Are U.S. Industries Becoming More Concentrated?

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Abstract

Over 75% of U.S. industries have registered an increase in concentration levels over the last two decades. Firms in industries with the largest increases in product market concentration have realized higher profit margins, positive abnormal stock returns, and more profitable M&A deals, which suggest that market power is becoming an important source of value. This paper posits two crucial factors behind this trend: one, lax enforcement of antitrust regulations; and two, increasing technological barriers to entry. These findings are robust to the inclusion of private firms, factors that account for foreign competition, as well as the use of alternative measures of concentration. Overall, our findings suggest the nature of U.S. product markets has undergone a structural shift that has weakened competition across a majority of industries.

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Introduction

A fundamental concept in economics is that competition promotes the efficient allocation of resources. This premise motivated governments around the world in the late 20th century to institute a series of policy reforms (e.g., tariff reductions, deregulations, aggressive antitrust enforcement) that drastically changed the industrial landscape of many markets to result in increased competition (e.g., Shepherd (1982), Graham, Kaplan, and Sibley (1983), Pryor (1994), Nickell (1996), Rajan and Zingales (2001), Irvine and Pontiff (2009)).

Since the beginning of the 21st century, however, the nature of U.S. product markets has arguably undergone a fundamental change. We find that Herfindahl-Hirschman index (HHI) has systematically increased in over 75% of U.S. industries, and the average increase in concentration levels has reached 90%. Concomitantly, the market share of the four largest public and private firms has grown significantly for most industries, and the average and median size of public firms, i.e., the largest players in the economy, has tripled in real terms.

Despite the economic magnitude of a consolidation at this level in U.S. product markets, a question remains whether increase in concentration has implications for the competitive environment of U.S. industries. If markets are contestable (e.g., few barriers to entry), then even firms operating in highly concentrated industries should behave as if they have many competitors (Baumol (1982)). Alternatively, if there are significant barriers to entry (e.g., economies of scale, technological barriers, large capital requirements, etc.), then firms operating in increasingly concentrated industries may exercise market power and generate larger abnormal profits (e.g., Bain (1951, 1956)).

This paper examines the changing nature of the competitiveness of U.S. industries. Specifically, we examine whether the changes in industry concentration levels are linked to firm profit margins, abnormal stock returns, profitability of M&A activity, and innovation. Our first set of results indicates that over the past two decades, firms in industries experiencing increases in concentration levels have achieved higher profitability. Using various industry definitions (based on three- or four-digit NAICS), we find that the changes in concentration levels are positively correlated with return on assets. We find similar results when we use the number of public firms and *Concentration Index*—measured as the sum of the annual rank of the HHI and the annual inverse rank of the total number of industry incumbents—as alternative proxies for

industry concentration.[1] When we decompose this profitability measure into asset utilization (i.e., sales to assets ratio) and operating profit margins (i.e., Lerner index), we find that the higher return on assets are mainly driven by firms' ability to extract higher profit margins. A change in the *Concentration Index* in the magnitude of its interquartile range (75^{th} minus 25^{th} percentile) increases profit margins by 142% (relative to its median), whereas the same change increases *Asset Utilization* by only 6%. This finding indicates that firms in concentrated industries may be exercising market power.

To confirm our findings, we consider the possibility that accounting profits do not fully capture firms' payments for the use of capital. Because concentration levels have been historically higher in capital-intensive industries, the results using ROA and profit margins may be driven by variation in cost of capital and in capital intensity across industries. To control for these factors, we augment our regressions with estimates of both the capital share and the cost of capital from the Bureau of Labor Statistics. While our findings for *ROA* and the *Lerner Index* remain economically and statistically significant, the positive correlation between concentration levels and *Asset Utilization* disappears. These results reinforce our thesis that the higher profits in concentrated markets come from the presence of markups, and not from increased reliance on capital or improvements in efficiency.

Additional tests indicate that a potential increase in foreign competition also does not explain the higher profit margin we document. Even after controlling for industry-level sales by foreign multinational enterprises in the U.S., as well as the level of import penetration, the relation between concentration measures and firm profitability remains positive and significant.

We also look at M&A transactions to further explore whether market power is the mechanism behind the higher profitability in industries with increased concentration. If industry concentration has an impact on firms' prospects, then the market should react more positively to the announcement of those transactions that further erode product market competition. We find that mergers of firms in the same industry have become more profitable to shareholders in general, and even more so in the industries with greater concentration.

[1] We find that the increase in HHI index is correlated with the recent decline in the number of public firms over the past two decades. This correlation is not a-priori obvious because the distribution of the market shares among the remaining publicly traded firms, as well as a stronger presence of other competitors (e.g., private firms), can significantly offset the effect of fewer public firms on concentration levels. In fact, previous research indicates that the number of public firms is a poor proxy for actual concentration measures (Ali et al. (2008)).

Finally, we find evidence that returns to shareholders increase as industries become more concentrated. To examine the changes to investors' welfare, we look at the performance of portfolios sorted on the change in concentration levels in their respective industries. In contrast to earlier periods, we find that during 2001–2014, a zero-investment strategy of buying firms in industries with the largest increase in concentration levels, and shorting firms in industries with the largest decrease in concentration levels, generates excess returns of approximately 9% per year, after controlling for standard risk factors. Thus, the higher profit margins that firms have realized as a consequence of this change in concentration since the turn of the 21st century are reflected in higher returns to shareholders. Even given the argument that these excess returns are compensation for bearing extra systematic risk not captured by standard factors (Bustamante and Donangelo (2014)), we find that firms operating in markets with few rivals tend to be less sensitive to macroeconomic shocks than other firms.

The evidence clearly indicates that the relations between changes in industry concentration levels and changes in profit margins and shareholders' wealth have become positive over past two decades. The important question remains, what are the underlying forces behind this secular trend? We explore several possible explanations. First, we examine the possibility that changes in the enforcement of antitrust laws by the Department of Justice and the Federal Trade Commission have allowed firms to significantly increase their market shares over time. Consistent with the arguments in several legal studies, we find evidence of a significant decline in antitrust enforcement during the administrations of George W. Bush and Barack Obama (e.g., Harty, Shelanski, and Solomon (2012), Crane (2012)). Specifically, we find that the use of Section 2 of the Sherman Act, which allows antitrust agencies to prevent increase in market power of existing dominant firms, has declined from an average of 15.7 cases per year over the period 1970–1999 to fewer than 3 over the period 2000–2014. Surprisingly, no cases were filed in 2014 even though aggregate concentration levels reached record levels during that year. Further, we find evidence that completion rates for M&A transactions, including mega M&A transactions, have increased during this period, which is consistent with the claim that antitrust regulators have become less likely to block proposed mergers.

Second, we examine whether markets are becoming more concentrated due to greater barriers to entry. According to Bain (1968), barriers to entry are "the extent to which, in the long run, established firms can elevate their selling prices above the minimal average costs of

production and distribution…without inducing potential entrants to enter the industry" (p. 252). Given the increased contribution of computer-related technology and innovation to the growth in output in the past two decades (e.g., Corrado and Hulten (2010)), firms can create significant barriers to entry by capturing the lion's share of technological advances through internal research and development, acquisition of innovative firms, and access to unique technologies competitors may lack.[2] There is historical precedent for the argument that concentration in technological innovation through patent accumulation can result in barriers to entry and increased market power. For example, Machlup (1952, p. 519) argues that "[the restriction of new entry] may be done through closed patent pools, through accumulation of vast numbers of patents in the hands of one concern, through harassing patent litigation to frighten away all potential newcomers." To explore this claim in a current context, we examine the relation between changes in concentration levels and patenting activity. If technological barriers are an important factor behind the recent changes in concentration, then firms in concentrated industries should own stronger patent portfolios. We find that although the relation between changes in concentration levels and changes in the number and impact of patents was negative before 2000, the relation has reversed in the last fifteen years. After 2000, firms in more concentrated industries have come to possess not only a larger number of patents, but also the most valuable ones. Further, since 2000, the largest four firms in an industry have been capturing the majority of industry-relevant patents. Thus, the bulk of innovation has shifted from competitive industries to noncompetitive industries, indicating that technological barriers to entry may have prevented new firms from entering profitable markets.

In summary, over the last 20 years product markets have undergone a structural change that is transforming the nature of competition. Markets have become more concentrated, and profit margins and shareholders' wealth gains have increased in proportion to the increase in industry concentration. Further, increased profit margins are mainly driven by wider operating margins rather than higher operational efficiency, possibly due to greater market power. Consistent with this notion, higher market concentration has resulted in more profitable investment opportunities, as the market reaction to those M&A announcements likely to increase

[2] Gao, Ritter and Zhu (2013) find evidence that the main reason for the disappearance of IPOs over the past two decades is that startups, which have been important drivers of technological innovation, are now more likely to sell their assets to a larger firm than to go public.

market power has become more positive. Finally, in contrast to latter decades of the 20th century, most innovation is currently conducted by large firms in concentrated industries, thus creating a significant barrier to entry for small new firms in many industries.

Our paper's findings are relevant and important to several strands of the literature. First, it adds to existing research on the relation between concentration levels and profitability. Consistent with models positing that exogenous barriers to entry increase the likelihood of market power, we find that profit margins have been economically and statistically positively related to several proxies of market concentration over the last two decades. We find no link between these two variables during the 1970s and 1980s, which is consistent with earlier studies (e.g., Domowitz, Hubbard, and Petersen (1986a, 1986b, 1987) and Schmalensee (1989)).

Second, our work contributes to the literature examining the evolution of product markets, and especially product market competition, over time. While previous studies document a significant decline in market concentration levels during the last part of the 20th century (Shepherd (1982), Irvine and Pontiff (2009)), we find that product markets have become more concentrated in the past two decades, and that the firms affected by this secular trend generate higher profits and abnormal stock returns. More broadly, our paper adds to a growing body of economic research pointing to a structural change in the nature of U.S. product market operation that began at the turn of the century. This structural development has been reflected by a weak relationship between investment and profitability (Gutiérrez and Philippon (2016)), a decline in business dynamism and entrepreneurship (Decker et al. (2014, 2016)), and an increase in profit share of the nonfinancial sector (Barkai (2016)).

Finally, our analysis also sheds light on potential factors for the recent decline in competition. We find evidence that the recent increase in industry concentration levels coincides with a significant reduction in the enforcement of antitrust regulations by government agencies. Furthermore, our findings indicate that technological barriers provide an important explanation for concentrated markets appearing to be non-contestable. Over the past few decades, firms in concentrated industries have been strengthening their patent portfolios and consequently increasing barriers to entry in a significant way.

I. Changes in Industry Concentration

I.A. Data

Our main sample consists of all firms in the CRSP-Compustat merged dataset over the period of 1972–2014. The main analysis entails firms incorporated in the U.S. that trade on major stock exchanges (NYSE, AMEX, and NASDAQ), and for whom information on their ordinary common shares is accessible.[3] Otherwise, we do not apply any additional filters, and we include financial firms as well as utilities.[4] To account for the role of private and foreign firms, we use information from U.S. Census Bureau and Bureau of Labor Statistics.

Throughout the paper, we use NAICS classification to define a firm's industry.[5] The NAICS system uses a six-digit coding method to identify industries and their placement in a hierarchical structure. The first two digits of the code designate the industry sector, the third digit designates the subsector, and the fourth digit designates the industry group. Although a 4-digit NAICS definition potentially captures industries in a more granular way, it is arguably too narrow to reflect when firms' activities span over closely related but separate markets. Consider, for example, leather and allied product manufacturing (NAICS 316). The subsector consists of three 4-digit industries: Leather and hide tanning and finishing (NAICS 3161), footwear manufacturing (NAICS 3162), and other leather and allied products, such as luggage, handbags, and purses (NAICS 3169). While it is possible that very small businesses focus on only one type of leather products, larger companies, such as Coach Inc., Nike Inc., and Skechers USA Inc. offer a variety of products, including handbags, athletic accessories, and even apparel. By using a 3-digit classification we increase the probability that large corporations are grouped together as competing firms in the same industry. Overall, our results are not affected by whether we use three- or four-digit NAICS classification. For this reason, we present our results using the three-digit code in the body of the paper. The main results using industry definitions based on a four-digit code to calculate HHI (both Census- and Compustat-based) are reported in the Appendix.

[3] For robustness, we repeat the analysis including firms incorporated outside of the U.S., as well as ADRs. The pattern of the change in the number of firms and HHI is slightly weaker but similar to the one presented here.

[4] Excluding financial firms and utilities from our analysis does not affect any of our main results.

[5] Relying on NAICS, rather than SIC, provides several advantages. First, NAICS codes are based on a consistent, economic concept, and group together establishments that use the same or similar production processes. Under the SIC system, some establishments are classified according to production processes, but others are classified using different criteria, such as class of customer, which creates inconsistent groupings across firms. Second, since all government agencies switched to NAICS classification by 2003, using NAICS industry code system allows for an easier merge between the Compustat-CRSP data on one side, and economic indicators, provided by the U.S. Census Bureau and Bureau of Labor Statistics, on the other. Using SIC codes whenever possible does not qualitatively affect any of our results. The detailed information on the NAICS industry classification system can be obtained on the Bureau of Labor Statistics website at http://www.bls.gov/ces/cesnaics.htm.

I.B. General Trend

We first investigate changes in industry concentration levels over time. We examine the trend in several Herfindahl-Hirschman (HHI) concentration indices, each based on different data sets and industry definitions. The first HHI index uses Compustat data, which contains information on U.S. public firms. Within every NAICS 3-digit industry-year, we sum up the squared ratios of firm sales to the total industry sales. Following the approach in Irvine and Pontiff (2009), we assign the industry-level HHI to each firm, essentially weighting each industry ratio by the number of public firms, and then aggregate across firms in every year.

Figure 1-A shows the results for the Compustat-based HHI. Consistent with increased competition associated with tariff reductions deregulations, the concentration index declines from the beginning of the 1980s until the late 1990s. From the late 1990s, the HHI increases until the end of the sample period in 2014. As we show later, this increase in concentration is widespread across industries.

We also use the number of public firms within an industry as another proxy for concentration. Publicly traded firms tend to be much larger than private firms, and therefore represent the key industry players. Figure 1-B presents the change in the number of public firms over time. We use an extended period, including information from the earliest CRSP database coverage, to calculate the number of public firms. Consistent with the evidence in Gao et al. (2013), Doidge et al. (2017), and others, the number of public firms has significantly declined since the late 1990s. This decline has been so substantial that the current number of publicly traded firms in the economy is similar to that of the mid-1970s, when the real gross domestic product was one third of what it is today.

We also find that after the late 1990s, the HHI increased in tandem with the drop in the number of firms. During the 1973–1990 period, the correlation between the number of firms and the HHI was only 0.14, and for a large part of the period both metrics were moving in the same direction. Yet, during the second half of the sample the correlation between these two variables dropped to −0.94. The significant change in correlation between the two periods suggests that our evidence is more than a simple mechanical relation, and points to a structural change in the nature of product market competition.

Further analysis shows that the main reason for this increased correlation between the HHI and the number of firms over the past two decades is that the remaining public firms are themselves much larger than in the past. Figure 1-C reports the annual mean and median size of public firms based on total sales in constant dollars of 1970. Note that while average firm size significantly declined from the early 1970s to the mid-1990s, it started to increase in the late 1990s. Currently the average U.S. firm is almost three times larger—in real terms—than it was twenty years ago. These findings suggest that the disappearance of public firms, combined with a significant increase in the scale of the remaining firms, has been driving a systematic increase in industry concentration.

Finally, we go beyond sales-based measures to evaluate the relative importance of large U.S. firms through labor market dynamics. We calculate the share of employment in firms with 10,000 or more employees the largest size category classified by the Census Bureau, and present the results in Figure 1-D.[6] The trend corresponds to the sales-based analysis: the share of employment by large firms in the overall economy started to escalate in the mid-90s, and has recently exceeded previous historical peaks, and this is consistent with the pattern found in sales-based measures of product market concentration. This trend is also consistent with the evidence in Decker, Haltiwanger, Jarmin, and Miranda (2014, 2016) showing that the role of small young businesses, as measured by business start-up rates, has been declining since 2000. Taken together, these results point to a structural change in the U.S. labor market, where most jobs are being created by large and established firms, rather than by entrepreneurial activity.

We also ensure that the dominance of large firms is not driven by higher prevalence of multisegment firms over the past two decades. We calculate the change in concentration ratios using industry definitions derived from the text-based analysis of a firm's product description in 10-K reports (see Hoberg and Phillips (2010, 2016) for further details).[7] According to this classification, every firm has a distinct group of competitors, which renders industry definition firm-specific: every firm in a given year has a distinct set of peers it competes against. The set of peers can change continuously over time as firms modify the variety of products or services they offer. While far from the standard approach for defining an industry, this method can be more

[6] The historical data on employment by firm size is obtained from Business Dynamics Statistics (BDS) annual report, managed by the U.S. Census (http://www.census.gov/ces/dataproducts/bds/data.html).
[7] The data was obtained from Hoberg-Phillips website (http://hobergphillips.usc.edu/industryconcen.htm).

precise in classifying competitors of firms whose operations span across several different industries. Using the text-based HHI ratio, we find that between 1997 and 2013 (the last year of data available) industry concentration has increased in over 60% of the firm-specific industries. To account for operations of multisegment firms across different geographic areas, we recalculate the Compustat-based HHI ratio after excluding sales of foreign divisions, as reported in the segment file. While the overall level of HHI ratio is lower using the alternative definition, the pattern of a steep increase since 1997 has remained unchanged.

I.C. Industry concentration—cross-industry evidence

Relevant to our investigation is whether the increased concentration has been widespread across industries or whether the phenomenon has been limited to a few industries. We start by calculating the changes in concentration measures in each three-digit NAICS industry during the 1997–2014 period. We use 1997 as our starting period for two reasons. First, 1996 and 1997 are the years in which the HHI was at its lowest level during the sample period (and the number of public firms in our sample peaked). Second, data from the U.S. Census is available for 1997 (since 1967, economic censuses have been conducted for calendar years ending in 2 or 7), which allows for an easier comparison between Compustat and census-based economic indicators. To compare the changes across industries with different levels of concentration ratio, for every industry we calculate a percentage change in HHI index over the 1997–2014 period, and report the distribution of all the changes in Figure 2-A. The concentration ratio has increased in 80% of the industries, and the magnitude of the change is concentrated in the extreme range of the spectrum. Specifically, the median increase in HHI is 41%, while the mean increase is 90%. As mentioned earlier, we also calculate the change in HHI using the 4-digit NAICS classification system. Figures A.1.A and A.1.B, provided in the Appendix, demonstrate that the increase in concentration remains robust and is not affected by a narrower industry definition.

A potential concern with using the Compustat-based HHI index is the absence of private firms in this measure. While private firms are on average very small ($1.3 million according to Asker, Farre-Mensa and Ljungqvist (2011)), a fraction of them could grow large enough to take over the product market space previously occupied by public firms. We address this concern in three ways. First, we use the HHI index provided by the U.S. Census Bureau, which includes revenues of both public and private firms. Although this measure is based on the 50 largest firms

in each industry, it is limited to manufacturing industries.[8] In Figure 2-B we examine the changes in concentration ratios using this alternative measure of the HHI over the 1997–2012 period (2012 being the most recent year for which census data is available); we find an HHI increase in 76% of the industries. Thus, the trend of increased concentration remains robust to including the share of sales generated by private firms.[9]

Since the importance of manufacturing industries in the overall economy has been declining over the past several decades, we ensure that the increase in concentration is prevalent across the U.S. economy when we look beyond the manufacturing sector. Because the census-based HHI index is not available for non-manufacturing industries, we perform a different type of analysis and look at the share of the top four firms (in terms of sales) in each NAICS three-digit industry. Specifically, we use census data to calculate the share of sales of the top four firms (public or private) relative to the industry sales. The advantages of this measure are threefold. First, it covers almost all U.S. industries, including manufacturing, retail, financial, and service sectors.[10] Second, it is based on both public and private firms' information, and therefore, is not limited to the Compustat universe. Lastly, the share of top four firms can be calculated out of total sales of the entire industry, so that the scope of the measure is not limited to the top 50 firms (the census-based HHI index).

Figure 2-C shows the distribution of percentage changes in the share of the top four firms in each industry between 1997 and 2012. The distribution is heavily skewed to the right, demonstrating a greater number of industries in which the share of the largest firms has increased contrasted to industries where the largest four firms became diluted by smaller peers. Moreover, a large proportion of the positive changes were extreme in magnitude: in 21 out of 65 industries the increase has exceeded 40%. Among furniture retailers (NAICS 442), for example, the share

[8]Another advantage of census-based measures of concentration compared to Compustat-based measures is the precise methodology of measuring activities of conglomerate firms. Specifically, the census constructs measures of concentration based on NAICS classification of each individual facility (rather than assigning NAICS codes at a firm level). As a result, sales of conglomerate firms are decomposed by divisions sharing the same NAICS code. The sales of each division are then grouped with the sales of stand-alone firms sharing the same NAICS code for construction of concentration measures.

[9] This concentration ratio is available at a 5-year intervals, for calendar years that end in 2 or 7 (economic census years), when the census conducts more comprehensive data collection. See Ali, Klasa and Yeung (2009) for a detailed discussion of this measure.

[10] The data is available at http://www.census.gov/econ/census/help/sector/data_topics/concentration_ratios.html. There are no data for Mining (NAICS 21), Construction (NAICS 23) and Management of Companies and Enterprises (NAICS 55). The information is available for economic census years only.

of the four largest firms went up from 6.5% in 1997 to 19.4% in 2012, which is equivalent to an almost 200% increase. Another example is the food and beverage industry (NAICS 445). As early as 2000, the USDA Economic Research Service published a special report pointing to an unprecedented consolidation of supermarkets that has brought together regional chains and created a small group of de facto nationwide food retailers.[11] Our evidence suggests that this consolidation trend has continued throughout the 21st century: while the revenues of the top four firms have increased from 18.3% in 1997 to 26.9% in 2012, the industry has lost over two-thirds of its publicly traded firms, and its HHI has more than tripled.

Finally, we ask whether the role of public firms in the overall economy has remained high despite their disappearing numbers. To address this question, we examine the economic importance of publicly traded firms by looking at the share of sales by public firms out of the total sales by public and private firms (see Appendix, Figure A.2). We find that the share of public sales in the total revenues of U.S. business enterprises has remained stable, with signs of increase over time. To zoom in on a potential role of large private firms, we repeat our analysis for the subsample of firms with sales over $100M (the largest size category classified in U.S. Businesses report), and find a similar trend.[12] Therefore, even though the number of private firms increased and the number of public firms decreased, the aggregate contribution of private firms relative to public firms did not increase.

Our final measure of concentration examines the change in the number of publicly traded firms across industries. Figure 2-D shows that the number of publicly traded firms has significantly declined in most industries. 66 out of 71 industries have experienced a negative change over the 1997–2014 period. Moreover, the largest mass of the distribution is concentrated in the extreme range, indicating that 73% of the industries have lost over 40% of their publicly traded peers.[13]

We also decompose the changes in the number of public firms by sources of entry and exit to address the possibility that the increase in industry concentration could be driven by industries shrinking due to declining demand, which, in turn, leads to fewer participants in the

[11] See http://www.iatp.org/files/Consolidation_in_Food_Retailing_Prospects_for_.pdf

[12] For robustness, we also calculate the aggregate revenues of publicly traded firms as a percentage of the U.S. gross domestic product. Consistent with the evidence in Gabaix (2011), we find that despite their shrinking numbers, public firms still represent a large fraction of the U.S. economy.

[13] We also find that over 50% of the industries in the U.S. have lost at least half of their peers.

market. We find that a decline in the number of IPOs and the higher rate of M&As are two key mechanisms responsible for the decline in the number of public firms (Appendix, Figure A.3). Thus, firms do not usually exit public markets due to liquidation or involuntary delisting. Instead, our results suggest that the remaining firms are thriving and expanding at a persistent and positive rate.

The results in this section consistently point to an increase in product market concentration over the past two decades. The pattern is economically large, robust to different measures of product market concentration and different industry classifications, and prevalent across the vast majority of U.S. industries.

II. The Economic Implications of the Increase in Concentration Levels

Does the systematic increase in concentration levels have an economic effect on the fundamentals of the remaining firms? To answer this important question, we first analyze the relation between profitability and changes in industry concentration in a panel-data setting, while controlling for other factors that could influence firms' profitability levels.

II.A. Industry Concentration Levels and Profitability

If markets are contestable (e.g., few barriers to entry), then even firms operating in highly concentrated industries should behave as if they had many competitors (Baumol (1982)). Consequently, profitability should not be affected by changes in industry concentration levels because the threat of potential entrants would not affect the competitive environment.[14] Furthermore, Sutton (1991) goes a step further and shows the presence of sunk costs such as advertising and R&D may result in declining industry profitability as concentration levels increase. Specifically, intense quality competition may increase the total costs of operating in a particular industry leading to concentrated markets, as low price-cost margins reduce the number of market participants.

Alternatively, if there are significant barriers to entry (e.g., economies of scale, technological barriers, large capital requirements, etc.), then firms operating in industries that

[14] Baumol (1982, p.2) argues that "in the limiting case of perfect contestability, oligopolistic structure and behavior are freed entirely from their previous dependence on the conjectural variations of *incumbents* and, instead, these are generally determined uniquely and, in a manner that is tractable analytically, by the pressures of *potential* competition."

become more concentrated may generate larger abnormal profits by exercising market power. Under this scenario, firms' profitability levels should be positively correlated with industry concentration levels, as firms compete against fewer competitors without facing the threat of entry by potential rivals. In this subsection we test these alternative hypotheses.

We examine the relation between changes in profitability and changes in industry concentration levels by estimating the parameters of the following regression model:

$$ROA_{ijt} = \alpha_i + \alpha_t + \beta_1 \log(Assets_{it}) + \beta_2 \log(Age_{it}) + \beta_3 \log(Concentration\ Level_{jt}) + \varepsilon_{ijt} \quad (1)$$

where *ROA* is the operating income before depreciation (Compustat item OIBDP) scaled by the book value of assets (item AT), α_i is a firm-fixed effect, α_t is a year-fixed effect, *Assets* is the book value of total assets, *Age* is the time (in years) from the firm's CRSP listing date, and $Concentration\ Level_{jt}$ is a proxy for the level of product market concentration in industry *j* at time *t*. Our proxies for concentration are: (i) the Herfindahl-Hirschman Index at the NAICS 3-digit level using sales from Compustat (*HHI*); (ii) the total number of public firms in an industry (*Number of Firms*); and (iii) a cross-sectional ranking of the previous two measures that is equal to the sum of the annual rank of the HHI and the annual inverse rank of the total number of industry incumbents (*Concentration Index*). Note that, by construction, this index increases as the level of industry concentration increases. The results in this section are based on the three-digit NAICS code. Table A.1 in the Appendix presents the results using the four-digit NAICS as the industry definition.

To control for potential time-series dependence in the residuals, we cluster the standard errors at the firm level. Since we include firm fixed effects, and firms rarely switch industries, the proxies for industry concentration can be interpreted as the changes in concentration relative to the industry mean. The inclusion of firm fixed effect also helps address a number of alternative explanations. For example, if profitable firms systematically acquire the nonprofitable ones, this matching could lead to a mechanical relation between concentration levels and profitability. The inclusion of firm fixed effects addresses this concern by focusing the analysis on the within-firm variation in profitability over time.

We use *ROA* as a proxy for profitability because this metric is not affected by changes in capital structure or by the presence of unusual and nonrecurring items. Further, simulation

evidence (Barber and Lyon (1996)) suggests that *ROA* is superior to other measures of profitability in detecting abnormal operating performance. Finally, ROA is calculated net of organizational capital expenses (SG&A), including R&D and advertising, and therefore, mitigates concerns that the relationship between concentration and profitability could be driven by industries where the role of intangible capital has increased over time (Bessen, 2016). Following Bertrand and Mullainathan (2003) and Giroud and Mueller (2010), we include firm size and age in all our regressions to control for the effect of economies of scales and learning about profitability (as firms get older, they have a better understanding of their production functions). In addition to firm fixed effects, we also include year-fixed effects to control for unobserved time-specific shocks affecting all firms. Finally, to mitigate the impact of extreme ratio values caused by denominators approaching zero, we exclude firms with assets or sales less than $5 million (e.g., microcaps).[15] We also winsorize ratios at the 1% and the 99% of their empirical distribution.

Figure 3 plots the dynamics of aggregate *ROA* over time. Aggregate ROA is calculated as the aggregate operating income before depreciation scaled by the aggregate book value of assets. Panel A shows that aggregate *ROA* has been declining over the past few decades from 11% in 1970 to almost 5% in 2014. Although this evidence seems to suggest that aggregate profitability and aggregate concentration levels are moving in the opposite direction, additional analysis reveals that this is not the case. Once we split the sample into nonfinancial and financial firms (Panels B and C, respectively), both groups of firms exhibit fairly stable trends in profitability, suggesting that the negative aggregate trend in *ROA* is mainly driven by the increasing importance of financial firms in the economy, which tend to have lower *ROA*.[16] These findings highlight the importance of controlling for other factors when examining the relation between profitability and concentration levels. The analysis below addresses this issue.

Panel A of Table 1 reports the coefficients of Equation 1 estimated over the period 1972-2014. We find that *ROA* is positively related to both the *HHI* and the *Concentration Index* and negatively related to the *Number of Firms.* This result shows that firms tend to generate significantly higher profits when their industries become more concentrated. The results also

[15] Including microcaps in our regressions does not affect our main results.
[16] Greenwood and Scharfstein (2013) document that the financial sector share of GDP has significantly increased over the past three decades.

reaffirm our earlier findings that the increase in concentration levels is not due to firms leaving unprofitable industries. Note that profitability is positively correlated with changes in firm size, suggesting that economies of scale are an important determinant of firms' profitability during the sample period.

Since most of the increase in industry concentration levels occurs in the latter part of our sample, we test whether the empirical relation between profitability and concentration levels might have changed over that particular time period. To perform this analysis, we estimate the regression parameters of Equation 1 over three different subperiods (1972–1986, 1987–2000 and 2001–2014).[17]

Panel B of Table 1 reports the results from this analysis. Similar to Domowitz, Hubbard, and Petersen (1986a, 1986b, 1987) and Schmalensee (1989), who have studied the intra-industry relation between industry-level price-cost margins and concentration levels over the 1958-1981 period, we do not find a strong relation between *ROA* and measures of concentration during the earlier part of our sample. In fact, there is some evidence that the correlation between these two variables is negative over the period 1972–1986. It is only the later subperiod (2001–2014) in which the relation between *ROA* and our proxies for industry concentration levels is positive and statistically significant across all measures. In terms of economic significance, the coefficient of *Concentration Index* estimated over this period indicates that a change in concentration from the 25th to the 75th percentile leads to an increase in *ROA* of about 32.3% relative to its median. We find similar magnitudes when we use HHI and the number of firms as alternative measures of concentration. Thus, this analysis points to a significant structural shift starting at the turn of the 21st century in the economic relation between industry structure and firms' profitability.

II.B. The Sources of Abnormal Profits

A potential explanation for the increase in profitability in the more concentrated industries is the decrease in contestability over time resulting from increasing barriers to entry. Thus, lack of competition may allow remaining industry incumbents to enjoy wider profit margins by setting higher prices relative to production costs. Along these lines, Barkai (2016) uses a general equilibrium model to demonstrate that increase in markups is the only factor able

[17] Splitting the sample into alternative subperiods does not qualitatively affect any of our main results.

to explain the increase in profit share in the U.S. nonfinancial sector in the past 30 years. Alternatively, some analysts argue that, given the changing nature of U.S. industries, the consolidation of firms within an industry may increase operational efficiency. For example, a large firm may enhance flexibility by reallocating its existing resources to extract the highest productivity from any unit of capital, consequently increasing firm profitability. To this end, we examine whether the empirical relation between profitability and change in industry concentration levels stems from higher profits margins, higher operational efficiency, or both.

We start by decomposing return on assets into two components: the *Lerner Index* and the *Asset Utilization* ratio. The *Lerner Index* measures the extent to which prices exceed marginal costs (price-cost margins), while the *Asset Utilization* ratio measures how efficiently firms manage their assets to generate sales. Following Aghion et al. (2005), we define the *Lerner Index* as operating income before depreciation (Compustat item OIBDP) minus depreciation (item DP) scaled by total sales (item SALE). We exclude depreciation from operating income to take into account the cost of physical capital (Hall and Jorgenson (1967)). *Asset Utilization* is simply defined as total sales scaled by total assets.

Figure 4 plots the dynamics of the aggregate *Lerner Index* and the aggregate *Asset Utilization* for all non-financial firms on the Compustat-CRSP dataset over the period 1970–2014. The aggregate *Lerner Index* is measured as the aggregate operating income after depreciation scaled by aggregate sales, and to construct the aggregate *Asset Utilization* we scale aggregate sales by the aggregate book value of assets. This figure shows that while the aggregate *Lerner Index* experienced a positive structural shift in the early 2000s, aggregate *Asset Utilization* has been declining over time. This evidence indicates the positive link between concentration and ROA is potentially driven by higher profit margins rather than by higher operational efficiency.

Using the same specification as in Equation 1, we estimate the coefficients of the model using the *Lerner Index* and the *Asset Utilization* ratio as dependent variables. The results from this analysis are reported in Table 2. Panel A shows a strong relation between the Lerner index and concentration measures during the whole sample period (1972–2014): the *Lerner Index* is positively correlated with both the *HHI* and the *Concentration Index*, and negatively correlated with the *Number of Firms*. On the other hand, Panel B shows no correlation between *Asset Utilization* and concentration measures over the same time period.

Consistent with our previous findings, the relation between profitability measures and proxies for industry concentration levels is stronger over the subperiod 2001–2014. In this subperiod, both the *Lerner Index* and the *Asset Utilization* ratio increase as industries become more concentrated. These results suggest that firms operating in industries becoming more concentrated are able to generate abnormal profits by increasing their profit margins and enhancing the efficiency of their existing assets. The economic significance of the profit margin impact is much stronger than the efficiency effect. While a change in the *Concentration Index* from the 25th to the 75th percentile leads to an increase in the *Lerner Index* of about 142% relative to its median, a similar change in the *Concentration Index* only leads to an increase in *Asset Utilization* of about 6% relative to its median. These results indicate relations between profitability (ROA) and the changes in concentration levels (Table 1) are mainly driven by the positive effect product market concentration on profit margins, and not by efficiency gains. Panel B of Table A.1 in the Appendix shows that these results are robust to the use of four-digit NAICS as the industry definition. At a conceptual level, the evidence in this subsection implies market power may be playing an important role in many industries. One possibility is that higher barriers to entry may have increased firms' ability to generate higher profit margins by fending off potential competitors.

II.C. Accounting Profits versus Economic Profits

Our previous analysis used accounting profits to measure firms' profitability. However, because no market transactions are recorded for capital services, the profits we measure from the accounting statements can differ from the true economic profits due to industry variations in the price and the use of capital. To formally illustrate this point, suppose the true economic profit of the firm in a competitive market is equal to

$$\pi^* = py - wn - \mu K$$

where py is the total revenue, n is the amount of labor, w is the wage, μ is the price of capital, and K is the capital stock. Assuming accounting profits do not include the payment for capital, they are equal to

$$\pi = py - wn$$

Consequently, the true *ROA* and *Lerner Index* are equal to

$$ROA^* = \frac{(py - wn - \mu K)}{K}$$

$$Lerner\ Index^* = \frac{(py - wn - \mu K)}{py}$$

whereas the accounting *ROA* and *Lerner Index* are equal to

$$ROA = \frac{(py - wn)}{K}$$

$$Lerner\ Index = \frac{(py - wn)}{py}$$

If we calculate the biases for these two accounting measures, we obtain

$$ROA - ROA^* = \frac{\mu K}{K} = \mu \quad (2)$$

$$Lerner\ Index - Lerner\ Index^* = \frac{\mu K}{py} = \alpha \quad (3)$$

where α is the capital share. Note that we can also express *Asset Utilization* as a function of μ and α:

$$Asset\ Utilization = \frac{py}{K} = \mu\left(\frac{py}{\mu K}\right) = \mu\left(\frac{1}{\alpha}\right) \quad (4)$$

These results indicate if the industry-level μ and α are correlated with concentration levels; our main results may be simply driven by cross-sectional differences in these two factors. Therefore, it may be premature to interpret the results in the previous section as evidence for firms in more concentrated markets earning abnormal profits or using their assets more efficiently. To address this econometric concern, we gather data on the price of capital (μ) and the capital share (α) at the three-digit NAICS industry level from the KLEMS Multifactor Productivity Tables produced by the Bureau of Labor Statistics (BLS). *Price of Capital* is defined as the capital payments scaled by the stock of assets, while *Capital Share* is defined as the capital payments scaled by the total value of production. Capital payments are equal to the flow of services from the stock of assets, which include equipment, structures, intellectual property products, inventories, and land. The BLS aggregates the stock of assets using weights based on the implicit prices these assets would generate on a rental market.[18] These variables are available at an annual basis starting from 1987.

[18] See https://www.bls.gov/mfp/mprdload.htm for a detailed discussion of these variables.

Table 3 reports the results from regressions of *ROA*, *Lerner Index*, and *Asset Utilization* on the *Concentration Index* controlling for the *Price of Capital* and the *Capital Share*. Consistent with our previous findings, this table shows *ROA* and the *Lerner Index* are positively related to concentration levels over the period 2001–2013. These results indicate that industry cross-sectional variation in the use and cost of capital are not driving our main findings. Moreover, consistent with the prediction from Equation 4, Table 3 shows *Asset Utilization* positively correlated with the *Price of Capital* and negatively with the *Capital Share*. It also shows the positive correlation between *Asset Utilization* and concentration levels documented in subsection II.B completely disappearing after controlling for these two factors. Overall, these results further support the claim that the higher profits earned by firms in more concentrated markets are coming from markups, and not from the use of more capital or better utilization of their assets.

II.D. Substitution by Foreign Firms

Since the 1970s, the globalization process has significantly increased the volume of international trade across countries. Consequently, if foreign firms have been filling the gap left by the disappearing U.S. public firms, then the level of product market competition in U.S. industries may not have been adversely affected by the increased concentration of domestic firms over the last two decades. Moreover, if foreign firms became more dominant in industries with the largest consolidation of domestic firms, then the observed higher profits of domestic firms in concentrated industries may be explained by factors unrelated to market power, such as change in growth opportunities of the local market.

To address this concern, we start by referring back to the census-based indicators of industry concentration. In addition to including sales of both public and private firms, the economic census tabulates the data of business establishments physically located in the U.S., regardless of their ownership. Thus, the census-based measures include the revenues of U.S.-located establishments of foreign-owned firms, capturing operations of foreign competitors.

Moreover, the census-based measures exclude the activity of foreign subsidiaries of U.S. firms. This point is also important: over the last several years, large conglomerates such as Walmart and Apple have generated over 50% of the total revenues in the overseas markets. Census-based measures of concentration help mitigate the concern that Compustat-based sales

include foreign sales by U.S. corporations, and, therefore, generate an upward bias in the measurement of product market concentration.

We perform two types of tests to further evaluate the impact of foreign competition on the profitability of U.S. publicly traded firms. First, we incorporate import penetration in our main analysis. Second, we examine operations of foreign multinationals as another way to measure international competition.

We start the analysis by looking at import penetration. This is one of the most common measures of foreign competition, which has been used in a number of studies (e.g., Katics and Petersen (1994), Borjas and Ramey (1995), Cuñat and Guadalupe (2009), Irvine and Pontiff (2009), Autor, Dorn, and Hanson (2013), Acemoglu et al. (2016)). We obtain the information on U.S. International Trade Data, which reports the dollar values of import and export activity at the industry level, from the public releases of the U.S. Census Bureau.[19]

To ensure that our conclusions regarding increased concentration in the U.S. are not driven by substitution of U.S.-manufactured goods by foreign imports, we reestimate the regression of profitability as a function of industry concentration including a dummy variable equal to one if the firm belongs to one of NAICS three-digit industries that could be potentially affected by import penetration (33 industries total). We find that the significance of the effect of concentration levels on firm profitability remains unaffected.

While import penetration data is widely used in economics studies, it has several shortcomings. First, import penetration is a valid source of competition only in a subsample of industries, specifically in those that produce tangible goods that could be shipped (apparel, food, rubber, metal, machinery, as well as commodities and crops). As a result, industries outside of manufacturing, mining, and agricultural sectors are not affected by foreign competition in the form of import penetration. Second, many foreign companies operate directly out of the U.S. and import penetration data does not capture this activity. If foreign firms manufacture and sell their products in the U.S., their revenues will not be accounted in imports data, therefore biasing the actual scope of foreign competition downwards. Although both aspects are captured by the census-based measures of concentration, which include operations of all domestic and foreign-owned facilities on the U.S. territory, we perform a different type of analysis and look at the

[19]The data is available at http://censtats.census.gov/naic3_6/naics3_6.shtml. Unfortunately, the information on foreign trade at a NAICS level is only available from 2000, so we limit our analysis to the period 2000–2013.

activities of U.S. affiliates of foreign multinational enterprises. These statistics, managed by the Bureau of Economic Analysis (BEA), a division of the U.S. Census Bureau, are based on mandatory surveys of virtually all U.S. business enterprises that are affiliates of a foreign person or a foreign parent company.[20] For the purpose of our analysis, we obtain information on total sales of majority-owned foreign affiliates by industry for the period of 2002–2013.[21] To assess the importance of foreign firms' operations in the U.S., for every industry-year we scale the total sales of foreign-owned U.S. firms by total sales of publicly traded firms.

We then ask whether the operations by foreign firms have grown primarily in the industries with the largest increase in concentration, thereby substituting for domestic competition. Our analysis indicates that this substitution is not the case. The correlation between the percentage increase in Compustat-based HHI ratio and the percentage change in the ratio of sales by foreign multi-national to US public firms is −0.19. The negative sign indicates foreign multinationals seem to be more active in industries that have become more competitive over time, thus contradicting the substitution hypothesis. We perform a similar exercise by replacing the change in concentration with the percentage change in the number of public firms, and find that the correlation coefficient is −0.05 and statistically insignificant. To examine the substitution hypothesis more formally, we repeat the main estimation of firm profitability as a function of concentration, while adding the log of sales by foreign multinational enterprises at the industry level. We find our main results are unaffected.

To summarize, our results indicate that although the overall volume of foreign activity in U.S. has been increasing, a large portion of U.S. industries have expanded at a similar pace, balancing off foreign competition. Moreover, the activity of foreign firms did not increase in industries whose domestic firms experienced the largest increase in concentration, thus further contradicting the foreign substitution hypothesis. Finally, the positive impact of the measures of product market concentration (based on the activity of U.S.-based firms) on productivity is not driven by import-sensitive sectors, and is robust to inclusion of foreign operations in the regression analysis. Further, the substitution effect of foreign firms should not have resulted in

[20] The data is available at http://www.bea.gov/itable/. The benchmark surveys, conducted for census years, cover the vast majority of U.S. affiliates of a foreign person or parent company. In the surveys of other years (sample surveys) reports are not required for small affiliates. Instead, BEA estimates the data by extrapolating forward their data from the most recent benchmark surveys.

[21] BEA provides data starting from 1997. However, the industry classification system for the period of 1997–2001 is too crude, so that the data is available for about one-third of NAICS 3-digit industries only.

increased ROAs for the industries with increase domestic concentration, as we find. In summary, data does not support the claim that foreign firms have been filling gaps left by U.S. public firms, consequently making the landscape more competitive.

III. Changes in Industry Concentration and the Value of Mergers

From a theoretical perspective, mergers can create value by improving efficiency (e.g., economies of scale and scope, synergies, and elimination of duplicate functions), or by increasing market power. The latter effect should become more dominant as competition declines. Therefore, examining the relations of mergers' profitability to changes in concentration may allow us to gain further insight into the mechanism behind the documented increased profitability. To this end, we disentangle these two effects by examining the effect of a firm's product market environment on the market reaction around mergers and acquisitions announcements. If investors perceive the wealth effects in mergers as partially due to increases in market power, then the market reaction to these corporate events should be stronger in industries with increased concentration, especially in related mergers. This claim is justified because, keeping everything else constant, mergers in concentrated markets are more likely to further reduce competition than mergers in competitive markets. This argument is consistent with the antitrust polices of the Federal Trade Commission and the Department of Justice, in which mergers in highly-concentrated markets are predominantly investigated and/or blocked

We gather data from the Securities Data Corporation's (SDC) Mergers and Acquisition database. Our sample consists of mergers and acquisitions transactions over the period 1980-2014 that meet the following conditions: (i) percent of ownership by acquirer prior to event is less than 50%; (ii) percent of ownership by acquirer after event is more than 50%; (iii) both acquirer and target are identified as public firms (since we are interested in total market reaction, to both public and target firms); (iv) acquirer and target firm have different identifiers; (v) the transaction is completed; (vi) return data around the announcement date is available on CRSP; and (vii) offer price is available on SDC.

We focus on the change in the combined value of the target and the acquiring firm to gauge the magnitude of the total wealth creation around the merger announcement. To capture this effect, we calculate the cumulative abnormal return (CAR) of the combined firm over a three-day event window [−1, 1] around the merger announcement:

$$Combined\ CAR_{i,t} = \frac{MV_{A,t+1}+MV_{T,t+1}}{MV_{A,t-1}+MV_{T,t-1}} - 1 - r_{CRSP,t-1,t+1} \quad (5)$$

where t is the announcement date of the transaction, MV_A (MV_T) is the market value of equity of the acquiring (target) firm, and $r_{CRSP,t-1,t+1}$ is the cumulative return on the CRSP value-weighted market portfolio from t-1 to t+1.

To investigate the effect of market power considerations on M&A transactions, we test whether the effect of the changes in concentration levels on announcement returns is stronger when the target and the acquirer are in the same industry (related mergers) than the effect is when they are in different industries (unrelated mergers). If the impact of the change in concentration levels on expected synergies is mainly driven by the impact of the merger on the competitive landscape of the industry, then the effect should be stronger for related mergers. To test this hypothesis, we estimate the parameters of the following model:

$$\begin{aligned} CAR_{ijt} &= \alpha_t + \alpha_j + \beta_1 B/M_{T,i,t-1} + \beta_2 B/M_{A,i,t-1} + \beta_3 \log(MV_{T,i,t-1}) + \beta_4 \log(MV_{A,i,t-1}) \\ &+ \beta_5 DUMCASH + \beta_6 DUMSTOCK + \beta_7 \log(Concentration\ Level_{jt-1}) \\ &+ \beta_8 Related_i + \beta_9 Related_i \times \log(Concentration\ Level_{jt-1}) + \varepsilon_{ijt} \end{aligned} \quad (6)$$

The main variable of interest is the effect of the increased concentration on related mergers. Therefore, we include a dummy variable (*Related*) that is equal to one if the target and the acquiring firm are in the same industry, and an interaction variable equal to the product of *Related* and *Concentration Level*. We also include several other relevant variables: α_t is a year-fixed effect, α_j is an industry-fixed effect, B/M_T (B/M_A) is the book-to-market ratio of the target (acquiring) firm, and *DUMCASH* (*DUMSTOCK*) is a dummy for pure cash (stock) transactions. Following the definition in Davis, Fama, and French (2000), we define the book-to-market ratio as stockholder's book equity, plus balance sheet deferred taxes and investment tax credit, if available, minus the book value of preferred stock. Further, we cluster the standard errors at the industry level and winsorize the book-to-market ratios at the 1% and the 99% of their empirical distributions.

We include the book-to-market ratios of the target and the acquiring firm as control variables to capture the effect of investment opportunities (Jovanovic and Rousseau (2002)) and/or potential misvaluation (Shleifer and Vishny (2003)) on the wealth effects of mergers. We also include the market values as proxies for firm size to control for the potential economies of scales generated by the merger, year-fixed effects to control for the impact of merger waves and macroeconomic conditions on announcement returns, and industry-fixed effects to control for time-invariant industry factors. Finally, we include dummies for pure cash transactions and pure stock transactions to control for the well-documented effect of the method of payment on M&A announcement returns.

If investors believe market power considerations are an important part of the expected synergies from a merger, then we should observe a positive coefficient on the interaction variable. Table 4 reports the estimated coefficients from this regression. Supporting the predictions of the market power hypothesis, the first column provides evidence for the empirical relation between *Combined CARs* and the proxies for concentration levels resulting largely from related mergers. Consistent with our profitability results, we find that this effect is much stronger during the post-2000 period. While the second column (period 1980–2000) shows that the interaction variable is insignificant for all measures of concentration, the third column (period 2001–2014) shows the effect of concentration levels on *Combined CARs* tending to be much stronger during related mergers. Overall, the findings in this section suggest that market power considerations appear to be an important source of value during M&A transactions. These findings lend further credibility to the claim that increased market power affects profit margins for firms in industries with increased concentration.

IV. Change in Concentration and the Cross-Section of Stock Returns

Our analysis so far indicates that firms in more concentrated markets tend to earn higher profits. In this section we examine whether these higher profits also lead to abnormal stock returns.[22] To investigate this issue, we calculate the annual change in the concentration levels in each industry (defined using a firm's three-digit NAICS code) over the period 1972–2014:

[22] There is a debate in the literature on how stock returns are related to concentration levels. While Hou and Robinson (2006) find that firms in more competitive markets tend to earn higher stock returns, Bustamante and Donangelo (2014) find that these firms earn lower returns. Our contribution to this debate is a focus on the changes

$$Chg_{t-1} = (Concentration\ Level_{t-1} - Concentration\ Level_{t-2}) \quad (7)$$

We then sort industries based on the magnitude of the change, and form three portfolios. The high *Chg* portfolio contains the top 10 industries, the low *Chg* portfolio contains the bottom 10 industries, and the middle portfolio the remaining industries.[23] To calculate returns in year *t*, we first calculate equally-weighted and value-weighted returns by industry. After these industries are assigned to one of the three portfolios based on the change in concentration levels, we calculate equally-weighted industry returns for each portfolio. For value-weighted returns, we aggregate the market value of equity of all firms within an industry and calculate value-weighted industry returns for each of the three portfolios. Using this portfolio formation, we calculate monthly equally-weighted and value-weighted returns from July of year *t* to June of year *t*+1.

To control for differences in systematic risk across portfolios, we use three different asset-pricing models: CAPM, Fama and French (1993) three-factor model, and Fama and French (2015) five-factor model plus momentum. Table 5 reports the difference in abnormal returns (alphas) between high and low concentration portfolios for all our proxies for concentration. Panel A shows that most alphas are not statistically different from zero over the period 1972–2014. When we isolate the period of the significant increase in concentration levels, the results change dramatically. Panels B, C, and D report alphas estimated over three different subperiods. While there is no evidence of abnormal performance over the periods 1972–1986 and 1987–2000, we find that the alphas are positive and statistically significant over the period 2001–2014. Even after controlling for Fama-French (2015) five factors plus the momentum factor, an investment strategy consisting of buying the high concentration portfolio and shorting the low concentration portfolio generates abnormal returns ranging from 5.6% to 8.9% per year. These abnormal returns are much larger in magnitude compared to those generated by other important investment strategies. For example, the momentum strategy generated a negative alpha over the

in concentration rather than on the levels of concentration to capture the aspect of concentration unanticipated by investors.

[23] Because the change may have many ties, we use a dense ranking system, which means we may have more than 10 industries in the top and bottom portfolios depending on the number of ties.

same time period. Interestingly, most of the abnormal returns from this investment strategy come from the firms in industries experiencing increased concentration (long portfolio).

A possible explanation for these empirical results is the higher expected returns commanded by firms in industries with fewer rivals, as their investment opportunity set is extremely sensitive to macroeconomic shocks (Bustamante and Donangelo (2014)). To test this possibility, we examine the returns of our investment strategy during one of the largest negative systematic shocks in recent history: the global financial crisis of 2007–2008. We find that the high concentration portfolio significantly outperforms the low concentration portfolio over the crisis period (untabulated). These findings suggest that the alphas documented in this paper are not related to a risk premium, and point to a possible market anomaly in which investors underestimate the effect of industry concentration and the corresponding increase in profit margins on stock returns.

V. Potential Explanations for the Increasing Trend in Concentration Levels

In this section we investigate economic forces that may have contributed to the widespread increase in concentration and the corresponding increase in profitability in the U.S. since the turn of the century. We identify two potential contenders: lax enforcement of antitrust laws, and technological innovation. Our evidence suggests that each may have uniquely contributed to the increased concentration and barriers to entry. We also examine more mechanical explanations to the increased concentration, and find that these suppositions cannot explain our main findings.

V.A. Enforcement of Antitrust Laws

Since the late 1800s, the U.S. government has approved a series of laws, notably the Sherman Antitrust Act of 1890 and the Clayton Act of 1914, to promote competition by outlawing monopolistic practices. However, many legal scholars believe that the enforcement of these laws has been strongly influenced by political factors. While some authors argue that the Clinton administration significantly intensified the enforcement of antitrust laws in the 1990s (Litan and Shapiro (2001)), others argue that during the two recent administrations, antitrust enforcement has declined ((e.g., Harty, Shelanski, and Solomon (2012), Spitzer (2011), Crane (2012)). In particular, legal scholars consider the presidency of George W. Bush as the turning

point in the enforcement of antitrust laws. His view on these laws was that they need "to be applied where there are clear cases of price fixing," and there should be no other roles for antitrust enforcement (Harty, Shelanski, and Solomon (2012) p. 1).

Using enforcement data from both the Department of Justice (DoJ) and the Federal Trade Commission (FTC), we investigate whether the increase in industry concentration levels coincides with a decline in the number of antitrust cases. We begin our analysis by examining the number of cases filed by the Department of Justice under Section 2 of the Sherman Act over time. We focus on these cases because they deal with situations in which the government believes firms have gained, or are attempting to gain, excessive market power.[24] We find that the number of Section 2 cases has significantly declined over time from an average of 15.7 cases over the period 1970–1999 to 2.8 cases over the period 2000–2014. More surprisingly, the antitrust agencies did not file a single case in 2014 despite the recent increases in industry concentration levels.

To examine the time-series relation between concentration levels and antitrust enforcement, we plot in Figure 5 the aggregate HHI and the number of Section 2 cases over time. This figure shows that since the early 1980s, the aggregate HHI has been negatively correlated with the number of Section 2 cases. Additionally, Figure 5 shows the spike in antitrust enforcement in the 1990s during the Clinton administration. More importantly, we are able to support the claim that antitrust agencies were more lenient the during both the Bush and Obama administrations: Figure 5 shows the number of Section 2 cases has been declining over the recent period of increasing concentration levels. The correlation between the HHI and the number of Section 2 cases over this time period is −0.49.

We also investigate whether the probability of completing an M&A transaction has changed over time. If firms face lower thresholds during the regulatory approval of M&A transactions, then the success rate for deal closures should have been higher in the past few decades. Figure 6 depicts the proportion of completed M&A deals as a fraction of total deals for all transactions involving public firms on the Securities Data Corporation's (SDC) Mergers and

[24] Section 2 of the Sherman Act establishes that "every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony, and, on conviction thereof, shall be punished by fine not exceeding $100,000,000 if a corporation, or, if any other person, $1,000,000, or by imprisonment not exceeding 10 years, or by both said punishments, in the discretion of the court."

Acquisitions database. This figure shows that completion rates have been increasing over time from approximately 70% in the early 1980s to approximately 90% in the last few years. The difference in means between the pre- and the post-2000 periods is positive (10.8%) and statistically significant at the 1% significance level. Our results are consistent with Mehta, Srinivasan, and Zhao (2017) who use cross-sectional analysis to demonstrate that firms linked to antitrust regulators receive more favorable antitrust outcomes.

Although we are careful regarding causal inferences from this analysis, the significant negative correlation between concentration levels and antitrust enforcement over the past two decades, supports a claim it is that fewer regulatory barriers may have direct implications on product market competition. Thus, low antitrust enforcement can incentivize firms to engage in M&A activity, which further reduces competition. Moreover, low enforcement may allow for mergers with more market power potential, leading to a higher market reaction and higher profit margins.

V.B. Barriers to Entry

Another possible explanation for the recent increase in industry concentration levels is technological changes. Over the past several decades, the investment in tangible capital as a proportion of the total output has remained flat, while the investment in intangible assets has doubled (Corrado and Hulten (2010)). Public adoption of the internet in the late 1990s, as well as the popularization of personal computers around the same time, has had a large impact on productivity and growth. Corrado and Hulten (2010) quantify the sources of growth in output and demonstrate that during the period 1995–2007, the contribution of intangible capital, and its components, such as computerized information, innovative property, and economic competencies have doubled. Thus, the innovation-related intangible inputs have been increasingly important to the U.S. economy growth.

Could technological advances, as well as innovation, benefit from economies of scale and firm consolidation? Studies in industrial organization examine this issue by estimating the effects of economies of scale on R&D. Schumpeter (1942) proposes that larger firms are better positioned than smaller firms to implement and successfully exploit R&D efforts, and although empirical evidence has arrived at mixed conclusions, several recent papers have presented evidence in favor of the economy of scale hypothesis. Henderson and Cockburn (1996) examine

the search productivity in drug discovery and show that larger research efforts in the pharmaceutical industry benefit from economy of scale. Ciftci and Cready (2011) derive R&D value based on its association with future earnings realizations, and show strong evidence in favor of the economy of scale hypothesis across the CRSP-Compustat universe of firms. Decker et al. (2014) examine the labor market shift from young to mature firms, and argue that information technology has provided an advantage for large multinational firms by enabling better coordination of the supply chain network across multiple locations. If large firms are better able to develop and implement technology, then recent technological advances may create barriers of entry to new firms. These new technological barriers to entry have the potential to change the industry landscape.[25]

We estimate technological innovation using several patent-related proxies. Using the patent database created by Kogan et al. (2016), we examine whether the relationship between technological innovation and industry concentration had changed around the turn of the century. First, we start with a univariate analysis and calculate patent concentration by looking at the share of the top four patent-generating firms in the industry. Specifically, for every NAICS 3-digit industry, we identify four firms that have generated the largest number of patents in a given year, and scale the total number of patents these four firms generated by the number of patents generated by all public firms in the same industry and year. As Figure 7 shows, the patent-based concentration has— similar to revenue-based measures of concentration—exhibited a structural break around 2000 and increased substantially in the 21st century.

Next, we turn to a multivariate analysis and examine whether firms in concentrated markets possess stronger patent portfolios after 2000 (controlling for firm's assets, age, and both year and firm fixed effects). Table 6 reports results from regressions relating the change in the number of patents granted, as well as their value, to firm characteristics and proxies for changes in industry concentration levels.[26] Panel A shows that while the relationship between changes in industry concentration and number of patents granted has been negative in the period 1986–2000, it has reversed in the last decade; firms in concentrated markets now possess more patents. We find similar results when we examine the relation between concentration levels and the

[25] Consistent with this argument, Autor et al. (2017) suggest that new technologies and stronger network effect could explain the rise of "superstar firms".
[26] Kogan et al. (2016) use the stock market reaction to news about patents as a proxy for their value.

market value of the patents (see Panel B). These results are consistent with the idea that advances in technology have made innovation more resource-consuming, thus creating entry barriers to new firms, and encouraging new firms to sell their inventions to larger corporations at early stages of development. Overall, if more complex technology also facilitates synergy potentials, then this explanation is consistent with the reduction in the number of firms, higher volume of M&A activity, and potentially higher profit margins.

As in the case of profitability, the relation between patents and concentration levels may be driven by the relation between patents and industry-level capital intensity. To address this concern, we reexamine the relation between patents and concentration levels controlling for the *Price of Capital* and the *Capital Share*. The results from this analysis are reported in Table 7. In general, patent generation is negatively correlated with the *Price of Capital* and positively correlated with the *Capital Share*, although this relation is weaker for the market value of patents. However, controlling for these factors does not affect our previous finding that the number of patents as well as the market value of those patents have become positively correlated with concentration levels over the period 2001–2010.

While the changes in antitrust policy may be particular to the U.S., technological changes are more widespread. With the exception of the number of publicly traded firms, detailed international data on most concentration measures is not readily available. Doidge et al. (2017) report that other countries whose economic and financial development are comparable to that of the U.S. have not experienced a parallel decline in the number of public firms. The uniqueness of the pattern in the U.S. suggests that additional factors must have played a role along with technological advances, allowing U.S. firms to exploit the consolidation benefits to a greater extent than have other countries. Regulatory differences regarding antitrust laws in U.S. and other developed countries may be an additional contributing factor.

Consistent with this argument, available research in law and economics suggests that, although U.S. and European antitrust agencies have similar objectives, their differences in laws, policy, and rules lead to different enforcement outcomes. For example, Fox (1997) shows that even the definition of a dominant firm differs across the two jurisdictions: the U.S. regards a firm as holding significant market power only if it controls two-thirds or more of a relevant market, while according to the E.U. law even a 40% market share can constitute dominance. The recent European antitrust investigations of Google, Apple and Facebook highlight those differences,

and provide an example of Europe's increasing willingness to police powerful companies, in contrast to a "relatively hands-off approach, favored by US authorities" (New York Times, "Antitrust and Other Inquiries in Europe Target U.S. Tech Giants", April 2, 2015). Thus, the combined evidence suggests that while many countries could also benefit from the economy of scale due to technological innovations, US firms were able to act on those changes, perhaps due to lenient anti-trust regulations.

VI. Conclusion

This paper documents the increase over the last 20 years in the level of product market concentration across most industries in the U.S. has increased. We demonstrate the implications this increase in concentration levels has for firm performance, affecting profitability, innovation, and returns to investors. First, the increase in industry concentration levels correlates with remaining firms generating higher profit margins. Our findings posit the increase in profit margins is related to increased market power rather than to an increase in efficiency. Second, horizontal mergers in more concentrated industries realize more positive market reactions, consistent with the claim that market power considerations are becoming a key source of value during these corporate events. Third and finally, firms in more concentrated industries experience significant abnormal stock returns, which indicates that a considerable portion of the gains accrues to shareholders. In general, our findings suggest that despite popular belief, competition has decreased over time.

Our results also contribute to understanding the motives behind the remarkable surge in M&A deals over the past few years, which has been widely discussed in the financial press. For example, a recent article by the WSJ ("Fear of Losing out Drives Deal Boom", June 26, 2015) shows that in 2015 firms have been merging "at an unseen pace", and argues that "there is a competitive and strategic pressure to act." Our results offer a potential explanation for this phenomenon by demonstrating that mergers have become more profitable over time. We show that the excess profits may be driven by higher market power, thus emphasizing the importance of industry consolidation.

Finally, we offer two possible explanations for the trend in product market consolidation. The unique combination of lax enforcement of antitrust laws and technological innovation in the

U.S. may have contributed to increased concentration and barriers to entry. Using enforcement data from both the Department of Justice and the Federal Trade Commission, we find that antitrust enforcement, as measured by the number of cases filed by the Department of Justice under Section 2 of the Sherman Act, has weakened since early 2000, whereas the probability of M&A deal completion has increased.

Another possible explanation for the recent increase in industry concentration levels is technological changes, which have created advantages to the economies of scale, and which have had the capacity to change the industry landscape. Consistent with this claim, we find that patent concentration has increased in the past two decades, and the relationship between changes in industry concentration and number of patents granted has reversed since 2000; consequently, firms in concentrated markets now possess more patents. These results suggest that complex technology also facilitates synergy potentials and increases barriers to entry.

More broadly, the findings that firms in more concentrated industries generate higher profit margins, and obtain better investment opportunities through M&A deals, should interest policy makers. While at least parts of these gains appear to be transferred to the firms' shareholders, whether the higher market concentration benefits consumers or other stakeholders is not clear. The increase in profit margins without a corresponding economically significant increase in efficiency may suggest the opposite. Although a greater concentration of product markets may improve the quality or variety of products offered, whether those changes are sufficient to compensate customers for firms' higher profit margins is also not clear. Our findings may motivate policymakers to examine the impact of the increased concentration further.

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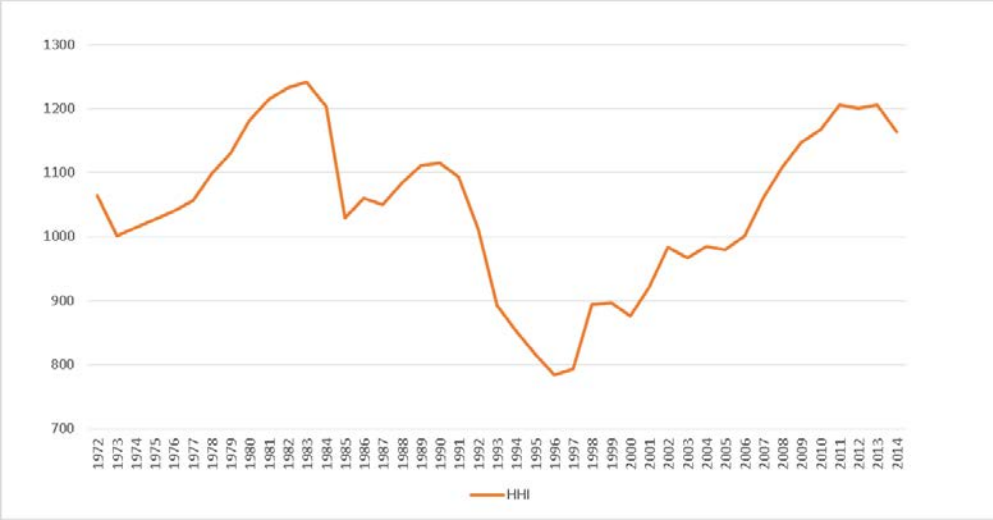
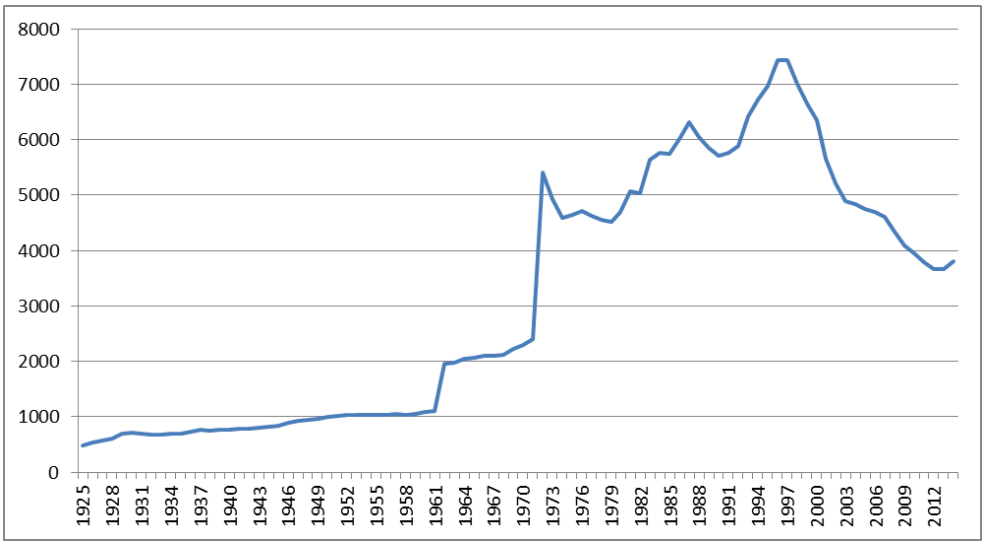
Figure 1
Trends in Industry Concentration

This figure shows the time-series trend in measures of industry concentration. Panel A present the Herfindahl-Hirschman (HHI) concentration index for all US publicly traded firms that appear in CRSP and Compustat. To construct the HHI index, every year we sum up the squared total sales of each firm in a given NAICS 3-digit industry divided by the aggregate number of firms in the industry. Panel B shows the number of publicly traded firms in CRSP database since the beginning of its coverage in 1925. To be included in the sample, we require that the stock has share code 10 or 11, is traded on one of the three major exchanges, and has non-missing stock price information as of December of year *t*. Panel C reports the average and median size for all US publicly traded firms that appear in CRSP and Compustat. Firm size is based on total sales in constant dollars of 1970. Panel 1-D shows the share of employment in firms with 10,000 employees or more out of the total US employment.

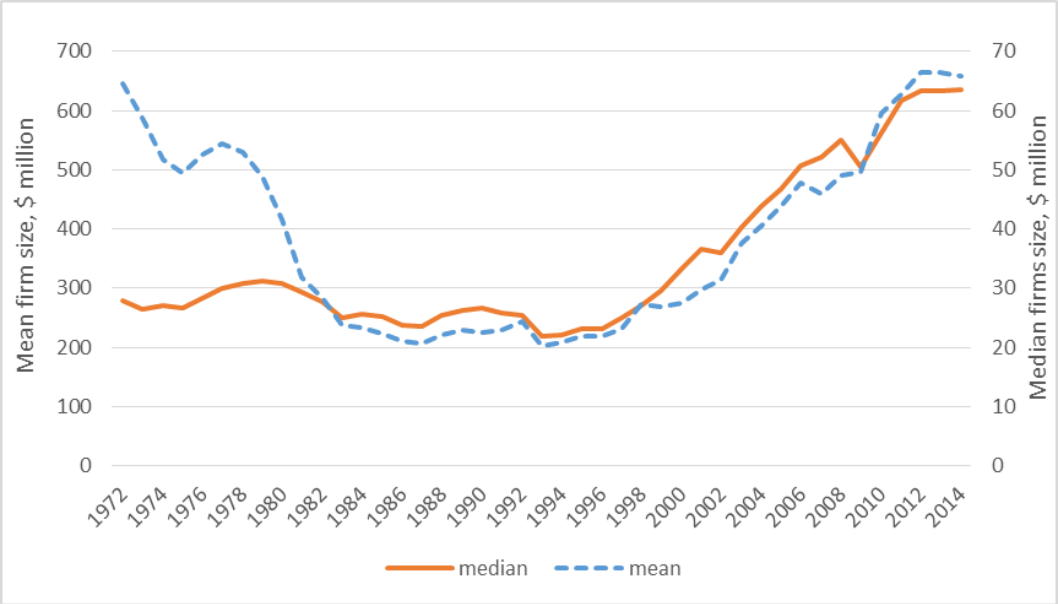
Panel A: Compustat-based HHI



Panel B: Number of Public Firms – Historical CRSP Coverage



Panel C: Average and Median Size of Public Firms



Panel D: Share of Employment in Firms with 10,000+ Employees

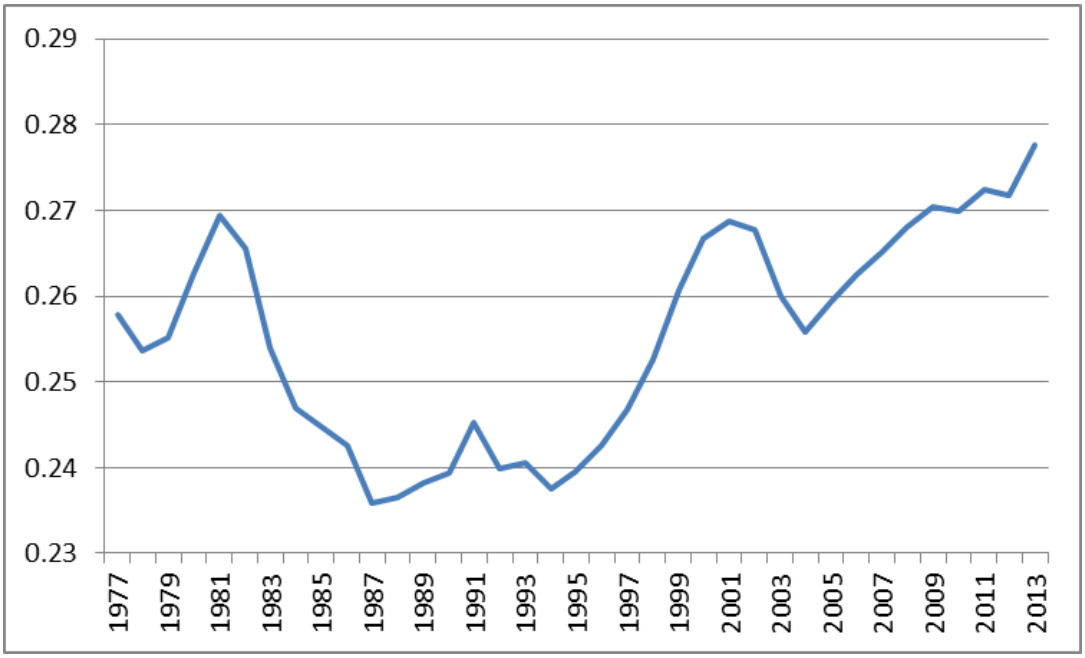
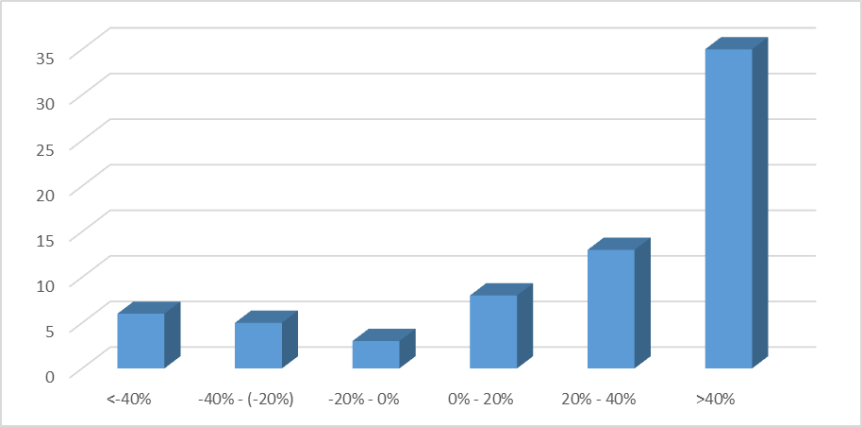


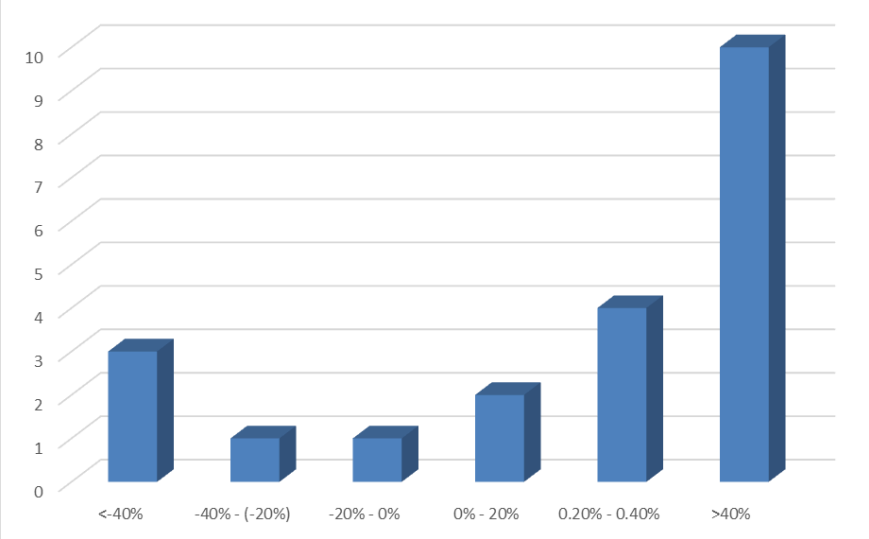
Figure 2
Change in Measures of Concentration across Industries

This figure depicts the distribution of percentage changes in the HHI Compustat-based index (Figure A) and HHI Census-based index (Figure B) across industries. Figure C shows the change in the share of the largest four firms in the industry (also Census-based), and Figure D shows the percentage change in the number of publicly traded firms across industries. The changes are calculated over the 1997-2014 period in the Compustat sample. Figure C shows the change in Census-based HHI index, and over the 1997-2012 period in the Census-based sample. The industries are defined based on NAICS 3-digit classification.

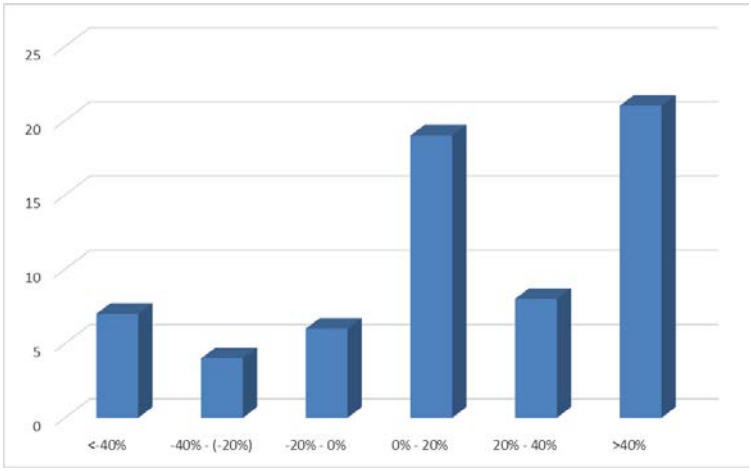
Panel A: Change in the HHI (Compustat-based)



Panel B: Change in the HHI (Census-based)



Panel C: Change in the Share of the Largest Four Firms in the Industry



Panel D: Change in the Number of Firms

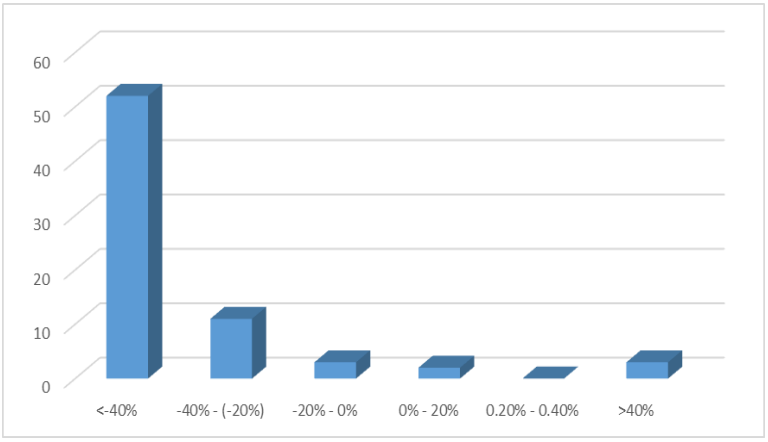
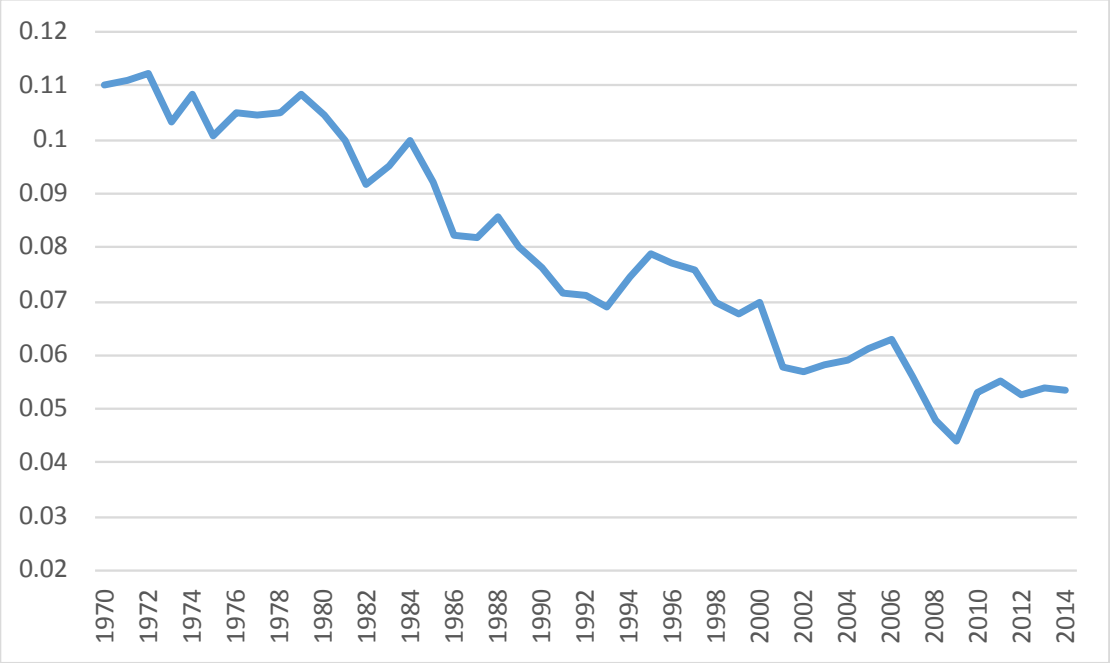


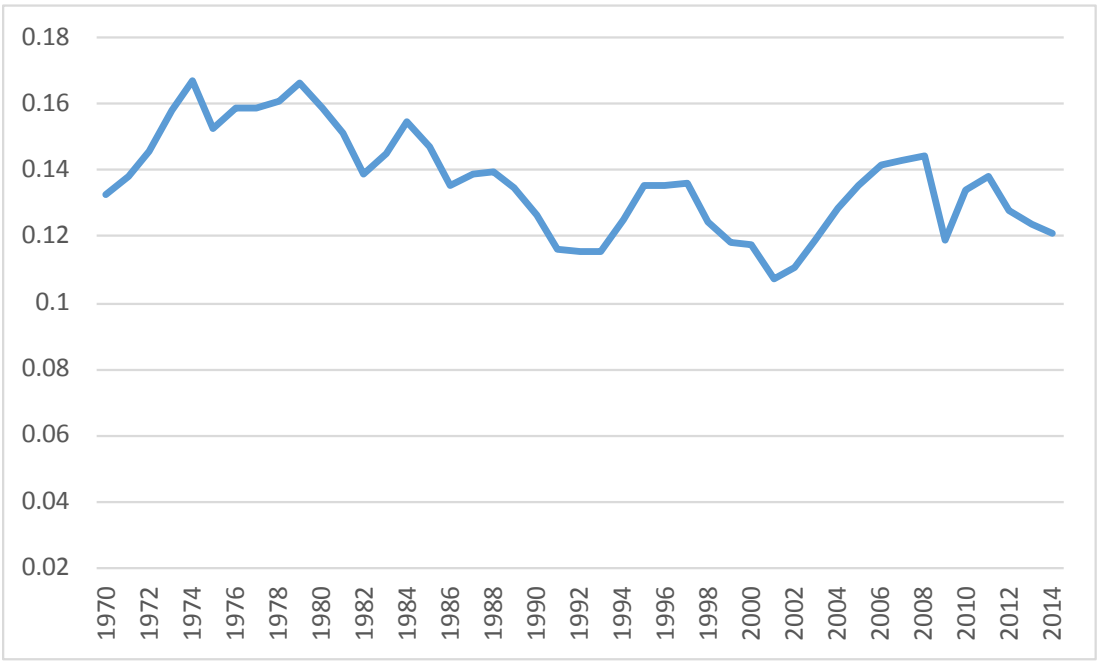
Figure 3
Trends in Aggregate ROA

Panel A depicts the aggregate ROA for all the firms on the Compustat-CRSP dataset over the period 1970-2014. Aggregate ROA is equal to the aggregate operating income before depreciation scaled by the aggregate book value of assets. Panels A and B depict aggregate ROA for non-financial and financial firms, respectively.

Panel A: Entire Sample



Panel B: Non-Financials



Panel C: Financials

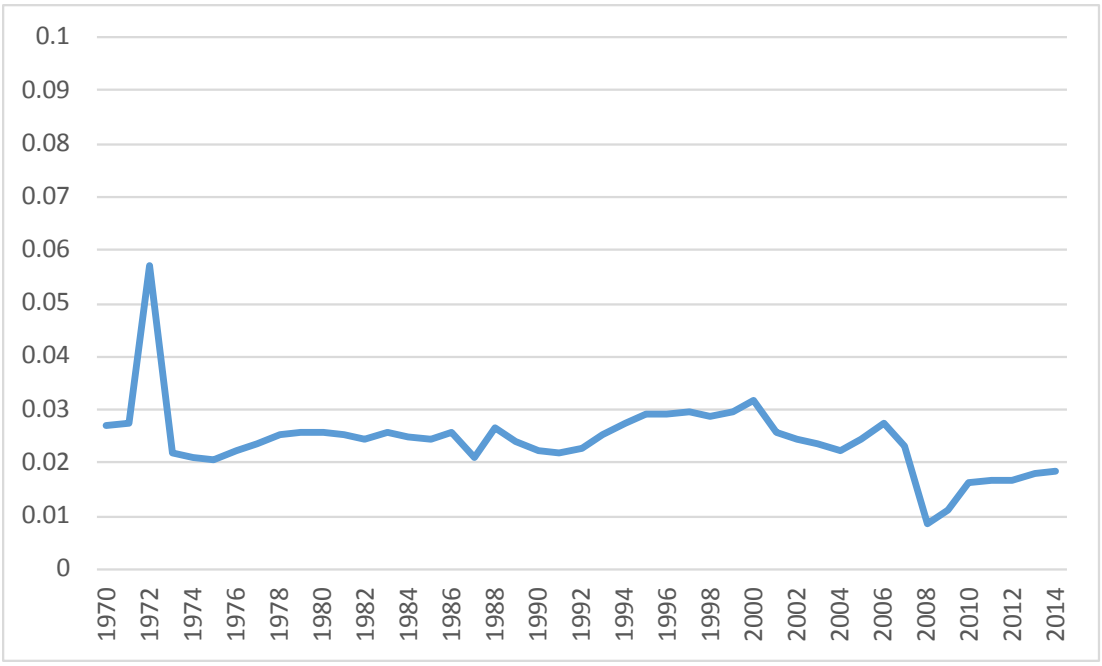
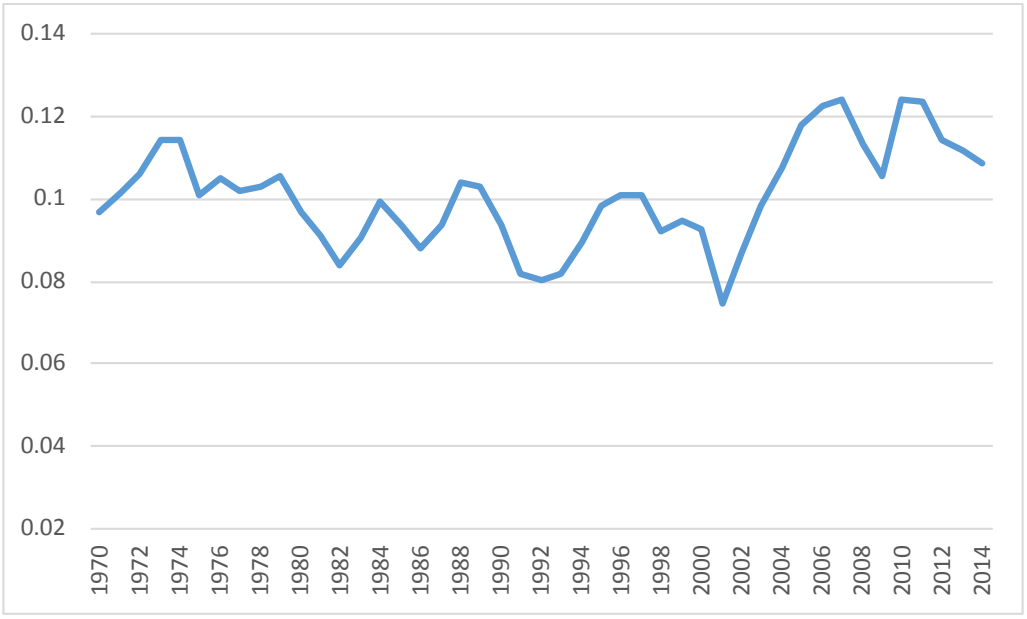


Figure 4
Trends in the Aggregate Lerner Index and the Aggregate Asset Utilization: Non-Financial Firms

Panel A depicts the aggregate *Lerner Index* and *Asset Utilization* for all non-financial firms on the Compustat-CRSP dataset over the period 1970-2014. The aggregate *Lerner Index* is defined as the aggregate operating income after depreciation scaled by aggregate sales, while the aggregate *Asset Utilizati*on is defined as aggregate sales scaled by the aggregate book value of assets.

Panel A: Aggregate Lerner Index



Panel B: Aggregate Asset Utilization

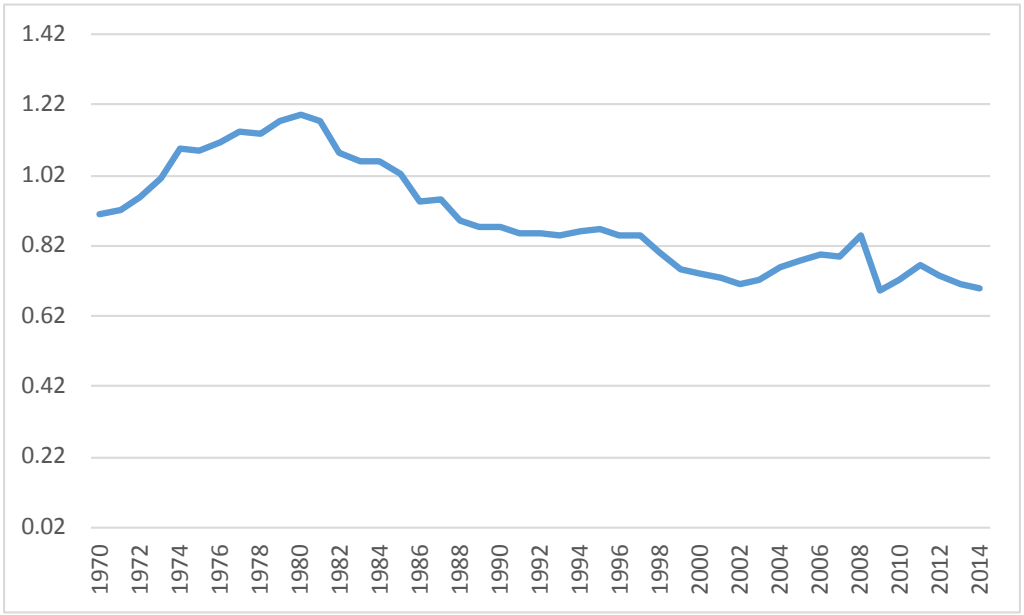


Figure 5
Relation between Concentration Levels and Antitrust Enforcement

This figure depicts the relation between the aggregate HHI and the number of cases filed by the Department of Justice under Section 2 of the Sherman Act of 1890. The HHI is Herfindahl-Hirschman concentration index for all US publicly traded firms that appear in CRSP and Compustat. To construct the HHI index, every year we sum up the squared total sales of each firm in a given NAICS 3-digit industry divided by the aggregate number of firms in the industry.

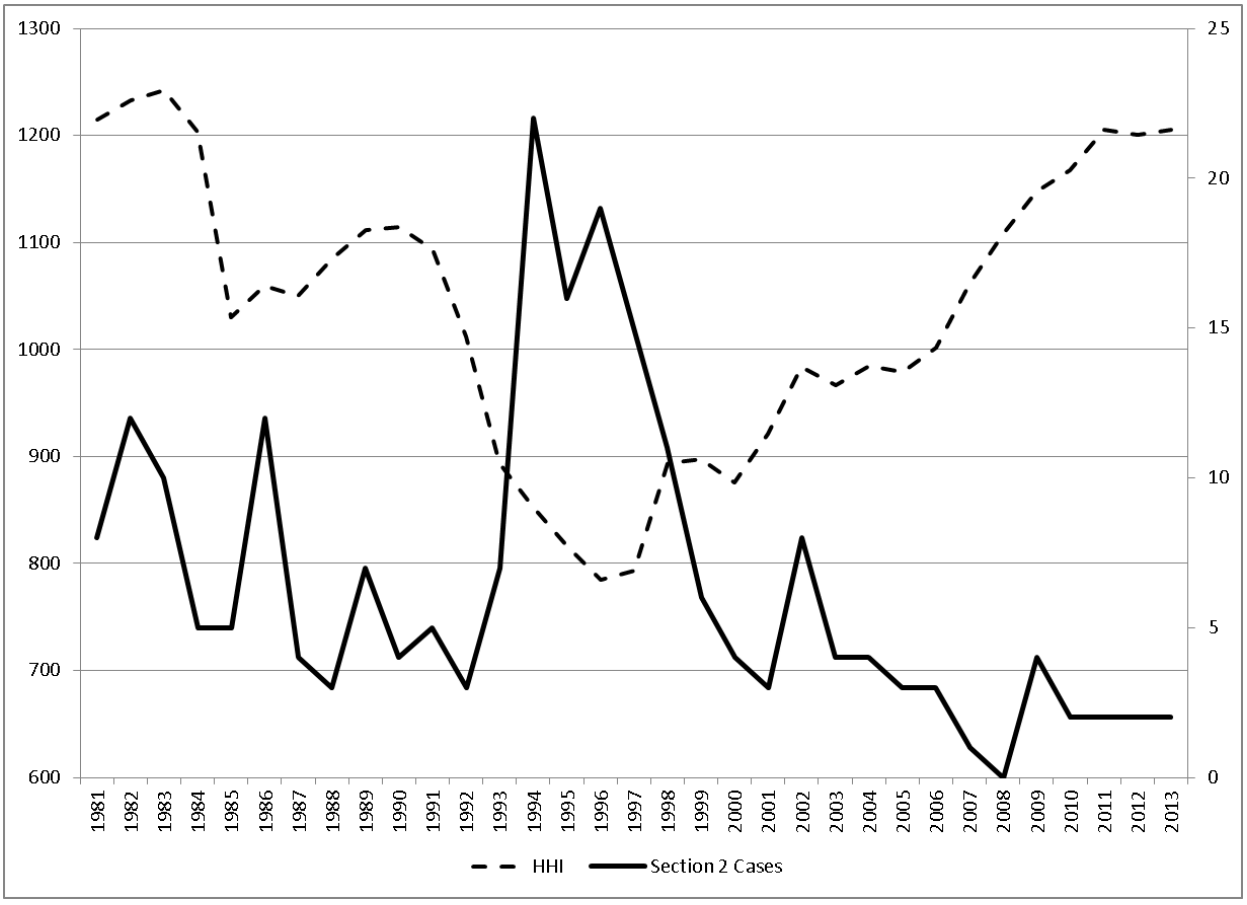


Figure 6
Proportion of Completed M&A Deals

This figure depicts the proportion of completed M&A deals as a fraction of total deals for the period 1979-2014. The sample consists of all transactions on the Securities Data Corporation's (SDC) Mergers and Acquisition database that meet all of the following conditions: (i) percent of ownership by acquirer prior to event is less than 50%; (ii) percent of ownership by acquirer after event is more than 50%; (iii) both acquirer and target are identified as public firms (since we are interested in total market reaction, to both public and target firms); (iv) acquirer and target firm have different identifiers; (v) the transaction is completed; (vi) return data around the announcement date is available on CRSP; and (vii) offer price is available on SDC.

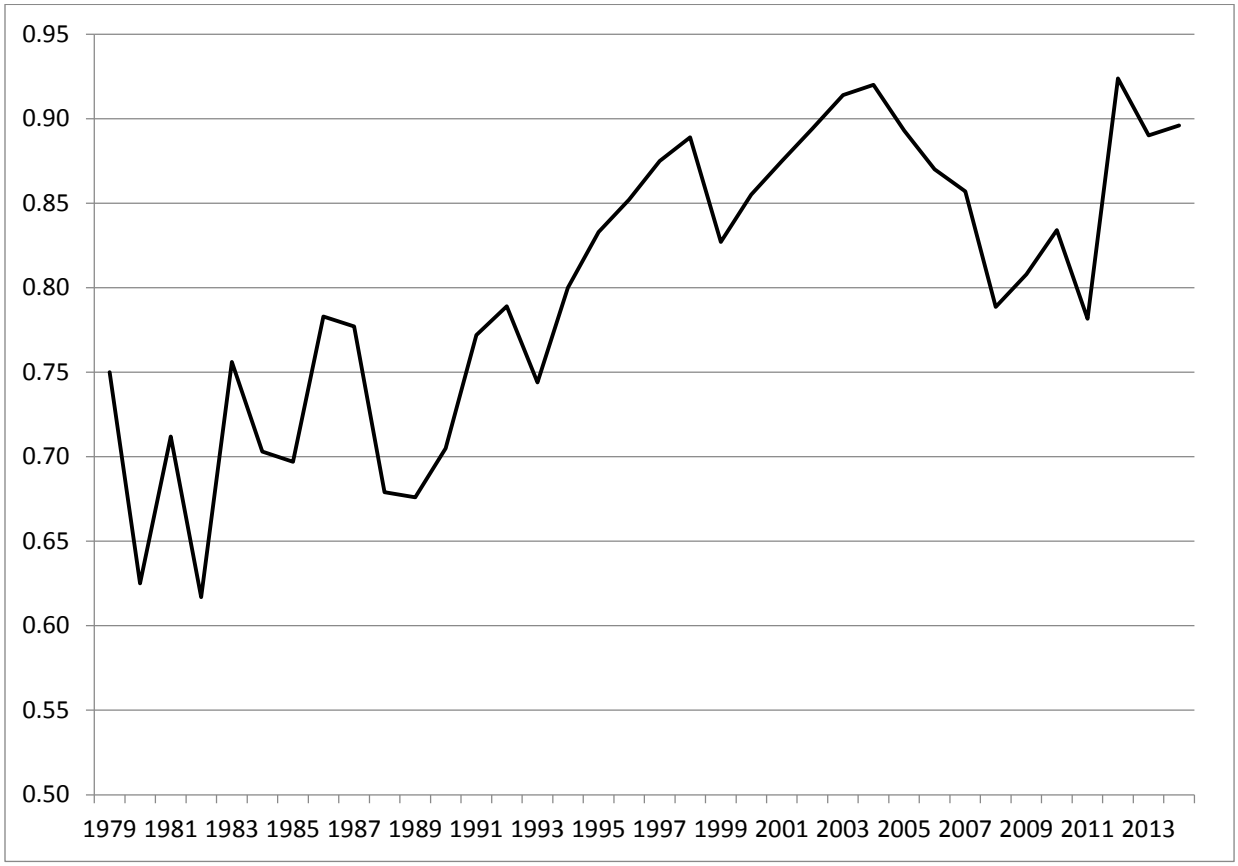


Figure 7
Patent-Based Industry Concentration over Time

This figure shows the change in the share of the largest four firms, measured by patent generation activity, over the 1972-2010 period. We use the patent database created by Kogan et al. (2016). The sample includes all the industries where at least one firm is granted a patent in a given year. For every industry and year we identify four firms that have generated the largest number of patents, and scale the total number of patents these four firms generated by the number of patents generated by all public firms in the same industry and year. The figure shows the average of the obtained ratios across industries.

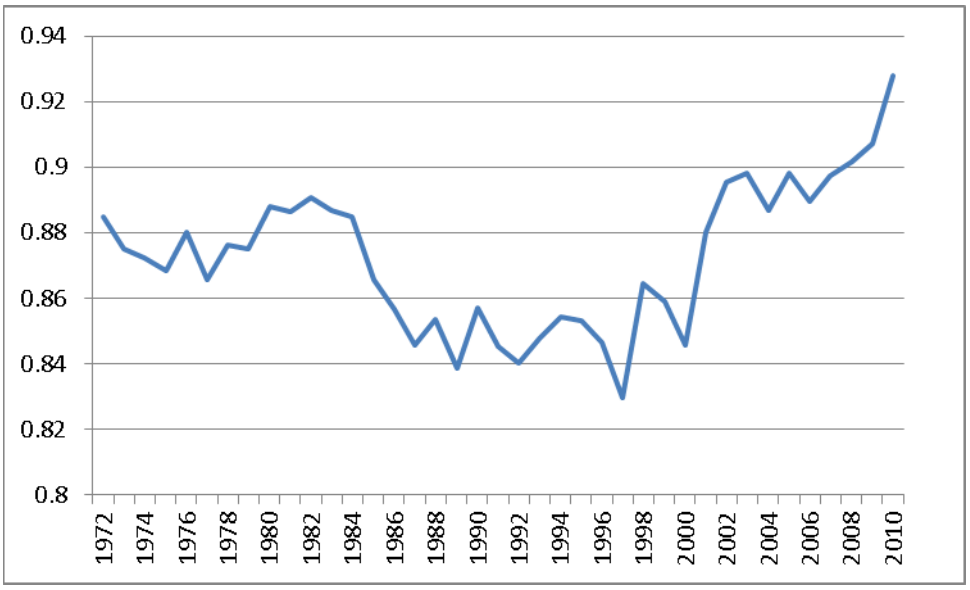


Table 1
Change in the Level of Product Market Concentration and Profitability

This table reports coefficients from regressions of firm profitability on several proxies for the level of product market competition in an industry and other control variables. *ROA* is the operating income before depreciation scaled by the book value of assets. *Assets* is the book value of total assets. *Age* is the time (in years) from the firm's CRSP listing date. *HHI* is the Herfindahl-Hirschman Index at the NAICS 3-digit level using sales data from Compustat. *Number of Firms* is the total number of public firms in an industry. *Concentration Index* is the sum of the annual rank of the *HHI* and the annual inverse rank of the total number of industry incumbents. Industry is defined using a firm's three-digit NAICS code. Standard errors (reported in parentheses) are clustered at the firm level. Symbols [a], [b], and [c] indicate significance at 1%, 5%, and 10%, respectively.

Panel A: Entire Sample

	Dependent Variable: *ROA*		
	1972-2014		
Constant	0.0559[a]	0.0916[a]	0.0741[a]
	(0.0094)	(0.0061)	(0.0042)
Log(*Assets*)	0.0146[a]	0.0148[a]	0.0147[a]
	(0.0011)	(0.0011)	(0.0011)
Log(*Age*)	-0.0155[a]	-0.0154[a]	-0.0155[a]
	(0.0011)	(0.0011)	(0.0011)
Log(*HHI*)	0.0031[b]		
	(0.0013)		
Log(*Number of Firms*)		-0.0039[a]	
		(0.0012)	
Concentration Index			0.0012[a]
			(0.0005)
N	175,254	175,254	175,254
Adjusted R^2	58.18%	58.19%	58.18%
Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes

Panel B: Sub-Periods

	Dependent Variable: *ROA*								
	1972-1986			1987-2000			2001-2014		
Constant	0.1980[a]	0.1493[a]	0.1694[a]	0.0591[a]	0.0662[a]	0.0654[a]	-0.1899[a]	-0.0432[a]	-0.1471[a]
	(0.0160)	(0.0101)	(0.0079)	(0.0174)	(0.0144)	(0.0092)	(0.0272)	(0.0226)	(0.0183)
Log(*Assets*)	-0.0004	-0.0006	-0.0007	0.0169[a]	0.0168[a]	0.0169[a]	0.0294[a]	0.0297[a]	0.0298[a]
	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0027)	(0.0027)	(0.0027)
Log(*Age*)	-0.01819[a]	-0.0182[a]	-0.01827[a]	-0.0281[a]	-0.0282[a]	-0.0281[a]	0.0050[c]	0.0052[c]	0.0043
	(0.0018)	(0.0018)	(0.0018)	(0.0021)	(0.0021)	(0.0021)	(0.0028)	(0.0028)	(0.0027)
Log(*HHI*)	-0.0057[a]			0.0017			0.0123[a]		
	(0.0021)			(0.0022)			(0.0033)		
Log(*Number of Firms*)		0.0028			0.0009			-0.0133[a]	
		(0.0020)			(0.0026)			(0.0032)	
Concentration Index			-0.0041[a]			0.0011			0.0069[a]
			(0.0009)			(0.0008)			(0.0013)
N	51,163	51,163	51,163	67,167	67,167	67,167	56,924	56,924	56,924
Adjusted R^2	57.01%	56.99%	57.03%	60.02%	60.02%	60.03%	67.05%	67.06%	67.09%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2
Change in the Level of Product Market Concentration, Profit Margins and Efficiency

This table reports coefficients from regressions of profit margins and efficiency measures on several proxies for the level of product market competition in an industry and other control variables. *Lerner index* is the operating income before depreciation minus depreciation scaled by total sales. *Asset utilization* is defined as total sales scaled by total assets. *Assets* is the book value of total assets. *Age* is the time (in years) from the firm's CRSP listing date. *HHI* is the Herfindahl-Hirschman Index at the NAICS 3-digit level using sales data from Compustat. *Number of Firms* is the total number of public firms in an industry. *Concentration Index* is the sum of the annual rank of the *HHI* and the annual inverse rank of the total number of industry incumbents. Industry is defined using a firm's three-digit NAICS code. Standard errors (reported in parentheses) are clustered at the firm level. Symbols [a], [b], and [c] indicate significance at 1%, 5%, and 10%, respectively.

Panel A: Concentration and Lerner Index - Entire Sample

	Dependent Variable: *Lerner Index*		
	1972-2014		
Constant	-0.0474[b]	0.0532[a]	-0.0001
	(0.0230)	(0.0166)	(0.0112)
Log(*Assets*)	0.0164[a]	0.0167[a]	0.0165[a]
	(0.0034)	(0.0034)	(0.0034)
Log(*Age*)	-0.0023	-0.0020	-0.0025
	(0.0035)	(0.0035)	(0.0035)
Log(*HHI*)	0.0082[a]		
	(0.0032)		
Log(*Number of Firms*)		-0.0116[a]	
		(0.0030)	
Concentration Index			0.0043[a]
			(0.0013)
N	169,924	169,924	169,924
Adjusted R^2	57.53%	57.54%	57.53%
Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes

Panel B: Concentration and Asset Utilization - Entire Sample

	Dependent Variable: *Asset Utilization*		
	1972-2014		
Constant	1.7691[a]	1.6858[a]	1.7107[a]
	(0.0470)	(0.0349)	(0.0219)
Log(*Assets*)	-0.1844[a]	-0.1845[a]	-0.1846[a]
	(0.0056)	(0.0056)	(0.0056)
Log(*Age*)	0.0915[a]	0.0914[a]	0.0916[a]
	(0.0058)	(0.0058)	(0.0058)
Log(*HHI*)	-0.0098		
	(0.0063)		
Log(*Number of Firms*)		0.0044	
		(0.0072)	
Concentration Index			-0.0038
			(0.0025)
N	176,234	176,234	176,234
Adjusted R^2	86.72%	86.72%	86.72%
Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes

Panel C: Concentration and Lerner Index - Sub-Periods

	Dependent Variable: *Lerner Index*								
	1972-1986			1987-2000			2001-2014		
Constant	0.1102[a]	0.0781[a]	0.0748[a]	-0.0089	-0.0169	-0.0093	-0.5045[a]	-0.0307	-0.3494[a]
	(0.0191)	(0.0119)	(0.0085)	(0.0342)	(0.0318)	(0.0216)	(0.1174)	(0.0967)	(0.0744)
Log(*Assets*)	0.0152[a]	0.0154[a]	0.0151[a]	0.0247[a]	0.0246[a]	0.0247[a]	-0.0091	-0.0081	-0.0077
	(0.0023)	(0.0023)	(0.0022)	(0.0052)	(0.0052)	(0.0052)	(0.0131)	(0.0131)	(0.0130)
Log(*Age*)	-0.0188[a]	-0.0186[a]	-0.0187[a]	-0.0324[a]	-0.0324[a]	-0.0324[a]	0.0922[a]	0.0932[a]	0.0894[a]
	(0.0022)	(0.0022)	(0.0021)	(0.0042)	(0.0043)	(0.0042)	(0.0147)	(0.0147)	(0.0147)
Log(*HHI*)	-0.0060[b]			0.0001			0.0466[a]		
	(0.0026)			(0.0041)			(0.0163)		
Log(*Number of Firms*)		-0.0026			0.0019			-0.0465[a]	
		(0.0023)			(0.0049)			(0.0130)	
Concentration Index			-0.0023[b]			0.0003			0.0274[a]
			(0.0011)			(0.0014)			(0.0061)
N	48,075	48,075	48,075	65,517	65,517	65,517	56,332	56,332	56,332
Adjusted R^2	61.23%	61.21%	61.22%	69.51%	69.51%	69.51%	58.67%	58.67%	58.70%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel D: Concentration and Asset Utilization - Sub-Periods

	Dependent Variable: *Asset Utilization*								
	1972-1986			1987-2000			2001-2014		
Constant	2.0275[a]	1.9870[a]	2.0309[a]	2.0308[a]	2.1176[a]	1.9576[a]	2.0830[a]	2.3685[a]	2.2340[a]
	(0.0770)	(0.0534)	(0.0449)	(0.0767)	(0.0699)	(0.0401)	(0.0885)	(0.0759)	(0.0567)
Log(*Assets*)	-0.2002[a]	-0.2009[a]	-0.2006[a]	-0.2259[a]	-0.2251[a]	-0.2255[a]	-0.2569[a]	-0.2567[a]	-0.2564[a]
	(0.0109)	(0.0110)	(0.0110)	(0.0084)	(0.0084)	(0.0084)	(0.0086)	(0.0086)	(0.0086)
Log(*Age*)	0.0176[c]	0.0171[c]	0.0173[c]	0.1059[a]	0.1073[a]	0.1064[a]	0.0801[a]	0.0813[a]	0.0799[a]
	(0.0101)	(0.0102)	(0.0101)	(0.0082)	(0.0082)	(0.0082)	(0.0089)	(0.0089)	(0.0089)
Log(*HHI*)	-0.0013			-0.0079			0.0317[a]		
	(0.0093)			(0.0103)			(0.0117)		
Log(*Number of Firms*)		0.0092			-0.0296[b]			-0.0159	
		(0.0106)			(0.0131)			(0.0107)	
Concentration Index			-0.0048			0.0046			0.0102[b]
			(0.0045)			(0.0036)			(0.0042)
N	51,259	51,259	51,259	67,865	67,865	67,865	57,110	57,110	57,110
Adjusted R^2	91.51%	91.51%	91.51%	88.98%	88.99%	88.98%	90.52%	90.51%	90.52%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3
Change in the Level of Product Market Concentration and Profitability – Controlling for the Use and Cost of Capital

This table reports coefficients from regressions of profit margins and efficiency measures on several proxies for the level of product market competition in an industry controlling for the use and cost of capital and other variables. *ROA* is the operating income before depreciation scaled by the book value of assets. *Lerner index* is the operating income before depreciation minus depreciation scaled by total sales. *Asset utilization* is defined as total sales scaled by total assets. *Price of Capital* is equal to the industry-level capital payments scaled by the stock of assets. *Capital Share* is equal to the industry-level capital payments scaled by the total value of production. The other control variables are defined in Table 1. Industry is defined using a firm's three-digit NAICS code. Standard errors (reported in parentheses) are clustered at the firm level. Symbols [a], [b], and [c] indicate significance at 1%, 5%, and 10%, respectively.

	1987-2013			1987-2000			2001-2013		
	ROA	*Lerner Index*	*Asset Utilization*	*ROA*	*Lerner Index*	*Asset Utilization*	*ROA*	*Lerner Index*	*Asset Utilization*
Constant	-0.0940[a]	-0.2083[a]	0.8424[a]	0.0252	-0.2499[a]	1.4075[a]	-0.1964[a]	-0.2532[b]	1.1860[a]
	(0.0221)	(0.0503)	(0.1088)	(0.0321)	(0.0714)	(0.1411)	(0.0373)	(0.1170)	(0.1280)
Log(*Assets*)	0.0233[a]	0.0271[a]	-0.1994[a]	0.0192[a]	0.0357[a]	-0.2268[a]	0.0322[a]	0.0067	-0.2512[a]
	(0.0017)	(0.0057)	(0.0061)	(0.0024)	(0.0051)	(0.0088)	(0.0031)	(0.0145)	(0.0087)
Log(*Age*)	-0.0175[a]	-0.0075	0.0952[a]	-0.0318[a]	-0.0462[a]	0.0984[a]	0.0001	0.0694[a]	0.0756[a]
	(0.0017)	(0.0056)	(0.0065)	(0.0023)	(0.0044)	(0.0086)	(0.0032)	(0.0157)	(0.0089)
Concentration Index	0.0053[a]	0.0047[c]	0.0036	0.0025[b]	0.0002	0.0008	0.0113[a]	0.0232[a]	0.0031
	(0.0009)	(0.0025)	(0.0038)	(0.0012)	(0.0021)	(0.0044)	(0.0020)	(0.0089)	(0.0062)
Log(*Price of Capital*)	0.0193[a]	0.0310[a]	0.1515[a]	0.0082	0.0419[a]	0.0667[a]	0.0056	0.0026	0.1576[a]
	(0.0035)	(0.0075)	(0.0184)	(0.0052)	(0.0116)	(0.0231)	(0.0057)	(0.0166)	(0.0197)
Log(*Capital Share*)	-0.0041	0.0131	-0.1284[a]	0.0038	-0.0198	-0.1062[a]	-0.0075	0.0331[c]	-0.1482[a]
	(0.0044)	(0.0103)	(0.0188)	(0.0062)	(0.0132)	(0.0238)	(0.0059)	(0.0199)	(0.0210)
N	95,149	92,952	95,975	51,518	49,869	52,174	43,631	43,083	43,801
Adjusted R^2	59.49%	56.37%	85.64%	59.81%	63.92%	87.65%	67.51%	59.21%	89.72%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4
Change in the Level of Product Market Concentration and M&A Returns – Related vs. Unrelated Mergers

The table presents results of regressing CARs around merger announcements on several proxies for the level of product market competition in an industry and other control variables. The sample consists of mergers and acquisitions transactions over the period 1980-2014. The cumulative abnormal return (CAR) of the combined firm over a three-day event window [-1, 1] around the merger announcement as calculated as follows:

$$Combined\ CAR_{i,t} = \frac{MV_{A,t+1} + MV_{T,t+1}}{MV_{A,t-1} + MV_{T,t-1}} - 1 - r_{CRSP,t-1,t+1}$$

where t is the announcement date of the transaction, MV_A (MV_T) is the market value of equity of the acquiring (target) firm, and $r_{CRSP,t-1,t+1}$ is the cumulative return on the CRSP value-weighted market portfolio from t-1 to t+1. *HHI* is the Herfindahl-Hirschman Index at the NAICS 3-digit level using sales data from Compustat. *Number of Firms* is the total number of public firms in an industry. *Concentration Index* is the sum of the annual rank of the HHI and the annual inverse rank of the total number of industry incumbents. Related is a dummy variable that takes on a value of 1 if the bidder and the target belong to the same NAICS 3-digit industry, and zero otherwise. Industry is defined using a firm's three-digit NAICS code. We control for deal characteristics by including the market values and book-to-market ratios of the target and acquiring firms, and dummies for pure cash transactions and pure stock transactions. Symbols [a], [b], and [c] indicate significance at 1%, 5%, and 10%, respectively.

	1980-2014			1980-2000			2001-2014		
Constant	0.0405	0.1239[a]	0.0559[a]	0.0557	0.1326[a]	0.0328	-0.0275	0.1713[c]	0.0389
	(0.0476)	(0.0444)	(0.0149)	(0.0647)	(0.0483)	(0.0239)	(0.0701)	(0.0937)	(0.0300)
Log(*HHI*)	0.0043			-0.0018			0.0120		
	(0.0068)			(0.0085)			(0.0104)		
Log(*Number of Firm*)		-0.0096			-0.0186[b]			-0.0211	
		(0.0081)			(0.0087)			(0.0164)	
Concentration Index			0.0039[c]			0.0031			0.0014
			(0.0021)			(0.0025)			(0.0040)
Related	-0.0460	0.0305[b]	-0.0643	0.0042	0.0076	-0.0120	-0.1183[c]	0.0828[b]	-0.0162
	(0.0338)	(0.0128)	(0.0055)	(0.0303)	(0.0176)	(0.0073)	(0.0636)	(0.0244)	(0.0115)
Proxy for Concentration x *Related*	0.0066	-0.0066[a]	0.0007	-0.0018	-0.0029	0.0009	0.0186[b]	-0.0154[a]	0.0047[b]
	(0.0052)	(0.0022)	(0.0010)	(0.0048)	(0.0032)	(0.0010)	(0.0094)	(0.0046)	(0.0021)
N	3,100	3,100	3,100	1,811	1,811	1,811	1,289	1,289	1,289
Adjusted R^2	7.33%	7.41%	7.40%	10.98%	11.34%	11.18%	4.43%	4.57%	4.31%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deal Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Industry Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5
Change in the Level of Product Market Concentration and the Cross-Section of Stock Returns

This table reports alphas for portfolios sorted by the change in the proxies for concentration from year t-2 to year t-1. Portfolio 1 (Low) contains the 10 industries with the smallest change in concentration levels, Portfolio 3 (High) contains the 10 industries with the largest change in concentration levels, and Portfolio 2 contains the rest of the industries. To calculate returns on year t, we first calculate equally-weighted and value-weighted returns by industry. After these industries are assigned to one of the three portfolios based on the change in concentration levels, we calculate equally-weighted industry returns for each portfolio. For value-weighted returns, we aggregate the market value of equity of all firms within an industry and calculate value-weighted industry returns for each of the three portfolios. Using this portfolio formation, we calculate monthly equally-weighted and value-weighted returns from July of year t to June of year t+1. Symbols [a], [b], and [c] indicate significant differences between the high and low portfolios at 1%, 5%, and 10%, respectively.

Panel A: 1972-2014

	Difference in Returns between High and Low Concentration Portfolios		
	HHI	Number of Firms	Concentration Index
CAPM			
Equally-Weighted Portfolios	0.0028	0.0033	0.0011
	0.9746	1.3356	0.5348
Value-Weighted Portfolios	0.0038[c]	0.0038[c]	-0.0003
	1.9309	1.8235	-0.1901
Fama-French 3 Factors			
Equally-Weighted Portfolios	0.0034	0.0027	0.0011
	1.1655	1.0730	0.5120
Value-Weighted Portfolios	0.0035[c]	0.0018	-0.0016
	1.7150	0.8992	-0.8960
Fama-French 6 Factors			
Equally-Weighted Portfolios	0.0035	0.0012	0.0002
	1.1445	0.4734	0.0898
Value-Weighted Portfolios	0.0013	-0.0014	-0.0039[b]
	0.6312	-0.6832	-2.1964

Panel B: 1972-1986

	Difference in Returns between High and Low Concentration Portfolios		
	HHI	Number of Firms	Concentration Index
CAPM			
Equally-Weighted Portfolios	-0.0039	-0.0004	-0.0022
	-0.5317	-0.0716	-0.4371
Value-Weighted Portfolios	0.0037	0.0048	-0.0015
	1.1867	1.3701	-0.5154
Fama-French 3 Factors			
Equally-Weighted Portfolios	-0.0045	-0.0009	-0.0018
	-0.5875	-0.1394	-0.3551
Value-Weighted Portfolios	0.0029	0.0028	-0.0013
	0.8876	0.7823	-0.4503
Fama-French 6 Factors			
Equally-Weighted Portfolios	-0.0039	-0.0021	-0.0032
	-0.4619	-0.2923	-0.5582
Value-Weighted Portfolios	0.0033	-0.0023	-0.0066[b]
	0.0951	-0.6670	-2.1013

Panel C: 1987-2000

	Difference in Returns between High and Low Concentration Portfolios		
	HHI	Number of Firms	Concentration Index
CAPM			
Equally-Weighted Portfolios	0.0049	0.0028	0.0003
	1.4311	0.8814	0.1313
Value-Weighted Portfolios	0.0030	-0.0010	-0.0024
	0.6861	-0.2318	-0.6912
Fama-French 3 Factors			
Equally-Weighted Portfolios	0.0060[c]	0.0020	0.0001
	1.7346	0.6331	0.0572
Value-Weighted Portfolios	0.0023	-0.0038	-0.0052
	0.5169	-0.9585	-1.6163
Fama-French 6 Factors			
Equally-Weighted Portfolios	0.0063	-0.0010	-0.0002
	1.6443	-0.2836	-0.0719
Value-Weighted Portfolios	-0.0096	-0.0072[c]	-0.0053
	-0.1986	-1.7057	-1.6255

Panel D: 2001-2014

	Difference in Returns between High and Low Concentration Portfolios		
	HHI	Number of Firms	Concentration Index
CAPM			
Equally-Weighted Portfolios	0.0076[a]	0.0076[a]	0.0053[a]
	3.1830	3.5580	2.4261
Value-Weighted Portfolios	0.0050[c]	0.0076[a]	0.0033
	1.8801	2.5208	1.1491
Fama-French 3 Factors			
Equally-Weighted Portfolios	0.0085[a]	0.0074[a]	0.0054[a]
	3.5713	3.4532	2.4517
Value-Weighted Portfolios	0.0053[b]	0.0066[b]	0.0024
	1.9679	2.1972	0.8381
Fama-French 6 Factors			
Equally-Weighted Portfolios	0.0074[a]	0.0060[a]	0.0047[b]
	2.9065	2.7075	2.0370
Value-Weighted Portfolios	0.0049[c]	0.0054[c]	0.0007
	1.7268	1.8449	0.2310

Table 6
Changes in the Levels of Product Market Concentration and Patent Generation

This table reports coefficients from regressing the number and the market value of patents granted to a firm as a function of industry concentration levels and other control variables. We use the patent database created by Kogan et al. (2016). The sample includes all the industries where at least one firm is granted a patent in a given year. In Panel A the dependent variable is the log of 1 plus the number of patents that a firm was granted in a given year. In Panel B the dependent variable is the log of 1 plus the proxy for patent value developed by Kogan et al. (2016). The other variables are defined in Table 1. Industry is defined using a firm's three-digit NAICS code. Standard errors are clustered at the firm level. Symbols [a], [b], and [c] indicate significance at 1%, 5%, and 10%, respectively, and p-values are reported in the parentheses.

Panel A

	Dependent Variable: log(1 + Number of Patents)								
	1972-1986			1987-2000			2001-2010		
Constant	0.1038	0.0960	0.1540[a]	0.0736	-0.3511[a]	-0.1473[a]	-0.5463[a]	0.1865[c]	-0.2615[a]
	(0.0836)	(0.0607)	(0.0470)	(0.0811)	(0.0914)	(0.0565)	(0.1483)	(0.1126)	(0.0903)
Log(*Assets*)	0.0952[a]	0.0938[a]	0.0952[a]	0.1187[a]	0.1187[a]	0.1174[a]	0.0819[a]	0.0826[a]	0.0838[a]
	(0.0104)	(0.0104)	(0.0104)	(0.0119)	(0.0119)	(0.0118)	(0.0112)	(0.0112)	(0.0112)
Log(*Age*)	0.0387[b]	0.0373[b]	0.0385[b]	0.0415[a]	0.0424[a]	0.0416[a]	0.0741[a]	0.0769[a]	0.0719[a]
	(0.0179)	(0.0179)	(0.0179)	(0.0146)	(0.0145)	(0.0146)	(0.0248)	(0.0248)	(0.0247)
Log(*HHI*)	0.0077			-0.0488[a]			0.0689[a]		
	(0.0100)			(0.0114)			(0.0183)		
Log(*Number of Firms*)		0.0171			0.0206			-0.0560[a]	
		(0.0117)			(0.0128)			(0.0147)	
Concentration Index			0.0009			-0.0255[a]			0.0333[a]
			(0.0050)			(0.0046)			(0.0071)
N	46,168	46,168	46,168	59,028	59,028	59,028	38,758	38,758	38,758
Adjusted R^2	89.81%	89.81%	89.81%	86.02%	86.00%	86.04%	89.88%	89.88%	89.89%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B

	Dependent Variable: log(1 + Market Value of Patents)								
	1972-1986			1987-2000			2001-2010		
Constant	-0.3448[a]	-0.1124	-0.1169[b]	0.0167	-0.8847[a]	-0.4668[a]	-0.9084[a]	-0.1272	-0.5373[a]
	(0.0921)	(0.0783)	(0.0586)	(0.1394)	(0.1539)	(0.0969)	(0.2115)	(0.1762)	(0.1416)
Log(*Assets*)	0.1500[a]	0.1491[a]	0.1506[a]	0.2359[a]	0.2360[a]	0.2335[a]	0.2055[a]	0.2061[a]	0.2064[a]
	(0.0139)	(0.0139)	(0.0139)	(0.0206)	(0.0206)	(0.0204)	(0.0183)	(0.0182)	(0.0183)
Log(*Age*)	-0.0910[a]	-0.0928[a]	-0.0914[a]	-0.0444[c]	-0.0426[c]	-0.0441[c]	0.0253	0.0285	0.0257
	(0.0228)	(0.0229)	(0.0229)	(0.0255)	(0.0255)	(0.0256)	(0.0388)	(0.0388)	(0.0389)
Log(*HHI*)	0.0375[a]			-0.1031[a]			0.0756[a]		
	(0.0103)			(0.0192)			(0.0250)		
Log(*Number of Firms*)		0.0061			0.0445[b]			-0.0571[a]	
		(0.0132)			(0.0210)			(0.0201)	
Concentration Index			0.0105[b]			-0.0498[a]			0.0243[b]
			(0.0052)			(0.0074)			(0.0100)
N	46,168	46,168	46,168	59,028	59,028	59,028	38,758	38,758	38,758
Adjusted R^2	91.97%	91.97%	91.97%	84.06%	84.03%	84.09%	89.03%	89.03%	89.03%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7
Changes in the Levels of Product Market Concentration and Patent Generation – Controlling for the Use and Cost of Capital

This table reports coefficients from regressing the number and the market value of patents granted to a firm as a function of industry concentration levels controlling for the use and cost of capital and other variables. We use the patent database created by Kogan et al. (2016). The sample includes all the industries where at least one firm is granted a patent in a given year. *# of Patents* is the log of 1 plus the number of patents that a firm was granted in a given year. *MV of Patents* is the log of 1 plus the proxy for patent value developed by Kogan et al. (2016). *Price of Capital* is equal to the industry-level capital payments scaled by the stock of assets. *Capital Share* is equal to the industry-level capital payments scaled by the total value of production. The other control variables are defined in Table 1. Industry is defined using a firm's three-digit NAICS code. Standard errors are clustered at the firm level. Symbols [a], [b], and [c] indicate significance at 1%, 5%, and 10%, respectively, and p-values are reported in the parentheses.

	1987-2010		1987-2000		2001-2010	
	# of Patents	*MV of Patents*	*# of Patents*	*MV of Patents*	*# of Patents*	*MV of Patents*
Constant	0.5829[a]	-0.0996	-0.2340	-0.9510[a]	0.2979	-0.4613[c]
	(0.1449)	(0.2287)	(0.1643)	(0.2642)	(0.1922)	(0.2823)
Log(*Assets*)	0.1707[a]	0.3281[a]	0.1469[a]	0.2887[a]	0.0993[a]	0.2342[a]
	(0.0133)	(0.0197)	(0.0148)	(0.0244)	(0.0128)	(0.0208)
Log(*Age*)	0.0792[a]	-0.0129	0.0553[a]	-0.0395	0.0876[a]	0.0497
	(0.0164)	(0.0257)	(0.0144)	(0.0220)	(0.0243)	(0.0349)
Concentration Index	-0.0218[a]	-0.0506[a]	-0.0383[a]	-0.0748[a]	0.0441[a]	0.0361[a]
	(0.0071)	(0.0110)	(0.0070)	(0.0112)	(0.0105)	(0.0141)
Log(*Price of Capital*)	-0.1597[a]	-0.1528[a]	-0.0008	0.0591	-0.0827[a]	-0.0395
	(0.0247)	(0.0382)	(0.0252)	(0.0383)	(0.0276)	(0.0439)
Log(*Capital Share*)	0.1632[a]	0.1087[a]	-0.0090	-0.0308	0.1431[a]	0.0108
	(0.0265)	(0.0394)	(0.0252)	(0.0451)	(0.0339)	(0.0458)
N	78,857	78,857	46,590	46,590	32,267	32,267
Adjusted R^2	84.40%	84.14%	86.39%	85.53%	90.23%	89.86%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes

Appendix

Figure A.1
Change in Measures of Concentration across Industries – 4-digit NAICS

This figure depicts the distribution of percentage changes in the HHI Compustat-based index over 1997 – 2014 period (Figure A) and the change in Census-based HHI index over 1997 – 2012 period (Figure B). The industries are defined based on NAICS 4-digit classification.

Figure A.1.A: Change in the HHI (Compustat-based)

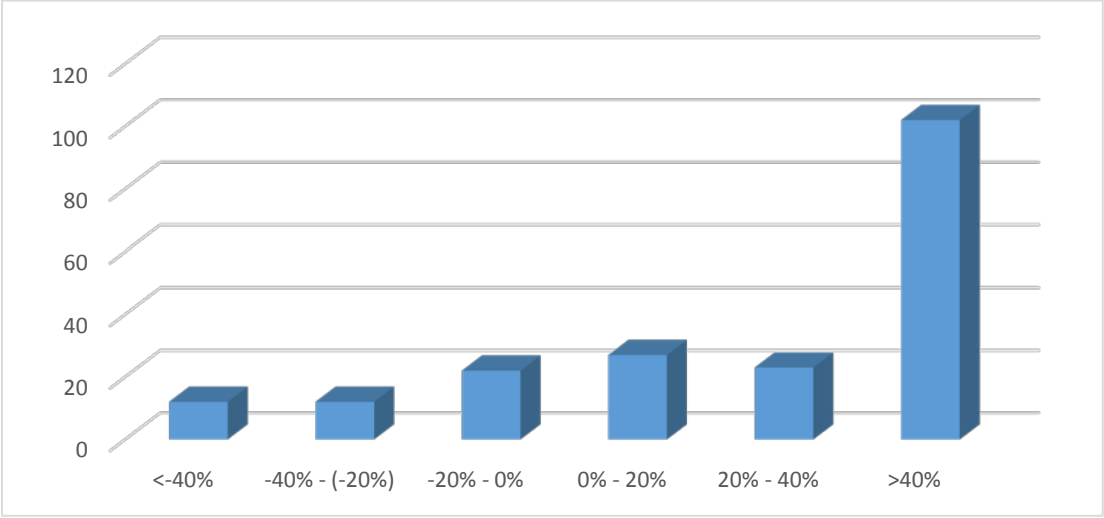


Figure A.1.B: Change in the HHI (census-based)

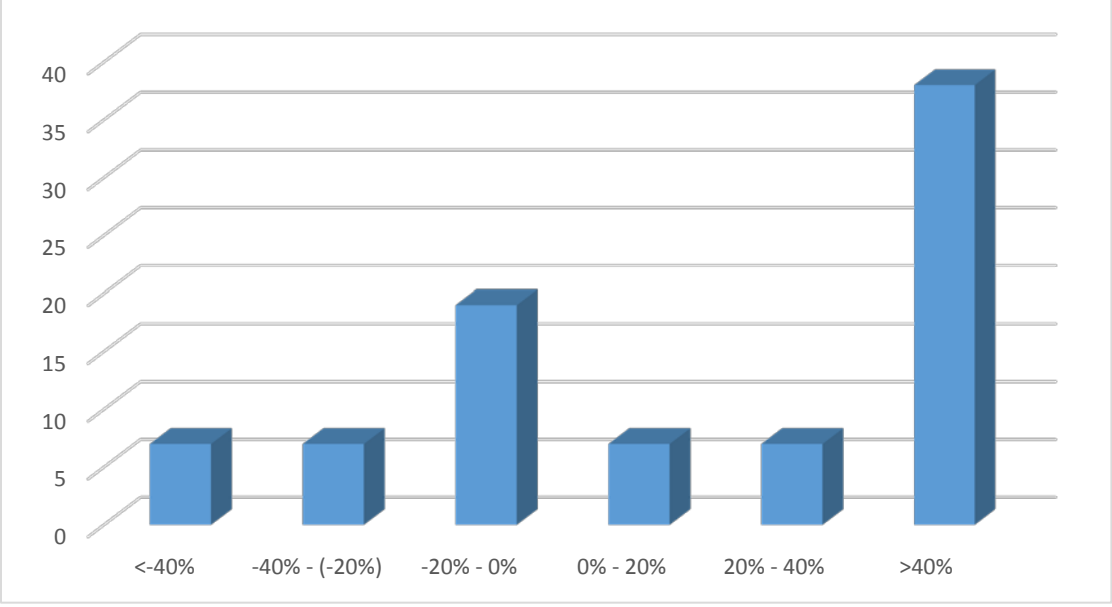
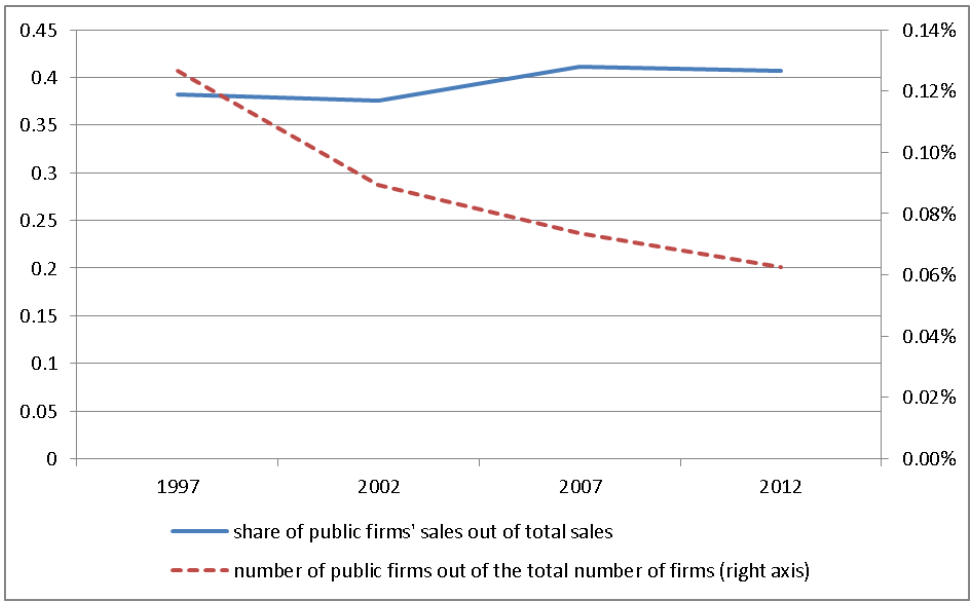


Figure A.2
Total Public Firms' Revenues as a Fraction of Public and Private Firms' Revenues

This figure shows total revenues [number] of public firms as a fraction of total revenues [number of firms] of public and private firms for the period 1997-2012. The information on public firms is obtained from Compustat, and the information on public and private firms are from Statistics of US Businesses (SUSB) report, managed by the US Census. Panel A is based on the overall sample, while Panel B is based on the subsample of firms with sales over $100M.

Panel A: All firms



Panel B: Firms with sales over $100M

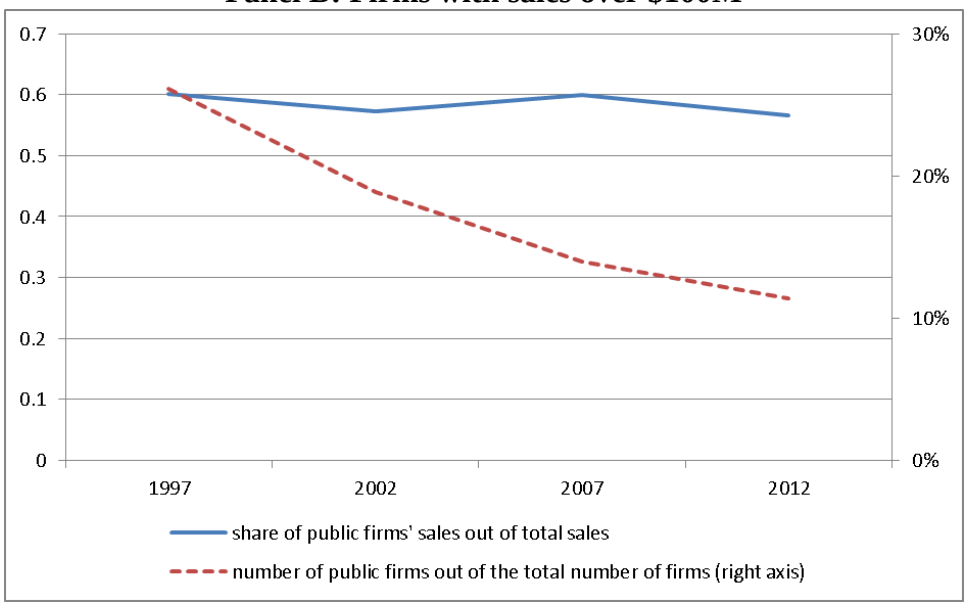


Figure A.3
Entries and Exits in Public Markets

This figure decomposes the changes in the number of public firms into entries and exits, as reported in the CRSP database. Firm exits are further split into mergers (delisting codes 200 through 299); liquidations (delisting codes 400 through 499, 574, and 580); and other exits (all the other delisting codes).

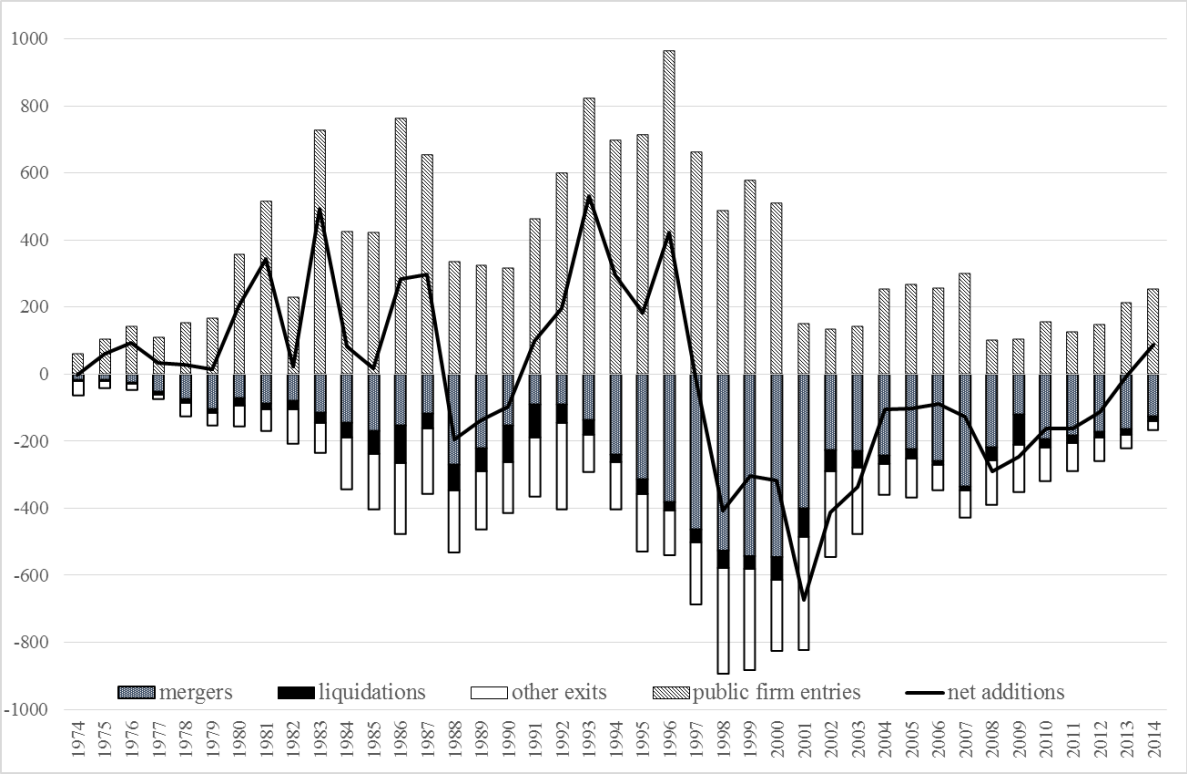


Table A.1
Change in the Level of Product Market Concentration and Profitability– 4-digit NAICS

This table reports coefficients from regressions of firm profitability on several proxies for the level of product market competition in an industry and other control variables. *ROA* is the operating income before depreciation scaled by the book value of assets. *Lerner Index* is the operating income before depreciation minus depreciation scaled by total sales. *Asset Utilization* is defined as total sales scaled by total assets.*Assets* is the book value of total assets. *Age* is the time (in years) from the firm's CRSP listing date. *Number of Firms* is the total number of public firms in an industry. *HHI* is the Herfindahl-Hirschman Index at the NAICS 4-digit level using sales data from Compustat. *Concentration Index* is the sum of the annual rank of the HHI and the annual inverse rank of the total number of industry incumbents. Industry is defined using a firm's four-digit NAICS code. Standard errors (reported in parentheses) are clustered at the firm level. Symbols [a], [b], and [c] indicate significance at 1%, 5%, and 10%, respectively.

Panel A: Entire Sample

	Dependent Variable: *ROA*		
	1972-2014		
Constant	-0.0361[a]	-0.0587[a]	-0.0520[a]
	(0.0063)	(0.0121)	(0.0051)
Log(*Assets*)	0.0473[a]	0.0469[a]	0.0471[a]
	(0.0013)	(0.0015)	(0.0015)
Log(*Age*)	-0.0201[a]	-0.0206[a]	-0.0206[a]
	(0.0013)	(0.0013)	(0.0013)
Log(*Number of Firms*)	-0.0067[a]		
	(0.0014)		
Log(*HHI*)		0.0004	
		(0.0014)	
Concentration Index			0.0015[a]
			(0.0005)
N	202,356	202,276	202,276
Adjusted R^2	66.85%	66.84%	66.84%
Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes

Panel B: Sub-periods

	1973-1986			1987-2000			2001-2014		
	ROA	*Lerner Index*	*Asset Utilization*	*ROA*	*Lerner Index*	*Asset Utilization*	*ROA*	*Lerner Index*	*Asset Utilization*
Constant	0.1593[a]	0.0652[a]	2.0591[a]	0.0487[a]	-0.0317	1.9906[a]	-0.1613[a]	-0.2802[a]	2.2696[a]
	(0.0079)	(0.0083)	(0.0444)	(0.0092)	(0.0218)	(0.0419)	(0.0179)	(0.0703)	(0.0543)
Log(*Assets*)	0.0010	0.0165[a]	-0.2045[a]	0.0230[a]	0.0293[a]	-0.2355[a]	0.0339[a]	-0.0095	-0.2631[a]
	(0.0019)	(0.0022)	(0.0110)	(0.0020)	(0.0051)	(0.0085)	(0.0027)	(0.0129)	(0.0084)
Log(*Age*)	-0.0193[a]	-0.0202[a]	0.0169[c]	-0.0319[a]	-0.0349[a]	0.1134[a]	0.0023	0.0885[a]	0.0822[a]
	(0.0018)	(0.0022)	(0.0101)	(0.0021)	(0.0042)	(0.0082)	(0.0028)	(0.0149)	(0.0086)
Concentration Index	-0.0020[a]	0.0004	-0.0096[b]	0.0001	0.0018	0.0051	0.0054[a]	0.0147[a]	0.0083[b]
	(0.0009)	(0.0011)	(0.0047)	(0.0007)	(0.0014)	(0.0035)	(0.0010)	(0.0047)	(0.0035)
N	52,309	49.193	52,413	69,854	68,158	70,599	59,246	58,614	59,468
Adjusted R^2	56.56%	60.67%	91.35%	59.35%	69.01%	88.63%	67.50%	58.15%	90.39%
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering at Firm Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes