentration groups

(Industries defined at the 4-digit level)

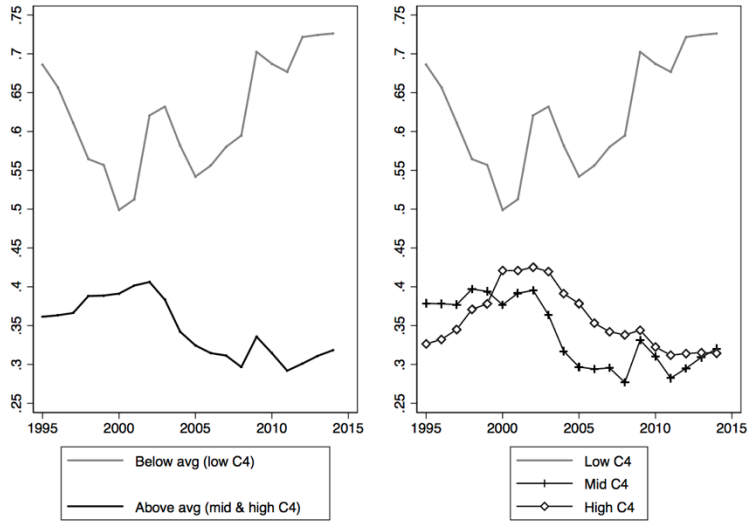


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows the average investment rate across firms in different groupings of low, mid, and high concentration industries. The investment rate is defined as capital expenditures relative to the lagged capital stock. Each series plots a weighted average, with each firm weighted by the cost of goods sold. Industries are classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.

Figure A8: Average capital intensity across firms in low, mid, and highly concentrated industries

(Industries defined at the 4-digit level)

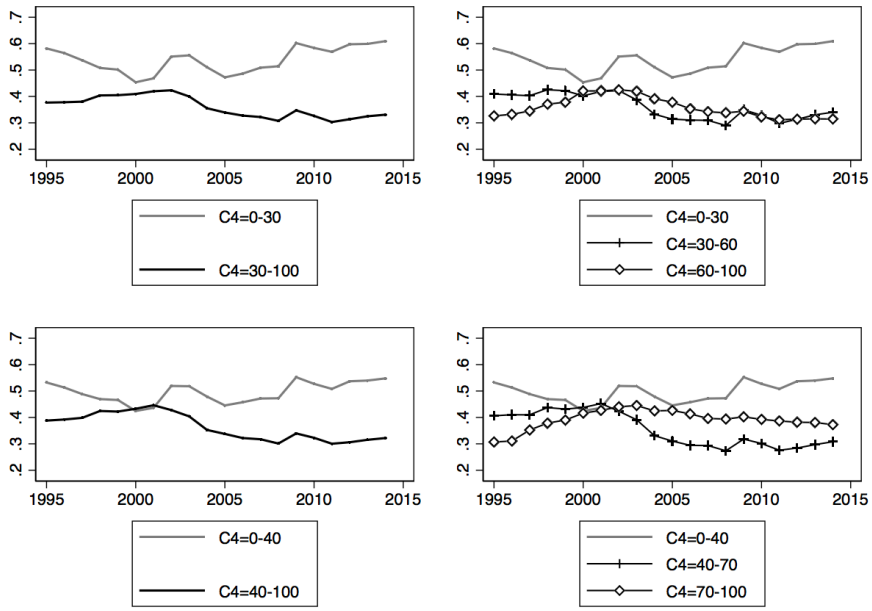


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average capital intensity across firms in low, mid, and high concentration industries. Capital intensity is defined as the capital stock relative to sales. Each series plots a weighted average, with each firm weighted by its sales. Industries are classified as low, mid, or high concentration based on their CR ratio in 2012. For other variable definitions and details describing the sample, see Section 3.1.

Figure A9: Average capital intensity across firms for alternative definitions of low, mid, and high concentration groups

(Industries defined at the 4-digit level)

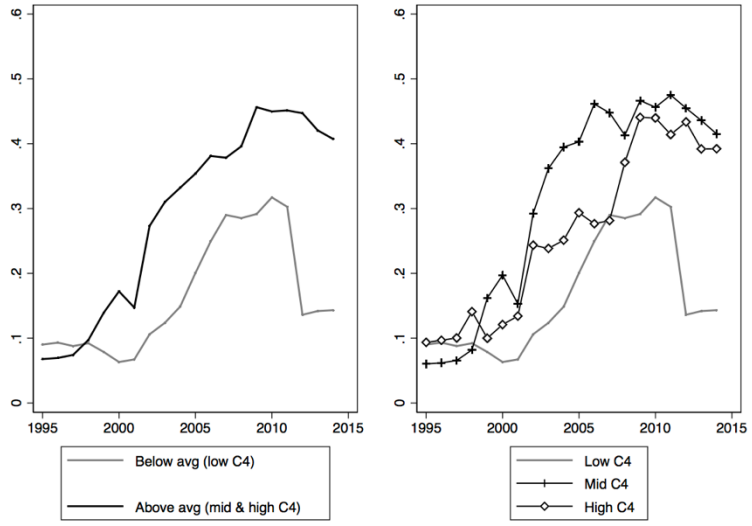


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average capital intensity across firms in different groupings of low, mid, and high concentration industries. Capital intensity is defined as the capital stock relative to sales. Each series plots a weighted average, with each firm weighted by its sales. Industries are classified according to their CR4 ratio in 2012. For other variable definitions and details describing the sample, see Section 3.1.

Figure A10: Average intangible intensity in low, mid, and highly concentrated industries

(Industries defined at the 4-digit level)

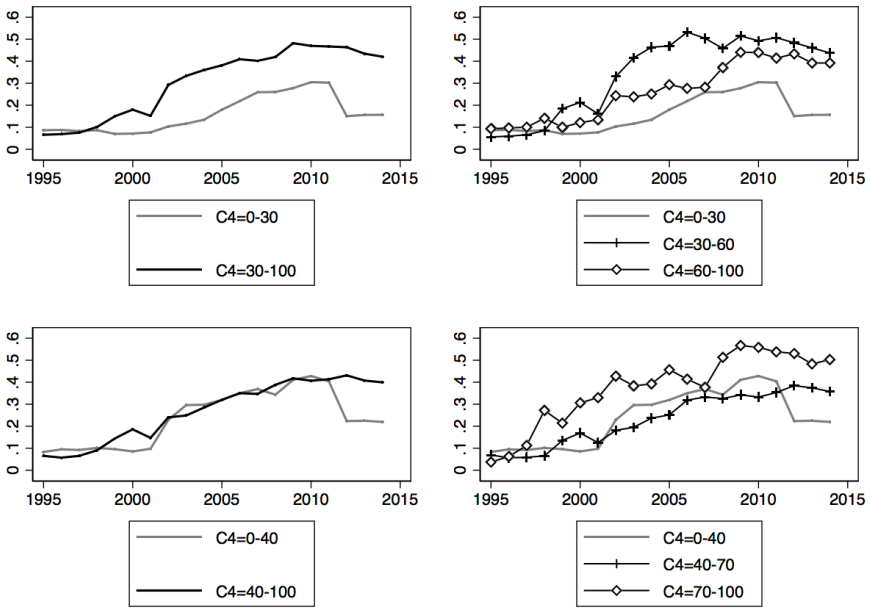


Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average intangible intensity across firms in low, mid, and high concentration industries. Intangible intensity is defined as total intangibles less goodwill, relative to the capital stock. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified as low, mid, or high concentration based on their CR4 ratio in 2012. For other variable definitions and details describing the sample, see Section 3.1.

Figure A11: Average intangible intensity across firms for alternative definitions of low, mid, and high concentration groups

(Industries defined at the 4-digit level)



Source: Authors' calculations from Compustat and Census.

Notes: The figure shows average intangible intensity across firms in different groupings of low, mid, and high concentration industries. Intangible intensity is defined as total intangibles less goodwill, relative to the capital stock. Each series plots a weighted average, with each firm weighted by its capital stock. Industries are classified according to their CR4 ratio in each census year, with the CR4 ratio from each census year applied to the census year and a +/- 2-year band. For other variable definitions and details describing the sample, see Section 3.1.