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- Dynamics of Firm Profits and Market Power since 1955: A Divergent Relationship -

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Summary and Acknowledgments

The central purpose of this paper is to take a step towards uncovering the determinants and persistence of profitability. To this end, the paper will employ various measures of profitability, derived from De Loecker, Eeckhout, and Unger in their paper called “The Rise of Market Power” (RMP). These measures will then be empirically analysed and interpreted in three distinct parts. First, the primary findings of RMP will be replicated and the key profitability measures selected. Secondly, persistence will be analysed and interpreted. Lastly, proxies will be used to estimate determinants of profitability. All these steps will be carried out at the firm and industry level. This will aid in elucidating the relevance of each theory presented before the conclusion.

All inputs of a service or product have an associated quantitative compensation, in return for their value added. Although as abstract and intangible as this value appears, it is nonetheless a real amount. Unfortunately, the complexity of measuring this amount is very cumbersome. But it is not futile. As with any seemingly complex enigma, time and research uncovers these true numbers and concepts. Since we face the behemoth of intricacies now, our first estimates must be based on simpler measures. Akin to how history started with Newtonian physics, before the more eluding general relativity and quantum mechanics came to front. Despite the common place of science in today’s world, the business world far too often doesn’t embrace it as it should. We tend to accept business leaders as exceptional experts, but their prominence can overshadow their methodology. I would argue too many leaders today base their understandings on weak evidence. This evidence may be based on experience, or the disturbing business dogma and expert hunches. I am not denying the advantages of using past personal experiences. I am pointing at its often inferiority to the scientific method. Take Sigmund Freud for example. He based all his insights informally off past experiences (his own life and client sessions). He chose, through his own opinion, which experiences were most important. Far from scientific, and today many of his theories are highly controversial or deemed impossible to test. Yet his innovative conceptions popularized psychology and he left an indelible mark on the field. But to yield direct practical results the scientific method is needed. Thus, after Freud, psychology transitioned to a more scientific approach. I would argue that we have far too many persuasive and creative

executives today, akin to Freud, who lack the scientific rigor. Like the field of psychology, the business world must take a more scientific basis to progress. This paper acts to take the scientific approach, in part, the way an executive would do. The main difference is that I am taking a macro perspective (looking at all firms), while a business leader would be most concerned with their specific firm or industry. The field of economics already provides the tools to help understand the profit phenomena. Therefore, econometrics is at the heart of this analysis.

Lastly, I want to thank Professor Nenov who guided me through this whole process. His knowledge and talents were indispensable, allowing me to learn and write a far better paper than I ever could alone. I could not have asked for a better supervisor; thus, I greatly thank him.

Introduction

This paper further confirms that profits and mark-ups have dramatically risen since 1980. The four profit and mark-up measures utilized show a similar progression since 1955. They reached a low around 1980 and have risen ever since. The dominance of large firms appears to be the key driver in this dynamic.

The variance decomposition shows that the rise in profit and mark-ups is associated with an increase in volatility. Specifically, within industry volatility disproportionately increases compared to between industry volatility since 1980. In addition, the most volatile industries tend to have the highest mark-ups and profits. Then we see that persistence of accounting profit among the top 10% of firms is significantly stronger than the aggregate through the whole time period. Profit rates appear to have little to no persistence after 1980. But the top 10% had far more consistent mark-ups after 1980. Thus, market power appears to be playing a more important role after 1980 in comparison to profit rates.

The regression analysis shows that profitability has a highly statistically significant relationship with both advertising expenses and r&d expenses since 1955. This relationship decreased after 1980 but was still statistically significant. Industry volatility also had a strong relationship with profitability since 1955, and its relationship grew stronger after 1980. Using lagged regressions, the level of significance was strongest when no lags were used, although we do see lag relationships with statistical significance.

In the final section, the limitations of stating cause and effect relationships are highlighted, allowing the reader to generate their own opinion on the results presented in this paper.

I. Related Literature

The first section of this paper heavily draws on “The Rise of Market Power” (RMP) by De Loecker, Eeckhout, and Unger. The methodology for measuring profitability will be replicated, but these measures will be utilized differently. RMP focuses on the macroeconomic implications of the rising trend of mark-ups. My thesis focuses on extending their analysis to shed light on the key drivers behind this trend. Particularly, at the industry and firm level. There are many papers on the topic of market power and profitability, each approaching similar concepts from different angles.

One approach aims at explaining the labor share since its decline coincides with the increase in mark-ups. Autor et al. (2020) show strong support for their "superstar firm" model in explaining the increasing trend of mark-ups. Their hypothesis deems that more productive firms begin to dominate in terms of market share, leading to higher mark-ups and a lower share of labor. Their research focuses on explaining the decreasing share of labor. Less so about explaining how the productive firms differentiate themselves from their competitors. Barkai (2020) claims this decrease in the labor share does not result in an increase in the capital share. In fact, Barkai states that the capital share has decreased and that the extra share goes to "pure profits". Elsby et al. (2013) also highlight the limitations of the neoclassical labor and capital trade-off, arguing that the decreasing labor share is not a new phenomenon. Kehrig and Vincent (2018) analyse how the decline in the labor share is predominantly among large firms and argue that this is due to high labor productivity, not low wages. They suggest that technological and advertising effectiveness creates excess productivity in superstar firms.

Other approaches seem to focus less on the labor share, and more on the capital drivers behind the mark-up trend. Karabarbounis and Neiman (2018) test three hypothetical dynamics to account for the "volatile residual" resulting in this trend. They find that typical measures of the capital rental rate do not accurately account for the real value. Gutiérrez and Philippon (2016) acknowledge that despite the increase in profitability and Tobin's Q, fixed investment has decreased. They argue that the decrease in investment is best explained by decreasing competition and short-sighted governance (short-termism). In addition, they say that globalization and intangibles may play a part, but these factors are difficult to quantify. This leads into the findings of Crouzet and Eberly (2019). They find that intangible assets have a different nature than physical capital, and the increase in intangible assets is more dominant in larger firms, with higher profitabilty. Lastly, Eggertsson et al. (2018) argue that the increasing trend of profits can explain the two Kaldor growth facts that have not held up: constant interest rate and constant labor share. They focus on both labor and capital, aiming to modify the standard neocalssical model to account for these trends.

Section 1 - Measuring Profitability

This section is heavily focused on following the methodology of "The Rise of Market Power" (RMP) by De Loecker, Eeckhout, and Unger (2019). It provides a solid method of attaining various profitability measures. These measures will then be further analysed and interpreted in the following sections.

All data in this paper is from Compustat and pertains to the time period of 1955-2019. This is slightly extended compared to the RMP period of 1955-2016. Note that all data is collected exclusively from public firms, listed in the United States (therefore a common currency of U.S. dollars is utilized). In RMP, the authors discuss the similarities between private and public firms regarding aggregate profitability. However, in my thesis I will not look to extrapolate results from public to private firms.

Regarding data trimming, firms with the top and bottom 1% of mark-ups were eliminated. Secondly, firms with a zero or negative number for certain entries, such as costs of goods, were eliminated. The trimming methodology is a direct replication of RMP (see that paper for details).

I. Profitability Measures

Mark-up

Using the production function approach, as in RMP, the mark-up can be expressed as:

$$\mu_{it} = \theta_{it}^{v} \frac{P_{it}}{P_{it}^{V}} \frac{Q_{it}}{V_{it}}, \tag{1}$$

μ is the mark-up, θ is the output elasticity of the variable input, "PQ" is revenue, and "PV" is variable costs. Subscript "i" is an index for firms. The subscript "t" represents the period. The superscript "V" denotes a vector for variable inputs, and superscript "v" is an indicator of output elasticity.

Estimating θ is rather controversial. As noted in RMP it also does not change the general trend of the data. Therefore, in my thesis I will use a constant value of 0.85. This is the standard time invariant θ used in RMP.

To find the mark-up we will use cost of goods sold (cogs) from the firm's income statement as the variable cost (PV), the revenue from a firm's income statement to represent sales (PQ), and the value of 0.85 to represent the output elasticity.

RMP Net Profit Rate

This measure utilizes the previous mark-up calculation but adds a fixed cost component. The formula is provided below:

$$\pi_{it} = 1 - \frac{\theta_{st}}{\mu_{it}} - \frac{r_t K_{it}}{S_{it}} - \frac{P_t^X X_{it}}{S_{it}}, \quad (2)$$

π represents the net profit rate which equals one minus the three right terms. The first term adjusts the profit rate for variable costs. This leaves us with the two last terms which account for the fixed costs. In the second last term, "K" represents capital, while "r" represents the cost of capital. Thus, the numerator equals capital expenditure. The denominator, "S", is revenue. The final term has a numerator of "PX" which equals the overhead costs. Then again, the denominator equals to revenue.

When calculating the net profit rate, we use the revenue from a firm's income statement to represent sales (S), the capex from a firm's statement of cash flows to represent capital expenditure (rK), and selling, general and administrative expenses from the income statement to represent overhead costs (PX).

Note that I made two deviations from RMP. First, I used a different measure of revenue (sales). My calculation takes the exact revenue amount stated in the income statement, where RMP uses an adjusted value of this amount which excludes certain types of revenue and discounts the value of others. I prefer the direct amount, due to its transparency, as opposed to the complex adjustments used in the alternative Compustat revenue. The second alteration was using the capex stated on the statement of cash flows. RMP used a much more detailed approach in which they calculated cost of capital, and capital amount separately, then multiplied them to find the capital expense. This process is far more detailed and begins to stray from this paper's main point. Thus, I took the second approach RMP suggested which was to use the capex amount directly.

Accounting Net Profit Rate

This measure was not used in RMP but included here for transparency. It takes the net income from the income statement and divides it by revenue, which is also on the income statement. RMP does not used this measure mainly due to the adjustment costs for capital expenditure that are not accounted for in this approach. But as we will see later, the results between the Accounting Net Profit Rate and the RMP Net Profit Rate are very similar.

Common Dividends over Revenue

Although common dividends may not be a direct measure of annual profit, it is included to act more as a proxy. This measure is mainly included for robustness, and to provide an alternative to typical profit measures. As we will see, common dividends show the same trend as the other profitability measures. This measure was also used in RMP.

II. Trends in Profitability

Next, I show the main trends of the above measures and discuss how they compare with the RMP measures. Appendix A includes several robustness results.

Note that all the following means are revenue weighted, akin to the RMP method. Therefore, firms with larger revenues are weighted more than those with smaller revenues.

Mark-up Trend

Figure 1.1 shows the trend of public firm mark-ups since 1955. Overall, the trend is very similar to RMP.

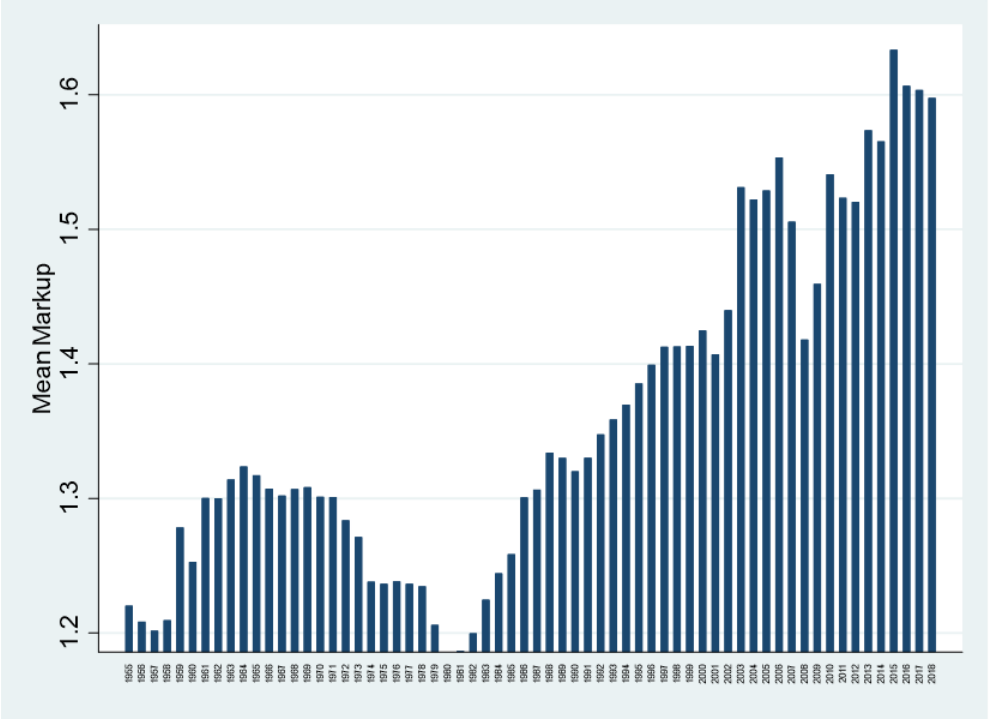


Figure 1.1 - Mean Mark-up Trend

The main takeaway, as thoroughly covered in RMP, is the strong upwards trend since the 1980's. Figure 1.1 above and Figure 1 in RMP, show the mark-up

increase from 1.2 to 1.6 in less than forty years, starting in 1980. Trends such as these are prevalent throughout this paper and RMP.[I]

The other segment, prior to the 80's, shows a path of an inverted "U". This is of interest, but we need to be more cautious considering the scarcer data in that time period, and the evolution of accounting methods.

Lastly, see appendix A1 to find the unweighted average, and median mark-up per year from the 1955 to present. Note that these measures include all outliers. Yet, we see the same general trend since the 80's.

RMP Net Profit Rate Trend

Figure 1.2 repeats the process above but for profit rate, using the RMP approach. Figure 8(a) in RMP uses the same process but only extends back to 1980.

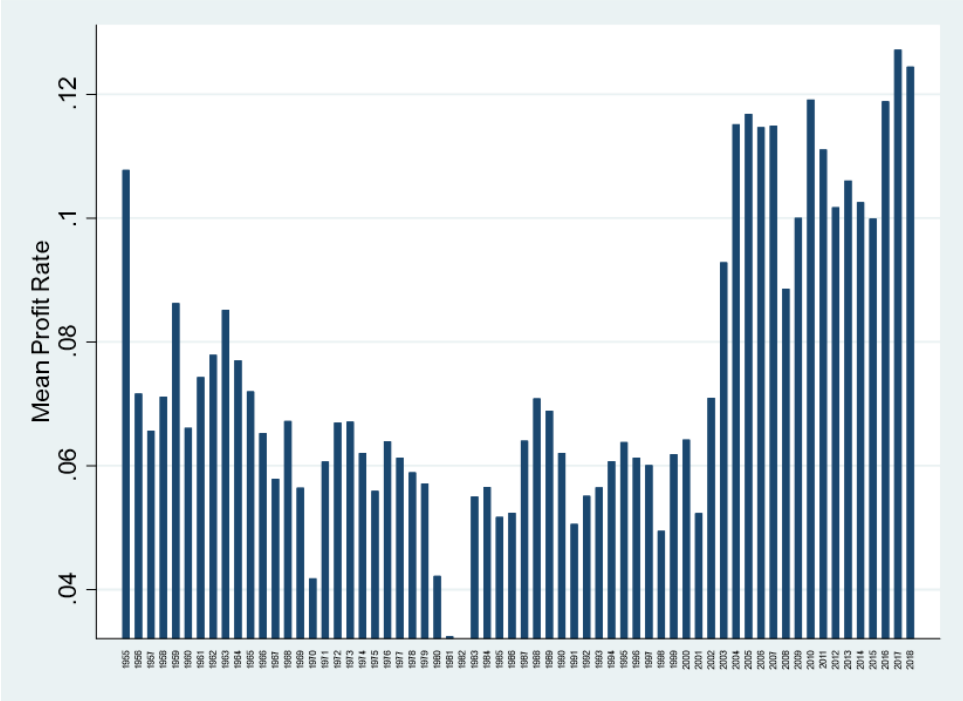


Figure 1.2 - Mean RMP Profit Rate Trend

Both figures follow the same path. The one difference is that Figure 1.2 has profit rates slightly inflated compared to Figure 8(a). This is likely a result of differences in accounting for capital costs.[II]

[I] One deviation of the trend is evident between Figure 1.1 and RMP Figure 1. Around 2008 Figure 1.1 plummets then sharply rebounds, while Figure 1 stagnates then increases. The discrepancy is reasonable since RMP took an adjusted revenue value which put limits on including certain financial service revenues.

[II] See appendix A2 for profit rates calculated without weighting revenue, and without removing outliers. The trend remains.

Accounting Net Profit Rate Trend

Figure 1.3 takes the annual net income directly from the income statement of firms. We can see an increasing trend (0.04 to 0.08) despite the high year to year volatility of accounting profits.

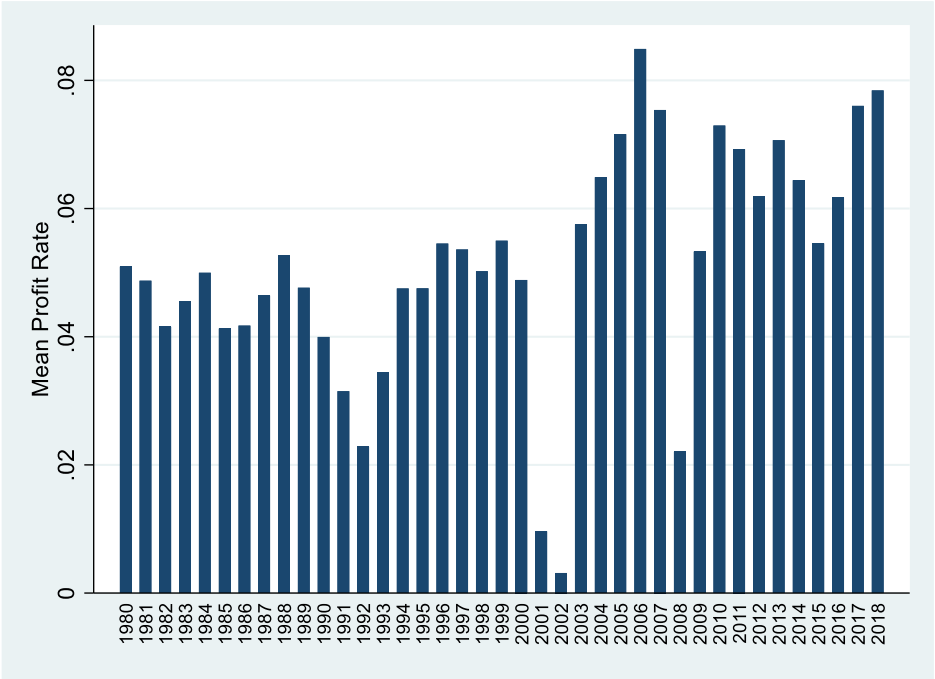


Figure 1.3 - Mean Accounting Profit Rate Trend

The trend is more discernible when we ignore periods of crisis. The large draw downs on the income statements in the dotcom bubble, and the financial crisis seem to obscure the trend. Figure 1.4 shows only the firms with positive profits, which allow us to better see the trend by removing large outlying losses. We more clearly see an increase in profit rate since 1980.

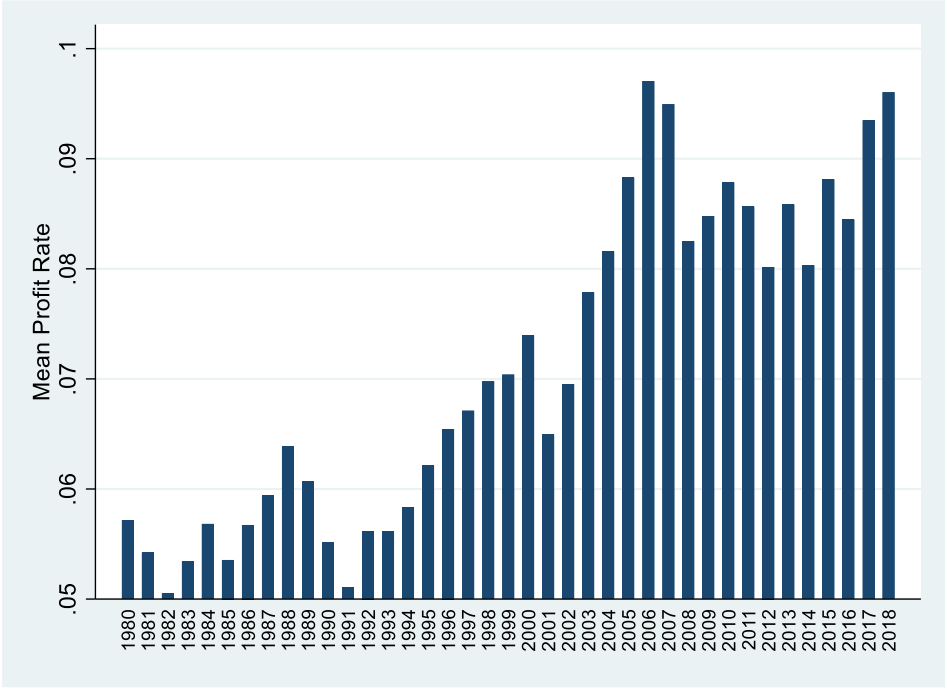


Figure 1.4 - Mean of Positive Accounting Profit Rate Trend

Common Dividends Over Revenue Trend

Figure 1.5 displays the last profit measure we will look at, common dividends over revenue. Figure 9(b) in RMP is the corresponding graph.

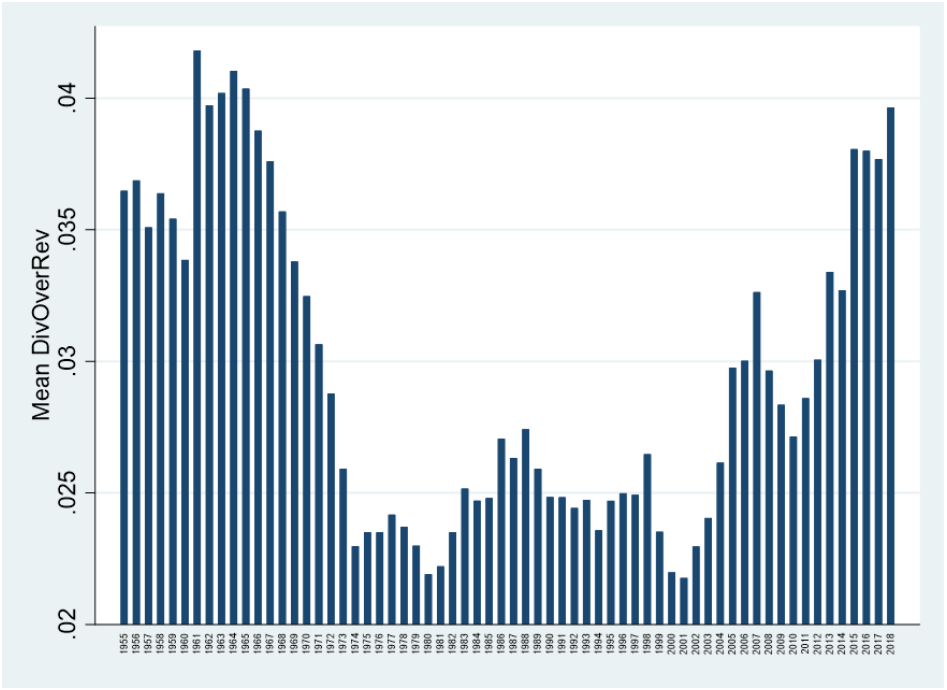


Figure 1.5 - Mean Dividends Over Revenue Trend

It is important to notice the similarity between the dividend trend and the prior three trends. Although not perfect, we still see a general increasing trend since the 80's. The incongruency can be expected as the tendency for firms to provide dividends may vary with time.

III. Distribution of Profitability Measures

Now that we seem to understand the general trend, we must dig a little deeper to understand the basis of this trend. RMP shows that the rise in profitability is driven by the corporations with the largest operations. We came to the same conclusion in this section.

Mark-up Density

Below we start off with the kernel density estimates, with no outliers removed, for the period of 1980 on the left and 2010 on the right.

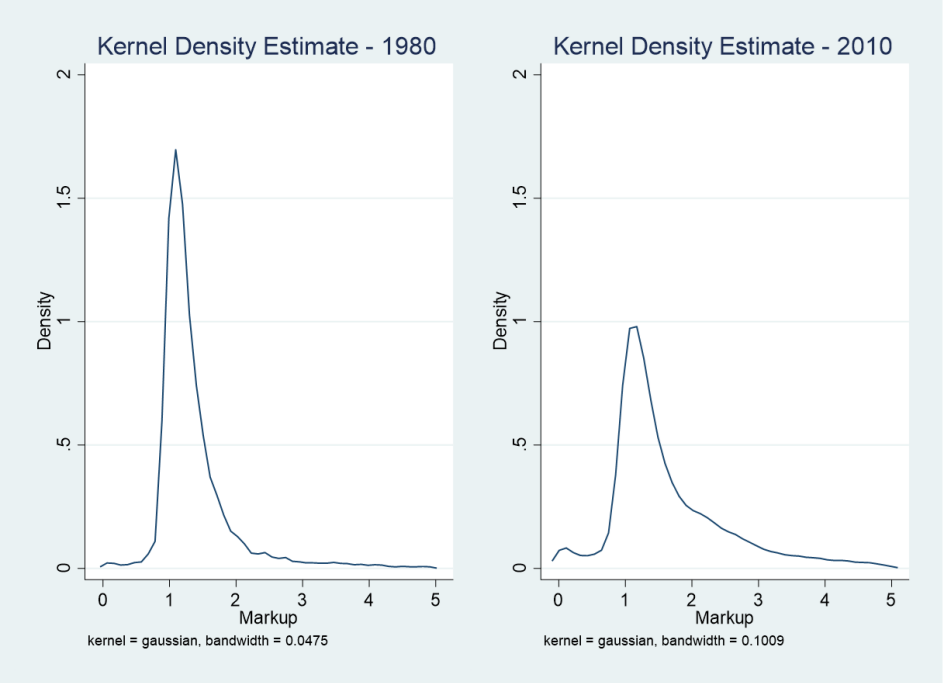


Figure 1.6 - Kernel Density Estimates

On the left (1980), we see a high concentration of firms with mark-ups hovering just over one, slightly skewed to the right. Then in 2010, we see the concentration of firms just above one drop as the mass shifts in the right tail of the distribution. Thus in 2010, more firms seem to achieve a higher mark-up than in 1980. But notice the median mark-up remains relatively intact. As RMP shows in detail, firms' profitability measures seem to remain relatively stable in aggregate over time, with one exception. The dominating firms (in terms of revenue) have increased their mark-ups significantly. Thus, we have a rise in market power.

Below we repeat the process but with outliers removed, and an extended time period. For ease of comparison they are plotted on the same graph. The left graph shows the comparison with the year 1980, while the right shows the same with 1960.

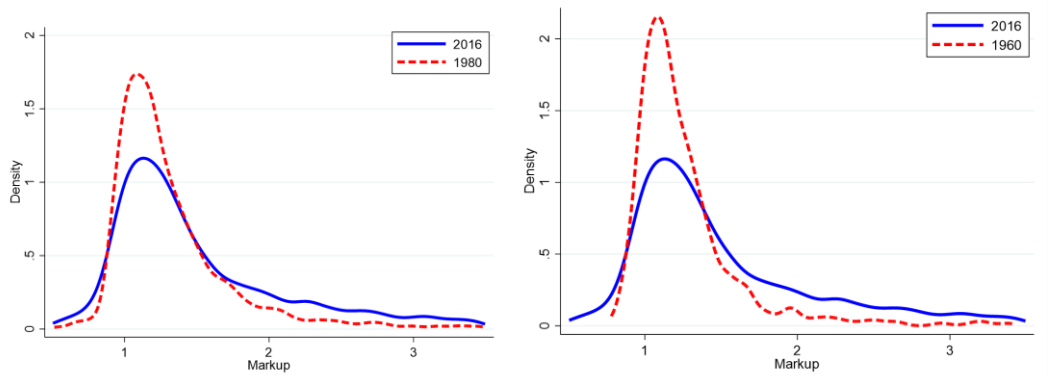


Figure 1.7 - Kernel Density Estimates with Outliers Removed

In both graphs we see the same trend. Since the 60's, the concentration of firms just above a mark-up of one has dropped, as a result, increasing the fatness of the right tail.

Other Densities

Using the same method as above for the different profitability measures, we reach the same conclusion. See appendix A3 for the results of the RMP Net Profit Rate, and the Accounting Net Profit Rate.

IV. Empirical Trends of Measures by Industry

Now trends of profitably will be analysed at the industry level. This was done by RMP as well, but with a different methodology. The details about industry trends are not required for the main understanding of this paper. Thus, I will provide a quick summary of the general trends.

Overall, there is large variation across industries, but the underlying increase in profitability is often evident. In addition, the accounting profit rate appears to be a more volatile version of mark-ups. But we need to verify that the trends and commonalties between industries are not spurious. Thus, using regressions on the industry level may help us to further elucidate the underlying mechanisms at play. Understanding profitability at the industry level is more complex yet a logical next step in understanding the dynamics of profitability. See appendix A4 for the full analysis.

V. Section Summary

This section showed that since 1980, mark-ups, profit rates, accounting profit rates, and dividend rates have increased significantly. This trend is primarily

driven by the increased profitability of the largest firms. These findings are in line with the results in RMP.

Section 2 - Variance Decomposition & Persistence

Analysing the persistence of profitability will help us comprehend how strong and long lasting the underlying drivers of profitably may be. It provides a context for profitability that will aid our understanding. This section marks the end of RMP replication, as they did not complete this type of analysis.

I. Variance Trends & Decomposition

We will start off with analysing the aggregate standard deviation of profitably measures over time, then between industries, and then the ratio of the two.

Total Standard Deviation

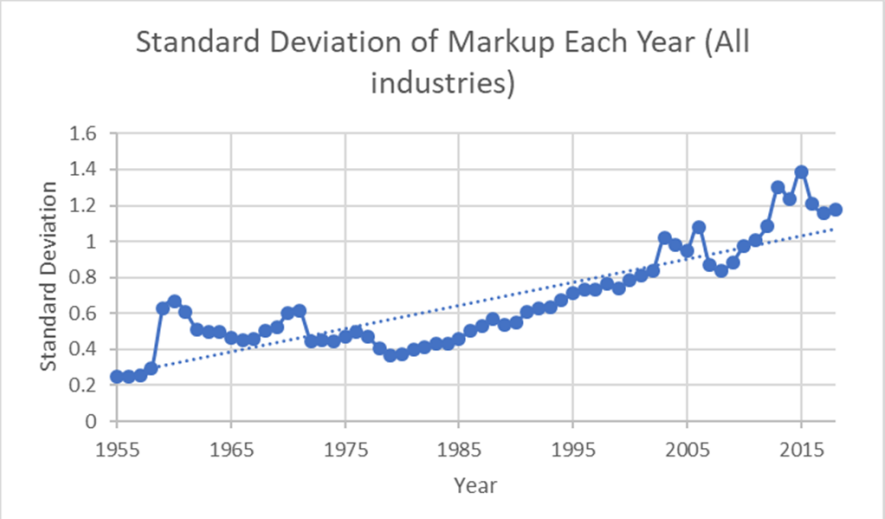


Figure 2.1 - Total S.D of Mark-up

Figure 2.1 shows a steady upward trend of mark-up's standard deviation. Note that these results are revenue weighted, along with all the graphs that follow. Unweighted results are shown in appendix B1.

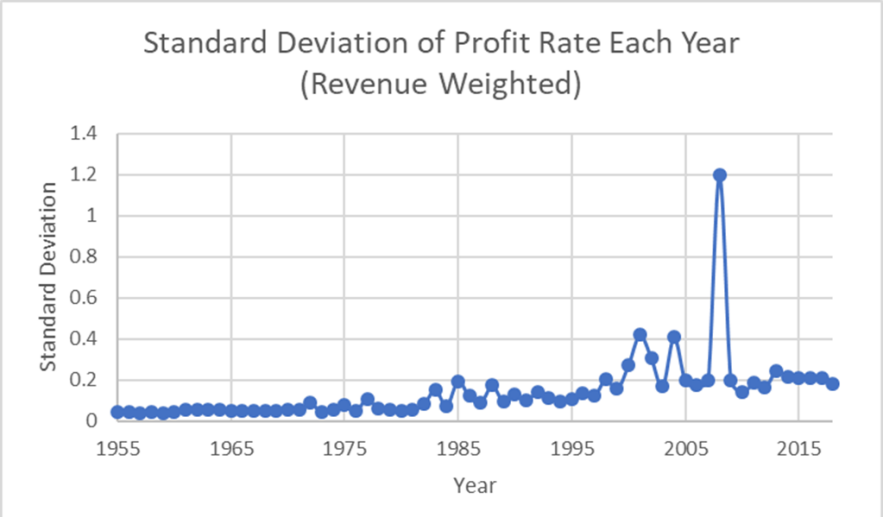


Figure 2.2 - Total S.D of Profit Rate

Figure 2.2 shows the standard deviation of accounting profit rate. Despite the few spikes in the 2000's we see a gradual increase in standard deviation. Note the prominence of the financial crisis in 2008, and to less of an extent the dot-com bubble in the early part of the decade.

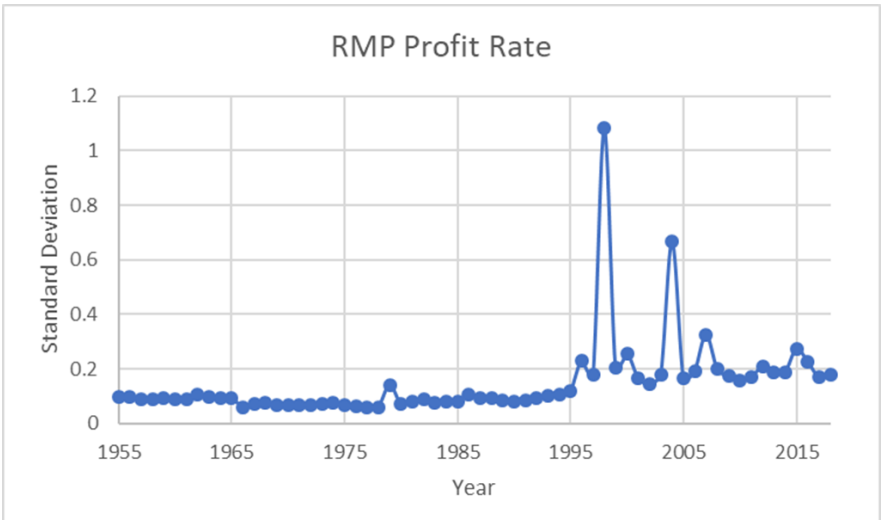


Figure 2.3 - Total S.D of RMP Profit Rate

Figure 2.3 shows a similar gradual increase in volatility, with a few outliers in the right half. The great recession appears relatively tame, compared to the accounting profit rate. As I explained before, the RMP method accounts for financial revenues and costs differently than modern accounting systems, thus this discrepancy is not a surprise.

Lastly, note the difference between profit rate and mark-up trends in volatility. Mark-up dispersion has steadily increased from a standard deviation of about 0.2 to 1.2. On the other hand, profit rate dispersion has started just above zero and risen to about 0.2. Profit rate and mark-up dispersion have both increased

since 1980, but mark-up dispersion appears to have increased more rapidly, at a more stable rate.

Between Industry Standard Deviation

Figure 2.4 (mark-up) and Figure 2.6 (profit rate) look at the between industry standard deviation for the NAICS, while Figure 2.5 (mark-up) and 2.7 (profit rate) show the same process but for GICS. Note that all the following results are revenue weighted, see the corresponding unweighted measures in appendix B2.

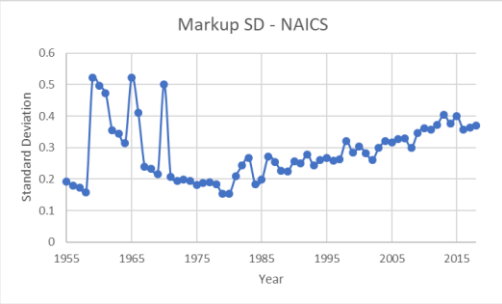


Figure 2.4

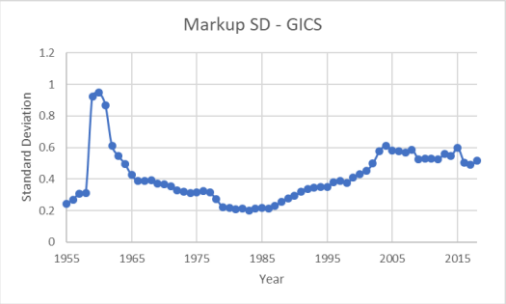


Figure 2.5

The mark-up standard deviations for both classification systems above, display a similar trend. High volatility is shown in the beginning, which eventually stabilizes, then gradually increases. Other than the beginning high volatility, the between industry trend follows the same trend of overall volatility, but with a smaller relative scale.

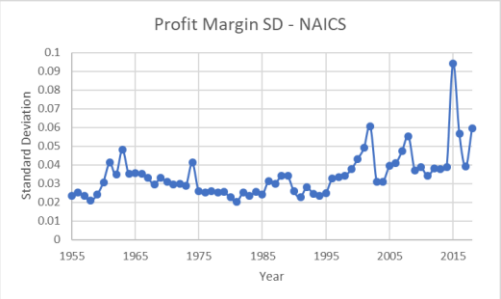


Figure 2.6

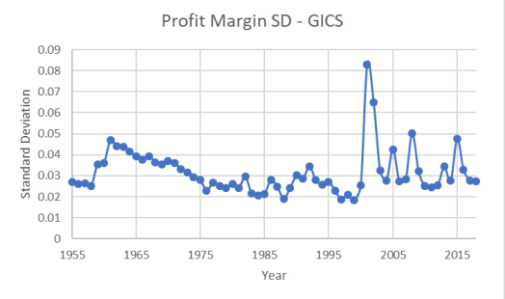


Figure 2.7

Repeating the process but for the accounting profit rate, we see a similar trend as mark-ups but with more year to year volatility. This can be expected due to the more stable nature of mark-ups.

Between Industry S.D over Total S.D Ratio

The graphs below show the ratio of between industry volatility compared to total volatility. They fundamentally show the degree of importance for between industry variance.

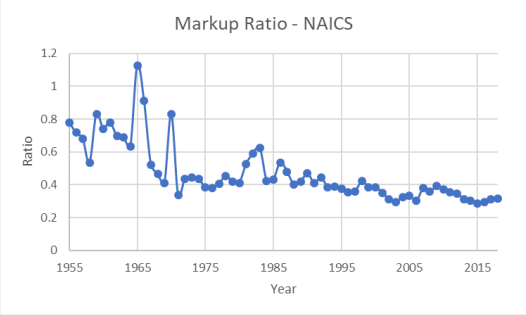


Figure 2.8

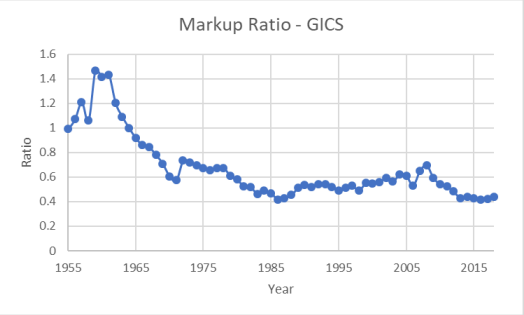


Figure 2.9

Figure 2.8 shows the ratio using mark-ups from the NAICS, and Figure 2.9 shows it for the GICS. The below graphs repeat the process but for the accounting profit rates.

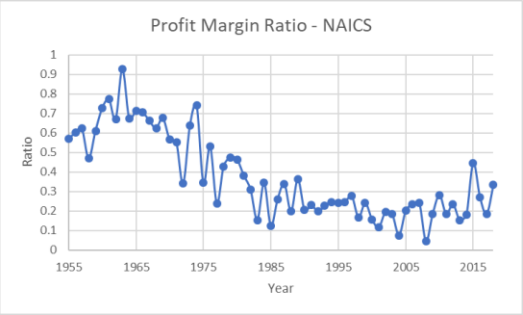


Figure 2.10

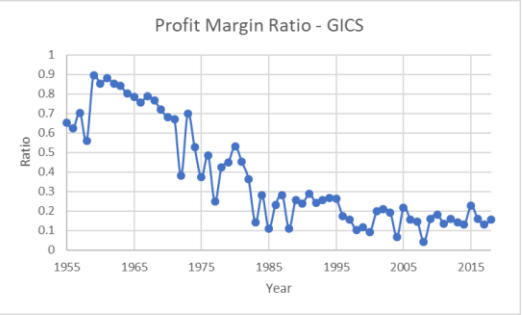


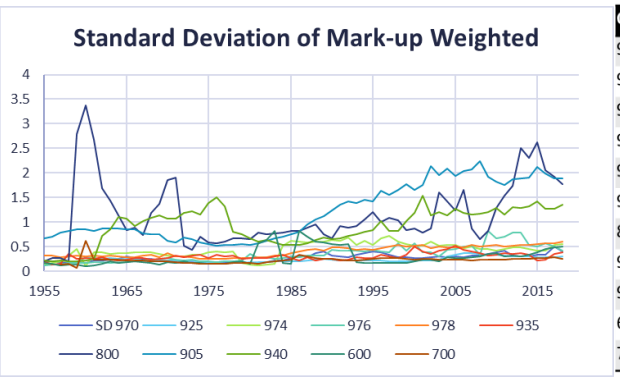
Figure 2.11

All four charts seem to show the same trend, high volatility in the first few decades, which eventually stabilize. This is crucial to understanding the trend of increasing profitability since the 80's. We now know the hump shaped trend prior to the 80's was in an environment of high volatility between industries, while the second period saw the importance of this between industry volatility decrease. Now it seems logical to explore the within industry volatility in recent decades. Look at appendix B3 for the above graphs unweighted.

Note that the high volatility in early periods may be partly representative of the lacking sample size. The number of observations between 1955 and 1980 is about 55,000, while the total observations is roughly 332,000. For the length of the 1955-1980 period, we would expect double the sample size (assuming consistency of publicly listed firms).

Within Industry Standard Deviation

Let's first look at the within industry variance for weighted mark-ups below. Each coloured line is a different industry (number assigned to each colour is its industry code, see table below).



Code	Economic Sector
970	Basic Materials
925	Capital Goods
974	Communication Services
976	Consumer Cyclicals
978	Consumer Staples
935	Energy
800	Financials
905	Health Care
940	Technology
600	Transportation
700	Utilities

Figure 2.12 - S.D of Mark-up within Industries

Figure 2.12 shows the tendency for three industries to deviate with higher variance than other industries. These three are financials, health care, and technology. This is very interesting considering that these three industries also deviate from the others in terms of the profitability measures we used before. Thus, we may be starting to see the importance of industry risk in explaining profitability.

Figure 2.13 is the average industry mark-up but with financial, health care, and technology removed (outliers). We can clearly see since the 80's, volatility has seemed to increase across these industries. This is also evident in Figure 2.12, without removing outlying industries. Again, we are beginning to see an importance for industry risk as a potential driver of profitability, since this period of increased volatility corresponds with higher average profitability.[III]

[III] See appendix B4 for the unweighted mark-up graph by industry and see B5 for the 3d surface plot of the weighted and unweighted volatility. I also included in appendix B6 a brief industry shock approach to understanding the increased volatility.

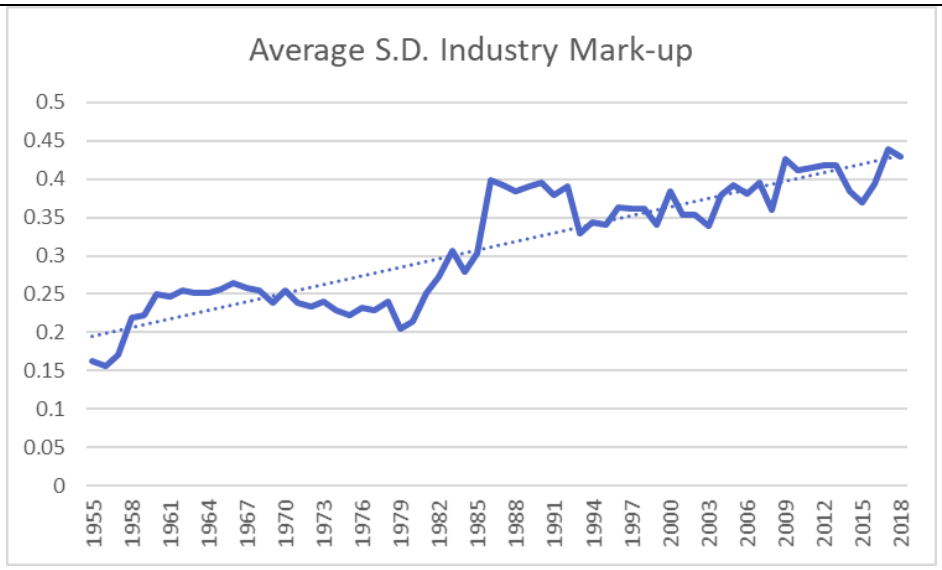
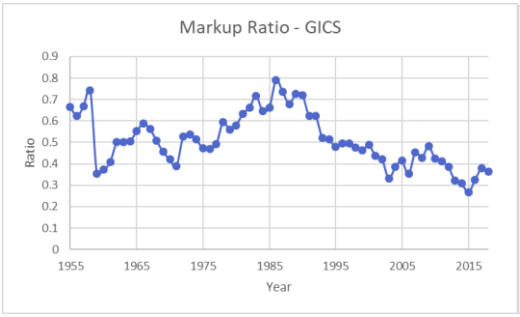


Figure 2.13 - Average S.D of Within Industry Mark-up

Within Industry S.D over Total Industry S.D Ratio

The following graphs show the ratio of within industry s.d over total s.d.



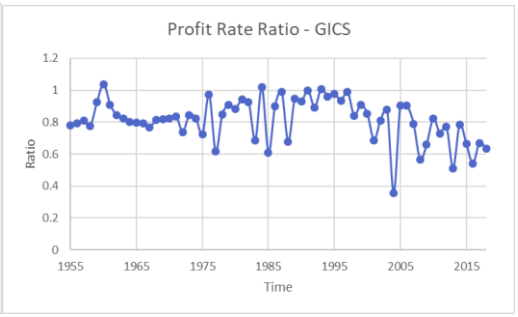


Figure 2.14 *Figure 2.15*

We see a constant to slightly negative trend over time. In comparison to between industry standard deviation, the within industry standard deviation seems to hold more constant over time. Remember that the within industry volatility is not decreasing over time, it is only slightly decreasing in comparison to total standard deviation.

Variance Decomposition

The following table shows the average ratio of within and between industry volatility before 1980 and after 1980.

Using GICS	Between Mark-Up	Within Mark-Up	Between Profit Rate	Within Profit Rate
Before 1980	0.89	0.52	0.65	0.82
After 1980	0.52	0.50	0.19	0.81

Table 2.1 - Ratio of Between and Within S.D by Time Period

Interestingly, within industry volatility seems to have increased in proportion to between industry volatility after 1980.

II. Autocorrelation Measures

To add to our understanding of profitability, this part will analyse autocorrelation at the firm level. Persistence will be measured for all firms and for the top 10% of firms.

We will begin with the autocorrelation of mark-ups for all firms. This will be done for two periods, prior to and after 1980. See Appendix B7 for the full 1955-2018 graph.

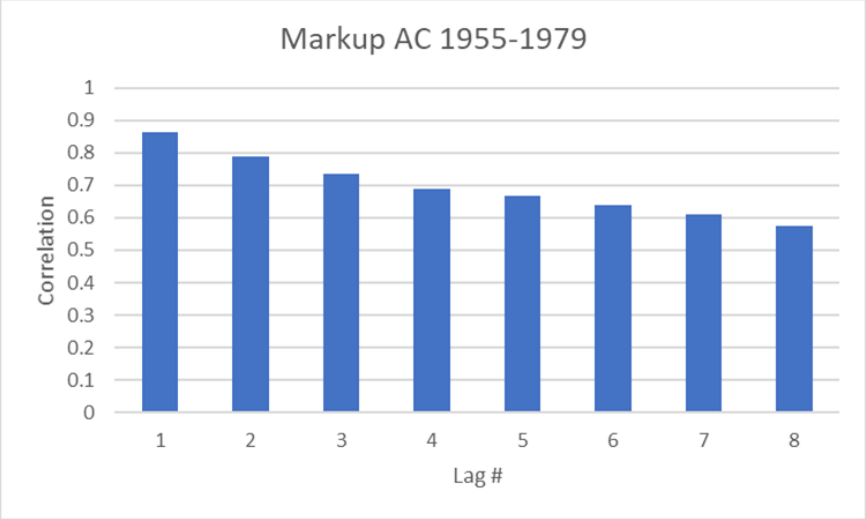


Figure 2.16 - Mark-up Autocorrelation from 1955-1979

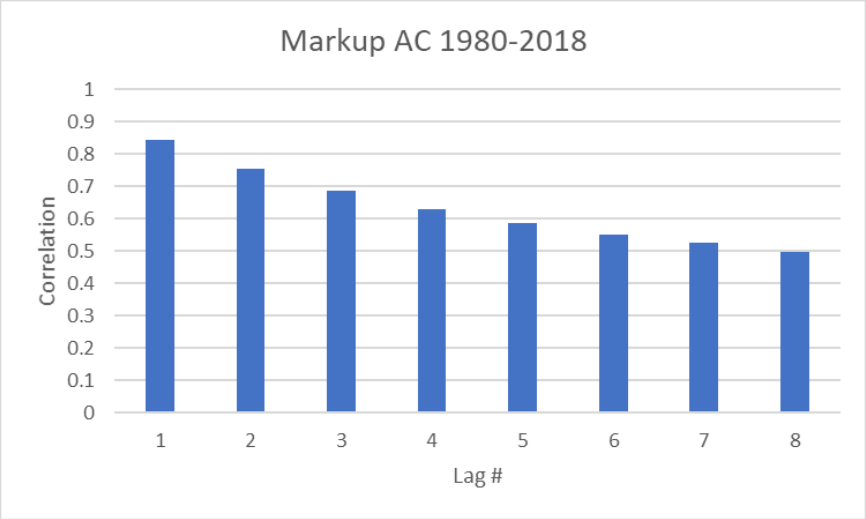


Figure 2.17 - Mark-up Autocorrelation from 1980-2018

The results above, show a strong persistence of mark-ups through each lag (note that each lag represents one year). Both graphs start around the same correlation at lag one, but in Figure 2.17 (1980-2018) autocorrelation dies out

faster. Thus, there is a reduction in long-run persistence. This appears to match the increasing volatility in the 1980-2018 period we saw before.

Now let us look at the persistence of accounting profit rate for the same time periods.

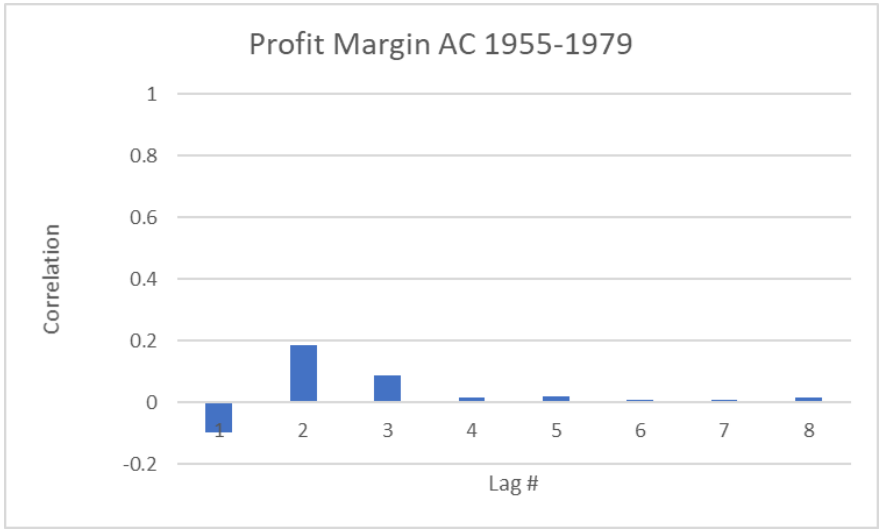


Figure 2.18 - Profit Margin Autocorrelation from 1955-1979

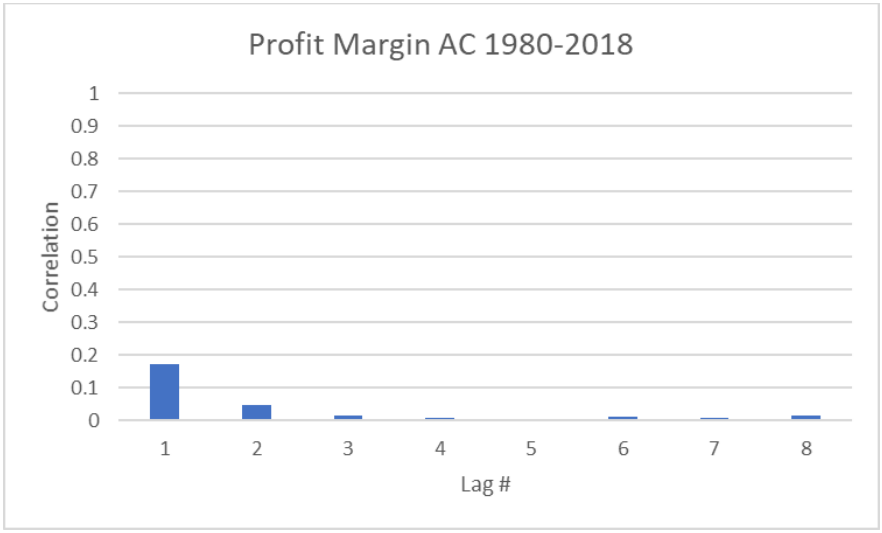


Figure 2.19 - Profit Margin Autocorrelation from 1980-2018

The autocorrelation of accounting profit is very low compared to the mark-ups. In fact, it seems to hover around zero after just three to four lags. But the first few lags are rather informative. Figure 2.18 begins with a negative correlation which may be suggestive of a cyclical nature of profitability. This indicates that the firm is more likely to have a negative profit after a year of positive profit. This is in direct contrast with the second period, which shows the opposite effect, where no negative correlations are present. The discrepancy may be indicative of

a changing market dynamic, where profitable firms in the second period are able to hold onto profits longer.

Autocorrelation of the Top 10%

This section will essentially repeat the above exercise but for the top 10% of firms each year, according to revenue.

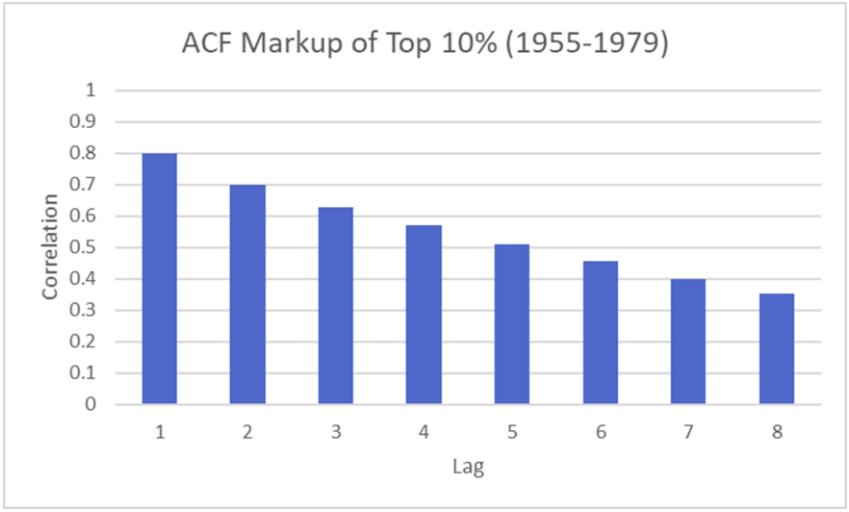


Figure 2.20: Mark-up Autocorrelation from 1955-1979

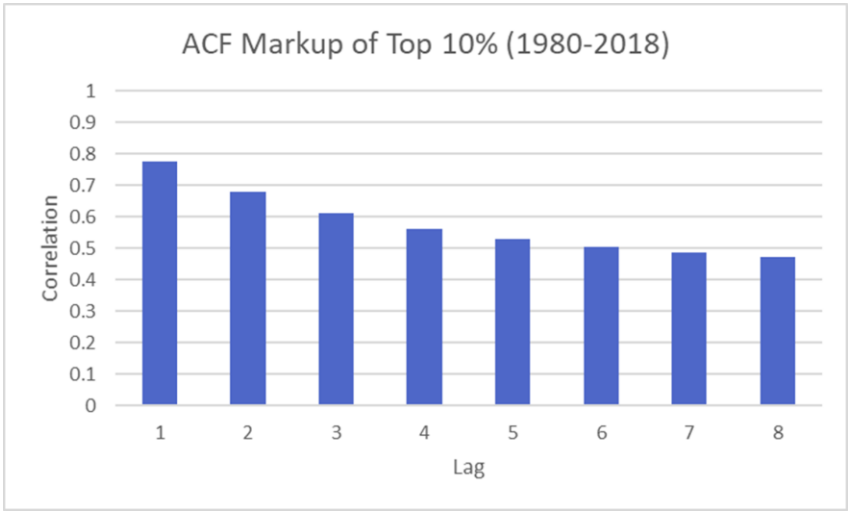


Figure 2.21: Mark-up Autocorrelation since 1980

In both periods, the first-year lag starts around the same value, but in the 1955-1980 period, the autocorrelation drops faster than the period after 1980. In fact, if we were to extrapolate the first period lag length, it seems that this rate would continue. Thus, it appears that persistence of mark-ups becomes stronger after 1980 for the large firms. In the total market, we saw the exact opposite. The persistence of mark-ups after 1980 declined. Therefore, it appears that we are seeing a rise in the dominance of large firms.

Below we repeat this method again but with accounting profit rate.

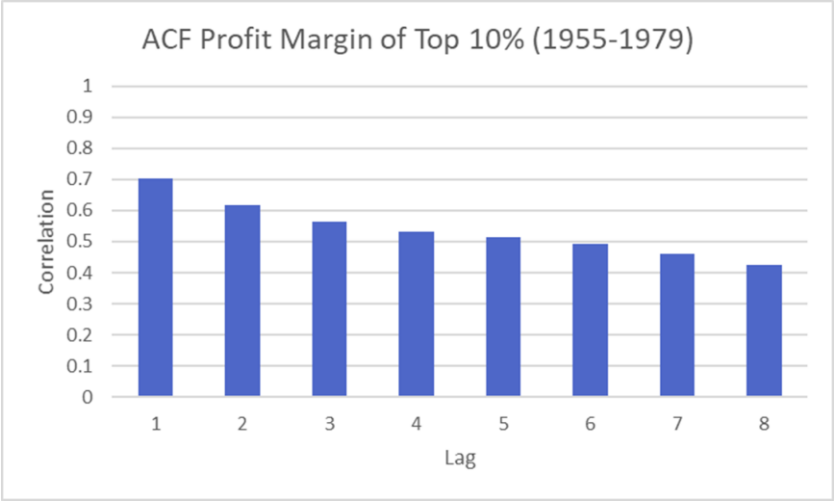


Figure 2.22 - Profit Margin Autocorrelation from 1955-1979

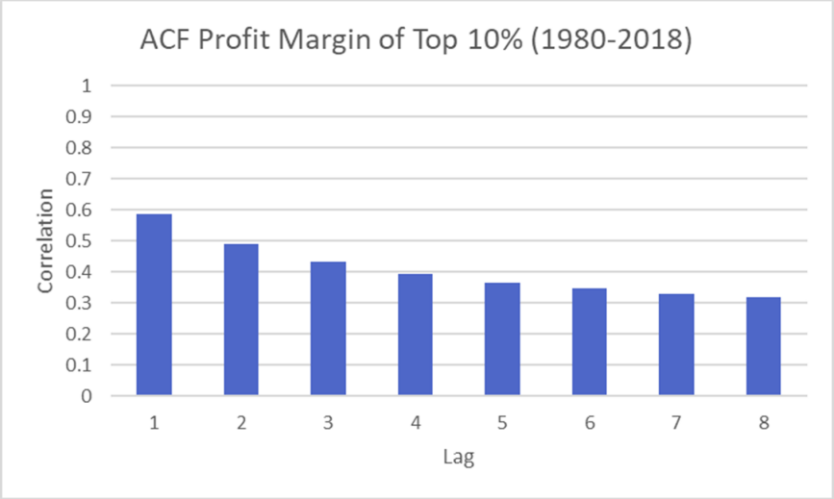


Figure 2.23 - Profit Margin Autocorrelation since 1980

These results are an antithesis of the mark-up graphs. Instead of persistence remaining stronger after the 1980, it becomes weaker (eighth lag is now 0.3 compared to 0.4). We can logically deduce that some fixed costs have increased for larger firms, leading to less persistent profits despite more persistent mark-ups.

Looking at the aggregate patterns, we see a few opposing dynamics which makes it more difficult to understand persistence, but we can conclude that persistence is highly dependent on the type of profitability measures being used. It also depends on the lag length used to compare before and after 1980. For example, comparing the first lags (short-run) may yield different results than comparing the eighth lags (long-run), yet both are measures of persistence.

We can conclude that mark-ups in all firms consistently shows great short-term and long-term persistence, and accounting profit rate a lack thereof.

Another general conclusion we can draw is that accounting profit rate is significantly more persistent in the top 10% of firms over the whole time period.

Lastly, we can see that long-term persistence of mark-ups become stronger after 1980 for the top 10% of firms. In contrast, long-term persistence of profit rates after 1980 for the top 10% becomes weaker. It appears that the firms with the largest revenues keep their position by maintaining high mark-ups, not through maintaining profit rates. These high mark-ups might be sustained through reducing variable costs, increasing revenue, or both. One hypothesis is that economies of scale are allowing these firms to sell more, at a lower variable cost. The increase in technology and network effects we see among firms in the past few decades may support this reasoning. Another hypothesis is that these firms are charging a premium price to their consumers because of their sustained market power.

Testing Autocorrelation Period Difference

Now we will test for differences in autocorrelation before and after 1980, using the following regression model. This is a robustness test for the change in persistence of mark-up and profit rate before and after 1980.

$$y = \alpha + \beta l.y + \gamma 1\{year <= 1980\} l.y + \varepsilon \quad (3)$$

The dependent variable y, is profit rate or mark-up, while β is the coefficient for a one-year lag before 1980. Then γ is the estimated difference for the effect of the lag mark-up/profit between the two periods. Note that values are revenue weighted, and standard errors are clustered.

1-Year Autocorrelation

	Before 1980	After 1980	Difference
Profit Rate	0.00	0.01	-0.01 (0.018)
Mark-Up	0.92**	0.94**	-0.02** (0.003)

*Significance markers: + for 10%, * for 5% and ** for 1%. Standard errors are in parentheses.*

Table 2.2 - Autocorrelations by Period and Profitability Measure

The profit coefficient before 1980 is negligible in this regression. We then see a non-significant increase in profit persistence in the second period. On the other hand, mark-up persistence seems to have increased after 1980 by a statistically significant amount.

The following table repeats the previous process but with the top 10% of firms according to profit rate and mark-up.

1-Year Autocorrelation for Top 10%

	Before 1980	After 1980	Difference
Profit Rate	-0.18**	-0.01	-0.17** (0.018)
Mark-Up	0.68**	0.74**	-0.06** (0.027)

Table 2.3 - Autocorrelation by Period and Profitability Measure

Mark-up after 1980 has a stronger relationship. The profit relationship is negative in the first period, and about zero in the second.

We conclude that mark-up has become more persistent since 1980 among all firms, especially the top 10%, in the short run. On the other hand, profit rate has not significantly changed among all firms, while it increased to a correlation of zero among the top 10%.

Now let us repeat the above process but with six lags to determine long-term persistence.

6-Year Autocorrelation

	Before 1980	After 1980	Difference
Profit Rate	0.011	0.001	0.01 (0.007)
Mark-Up	0.72**	0.82**	-0.10** (0.017)

Table 2.4 - Autocorrelations by Period and Profitability Measure

6-Year Autocorrelation for Top 10%

	Before 1980	After 1980	Difference
Profit Rate	-0.12**	0.01	-0.13** (0.035)
Mark-Up	0.12	0.33**	-0.21** (0.070)

Table 2.4 - Autocorrelations by Period and Profitability Measure

For the top 10% of profit rates, we see long-term autocorrelation yields no significance after 1980. For the top 10% of mark-ups we see an increasing long-term autocorrelation. This is the same relationship we saw with using the top 10%

by revenue. These findings support the hypothesis that top firms tend to lead more through market power after 1980. We also see similar relationships with all firms, which supports the growing importance of mark-up regarding industry dominance.

III. Section Summary

The first finding is that volatility has increased dramatically since 1980. We also see that within industry volatility has become more important relative to between industry volatility after 1980. The autocorrelation results showed that persistence in the short and long run of accounting profit rates was much larger among the top 10% of firms (for the whole time period). One of the most intriguing findings, is that persistence of profit rate and mark-up take different directions after 1980. Long run persistence of profit rate for the top 10% shows no relationship after 1980 (when top 10% is defined by mark-up/profit), and a decrease in persistence (when top 10% is defined by revenue). On the other hand, mark-up persistence has increased whether we define the top 10% in terms of revenue, profit, or mark-up. These dominant firms seem to maintain their top spot through market power (mark-up), rather than profit. It is also important to remember that the one-year lag (short run persistence) shows a similar but slightly different relationship. Therefore, it is important to make a distinction between short run and long run persistence.

Section 3 – Determinants of Profitability

This section seeks to elucidate the determinants of profitability and market power. First, the methodology and utilized proxies will be justified. Secondly, the results from several regression models will be shown and discussed.

Three determinants of profitability will be considered. The first is advertising expenditure over revenue. This variable is a proxy for firm marketing activity and looks to find a relationship between selling efforts and profitability. The second proxy is research & development (r&d) expenditure over revenue. This represents a firm's technological investment. The last proxy is industry variance of accounting profit rate; a fixed number that is assigned to each firm depending on their classified industry. It represents the general level of risk that a

firm is exposed to. Regarding the dependant variable, we will use the same two profitability measures as above, the mark-up and the accounting net profit rate.[IV]

I. Regression Models

The regression equation is:

$$y_{it} = \alpha + \beta x_{it} + \gamma z_{it} + \varepsilon_{it}, \quad (4)$$

The dependant variable, y_{it}, is the outcome (mark-up or profit rate), α is a constant term, and ε_{it} is a mean zero error term; β is the coefficient for x_{it}, which is the vector of proxies, and γ is the coefficient for z_{it}, which is for additional vector controls. Finally, i indexes firms, and t indexes years. All the following regressions are weighted according to revenue.

See appendix C1 for a subperiod focused assessment and see appendix C2 for a similar analysis but at the industry level. In short, proxies vary largely due to the nature of each industry. Therefore, we must acknowledge our limitations of applying the aggregate patterns in this paper to specific industries.

Baseline Regressions

For the baseline analysis, the two independent variables in both regressions are advertising and r&d (both as a ratio of revenue). Note that all the standard errors are clustered. Table 3.1 shows the results using different controls, and Table 3.2 shows the results between the two subperiods (with all controls).

Table 3.1 - Profit Rate Regression.

	No Controls	Time Fixed Effects	Time and Industry Fixed Effects
Advertising	1.57**	1.57**	1.15**
	(0.20)	(0.20)	(0.25)
R&D	0.57	0.50	0.73**
	(0.42)	(0.41)	(0.19)
Observations	48,437	48,432	42,541
R Squared	0.1181	0.1405	0.5513

*Significance markers: + for 10%, * for 5% and ** for 1%. Standard errors are in parentheses.*

[IV] Note that importing these variables means the data must be trimmed again to remove outliers. We use the same method as before, trimming the bottom and top 1% of firms regarding each proxy. Moreover, anomalies with revenue<0, cost of goods<0, and overhead<0 are removed.

When you consider the industry effect in Table 3.1, the r&d relationship increases into significance, thus r&d appears to be more important when the nature of the industry is accounted for. This would back up the intuition that r&d is crucial in certain industries for firms that wish to dominate, while less so in other industries. See appendix C2 for the r&d relationship with profitability in each industry.

On the other hand, advertising seems to be statistically significant for each level of controls. Thus, we are starting to see that advertising has a generally strong relationship with profitably both across and within industries, whereas r&d is more important within industries.

It is important to highlight the magnitude of these coefficients in applicable terms. With no controls, increasing advertising by 1% relative to revenue, corresponds to an increase of profit rate by 1.57%. On the other hand, increasing r&d relative to revenue by 1%, increases the profit margin by 0.57%. When controlling for time and industry effects, a 1% increase in advertising corresponds to a 1.15% increase in profit margin, while a 1% increase in r&d corresponds to a 0.73% increase in profit margin.

Table 3.2 - Profit Rate Regression. Split by period. All controls.

	1955-1980	1981-2019
Advertising	1.90** (0.20)	1.12** (0.26)
R&D	1.27** (0.47)	0.71** (0.20)
Observations	9,345	33,196
R Squared	0.5301	0.5525

In each time period, we see a strong positive relationship between both proxies and profits. We also observe that this relationship appears to decrease after 1980, although remaining significantly positive. Therefore, the rise in profitability after 1980 is not well explained by a similar increase in r&d or advertising.

Table 3.3 – Mark-up Regression.

	No Controls	Time Control	All Controls
Advertising	6.23**	6.32**	4.70**
	(1.11)	(1.10)	(1.25)
R&D	7.62**	7.35**	7.31**
	(1.87)	(1.83)	(1.14)
Observations	48,437	48,432	42,541
R Squared	0.2331	0.2501	0.5263

Using mark-ups as the dependant variable shows some similarities and differences. Advertising is significantly positive using all controls and seems to become less so when we account for industry effects. Thus, again we begin to see the importance of advertising, but not as a differentiating factor within industries.

With r&d we now see a statistically significant relationship with no controls and with the time control, which we did not observe before. This may be attributed to the more stable nature of mark-up in comparison to profit rate. But unlike before, the industry effect is not as prominent.

Again, consider the magnitude of these relationships. With no controls, increasing advertising by 1% relative to revenue, corresponds to an increase of mark-up by 6.23%. On the other hand, increasing r&d relative to revenue by 1%, increases the mark-up by 7.62%. When controlling for time and industry effects, a 1% increase in advertising corresponds to a 4.7% increase in mark-up, while a 1% increase in r&d corresponds to a 7.31% increase in mark-up.

Table 3.4 – Mark-up Regression. Split by period. All controls.

	1955-1980	1981-2019
Advertising	4.66**	4.79**
	(0.52)	(1.28)
R&D	4.47**	7.14**
	(1.10)	(1.14)
Observations	9,345	33,196
R Squared	0.3744	0.5305

Both proxies are statistically significant in both time periods, but now we see their relationship with mark-up has increased after 1980. This is particularly evident with r&d and less so with advertising considering the large increase in the standard error. Since we see the direct opposite when using profit rate, this means

that r&d must be negatively correlated with other significant fixed costs or costs of capital.

Industry Risk Regressions

Lastly, the risk proxy will be added to the baseline regression.

Table 3.5 – Profit Rate Regression.

	1955-1980	1981-2019
Advertising	2.01** (0.20)	1.80** (0.20)
R&D	1.46+ (0.75)	0.91** (0.24)
Industry Risk	2.79* (1.24)	4.17** (1.09)
Observations	9,345	33,196
R Squared	0.3865	0.3407

*Significance markers: + for 10%, * for 5% and ** for 1%. Standard errors are in parentheses.*

Industry risk appears to have an increasing positive relationship with profit rate after 1980, as the coefficient has increased substantially, and the standard error has decreased. Contrasting this with advertising and r&d shows that industry risk may be one of the key drivers explaining the increase in profitability since 1980.

Table 3.6 – Mark-up Regression.

	1955-1980	1981-2019
Advertising	5.01** (0.65)	7.14** (1.12)
R&D	4.89** (1.48)	9.58** (1.69)
Industry Risk	8.38+ (5.09)	10.25* (4.32)
Observations	9,345	33,196
R Squared	0.3153	0.3664

Again, we see the increasing importance of industry risk, but now for explaining mark-up. Thus, industry risk may be one of the key factors in explaining the increasing trend of profit rates and mark-ups.

II. Lagged Regression Model

$$y_{it} = \alpha + \beta x_{it} + \gamma z_{it} + \varepsilon_{it} \quad (4)$$

The delayed effect of some proxies on profitability must be considered. Therefore, we use the same regression model as above but lag values of the vector x_{it}. This delay should have an effect lasting longer than one year, since the measures are annual.

Table 3.7 – Profit Rate Regression. 1 Year Lag.

	1955-1980	1981-2019
Advertising	1.89**	0.69**
	(0.22)	(0.24)
R&D	0.31	0.21
	(0.27)	(0.13)

Table 3.2 shows that not lagging r&d and advertising results in a statistically significant relationship with profit rate before and after 1980. Table 3.7 shows that lagging advertising one year weakens the relationship but, in both periods, it is still statistically significant. On the other hand, lagging r&d weakens the relationship to no statistical significance.

Table 3.8 – Profit Rate Regression. 2 Year Lag.

	1955-1980	1981-2019
Advertising	1.81**	0.48+
	(0.22)	(0.29)
R&D	0.71+	0.17+
	(0.39)	(0.09)

Table 3.9 – Profit Rate Regression. 3 Year Lag.

	1955-1980	1981-2019
Advertising	1.76**	0.19
	(0.22)	(0.21)
R&D	1.20**	0.09
	(0.39)	(0.06)

Table 3.8 and 3.9 show that advertising's relationship decreases with each lag in both time periods. With r&d after 1980, we see the same decrease in relationship. Interestingly, prior to 1980, r&d became more strongly related to profits in the second and third lag.

The same patterns are observed when using mark-up as the dependant variable, even for the r&d lags prior to 1980.

In practical terms, it appears that advertising's relationship grows weaker with each lag. We also see r&d's relationship decreases with each lag, apart from it increasing prior to 1980. This may indicate that an investment in r&d prior to 1980 yielded long term effects on profit rate and mark-up, while after 1980 the results came to fruition within the year and decreased over time. It is also possible that companies immediately decreased their investment in r&d the following year but increased it steadily afterwards.

In summary, it appears that any lag effect seems to be rather limited for our purpose because the strongest relationship between r&d/advertising and profitability is present when no lags are utilized.

III. Section Summary

First, we found that advertising has a stronger relationship with profit rate than r&d. Although when we control for industry effects, r&d becomes stronger and advertising lessens. Thus, advertising appears important in a general sense, while r&d is more important at the industry level. We also saw both advertising and r&d become less correlated with profit after 1980. For mark-ups, we see that r&d is more strongly correlated overall, while slightly less for advertising. There is no aggregate increase in the relationship when accounting for industry effects. After 1980, mark-up becomes more correlated with both advertising and r&d. Then we saw that both profit rate and mark-up have a significantly stronger relationship with the industry risk proxy after 1980. Hence, risk may play a substantial role in the rise of profits and mark-ups since 1980. Finally, we found that using lags for advertising and r&d does not provide a stronger relationship than their non-lagged counterparts.

Section 4 - Theoretical Assessment

This section will briefly explain why each proxy may impact the profit rate and mark-up. See appendix D for a more lengthy and abstract analysis applying the above empirical findings to well established theories in economics.

I. Advertising

The first and most straightforward theoretical effect is that increased advertising expenses increases firm profit and mark-up. This simple cause and effect dynamic is founded in the intuition that spending more on advertising, increases firm revenue at a rate that more than offsets the initial advertising cost. Note that the advertising expenses must be less than the revenue it raises. Therefore, if advertising is not efficient, it will decrease profitability.

The second effect, which is far easier to neglect, is the reverse causation dynamic. Instead of advertising leading to higher profits, profits may indicate that a firm has more cash on hand and thus spends more on advertising. In a regression we would see the same strong relationship between advertising and profitability, as if advertising was causing increased profits. Lags can better establish causal effects, but we have a couple problems in this situation. First, the effects of advertising may be large, but last shorter than a year. Therefore, using a lag of a year or more would not display this effect. Secondly, omitted variables can play an important role. For example, if we do find a strong relationship with lagged advertising, it may be the lagged profitability, revenue, or some other factor unrelated to advertising that is driving future profit.

II. Research and Development

The direct effect of increased r&d may lead to increased profitability. For example, investing in technology may improve business operations or generate better products. This investment must offset its costs to show up in profitability, thus we see that efficiency matters once again.

The second possible effect is reverse causation. High profitability may indicate that the firm has more resources to invest in r&d. We can be more certain that this effect is limited since the profitability relationship is rather strong two years after r&d is lagged. Thus, it appears that r&d expenses today do have a stronger positive impact on profitably in a few years, indicating a causal relationship.

The last effect worth noting is the systematic macroeconomic effect of technology. The well-established effects of technology and growth, or Solow's residual, may have an important interplay with r&d. It is possible that a firm's r&d expense does not have a direct relationship with profitability, and instead the

relationship is with the firm's ability to adopt technology from other firms, institutions, and academia. Thus, the source of technology is coming from outside the firm. For example, a firm in its own isolated world may invest heavily in r&d and find some positive effects on profitability, while another firm in a connected world which feeds off the technology of other institutions and invests less on r&d may have a stronger increase in profits. Akin to the free rider problem.

III. Industry Risk

At the core of finance, higher risk is compensated with higher reward. In an efficient market this would be expected. Using industry risk as a proxy, the idea is that industries with more uncertainty of revenue and profits, require a premium in return. This premium would then manifest itself in the terms increased profitably in the long run.

The reverse causality of higher profitability leading to higher risk taking is possible, but in my opinion is less founded. Mainly since it would have to apply to whole industries. This would seem to tap into psychology more than economics. For example, the pressure to improve each year among top companies might lead executives to take more risks or their compensation encourages them to take more risk.

Conclusion

This paper supports the trend of increased mark-ups and profits for dominant firms since 1980. The new and key finding of this paper is that large firms tend to dominate through sustained mark-up and not necessarily sustained profit following 1980. Thus, market power plays a crucial role for the leaders of each industry today. In an era of high volatility, industry leaders may see more volatile profits, but sustaining their market power is key to remaining at the top. Three prime examples are Amazon, Apple, and Facebook. Their annual profits can be unstable in comparison to their sustained market power. Anti-trust actions may hamper this dynamic in the future. The rise of large corporations with little to no annual profits may also be a manifestation of this dynamic. Firms such as Tesla, Uber, and Airbnb currently struggle to earn an annual profit, but they are leaders in their respective industry. They have dominated through market power, not profit. In summary, the dichotomy of profit and mark-up is evident and appears to be playing an essential role in today's world.

The factors that lead a firm to high profits and mark-ups are less clear. In my opinion, this paper shows that risk best explains the increase since 1980, while advertising and r&d are important to profit and mark-ups but are not the drivers of this change. I would still anticipate that technology has played an important part in this change, but that r&d cannot fully capture this concept. Other factors that I believe have impacted the rise of profitability are decreased taxation, increased executive compensation, and decreased business regulation. This would be a great area for further research.

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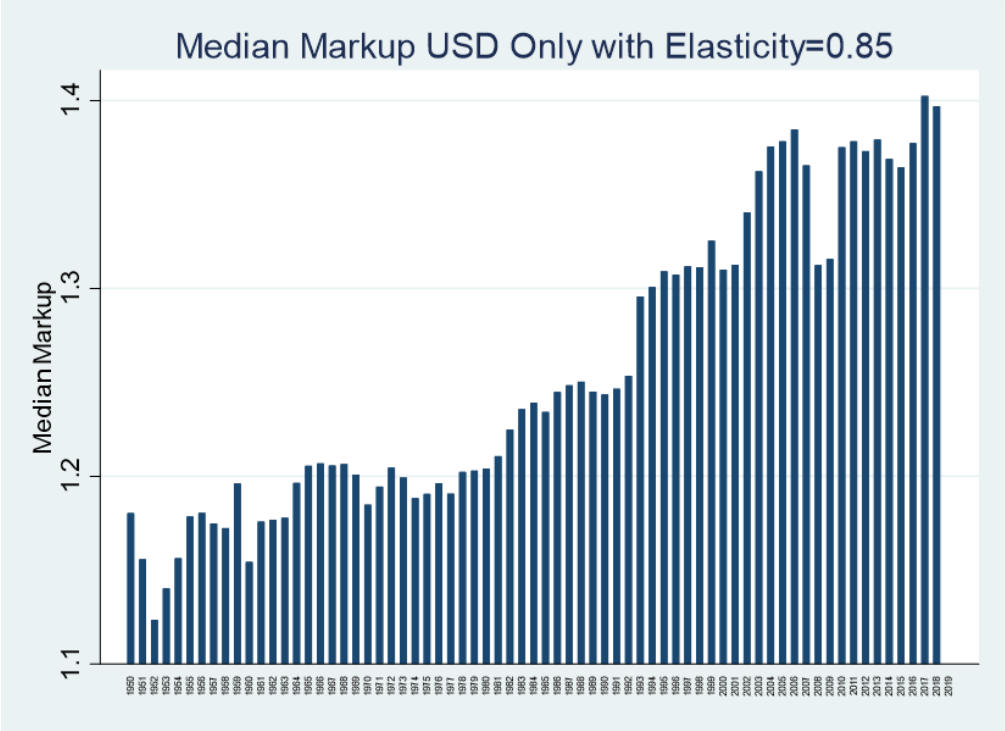
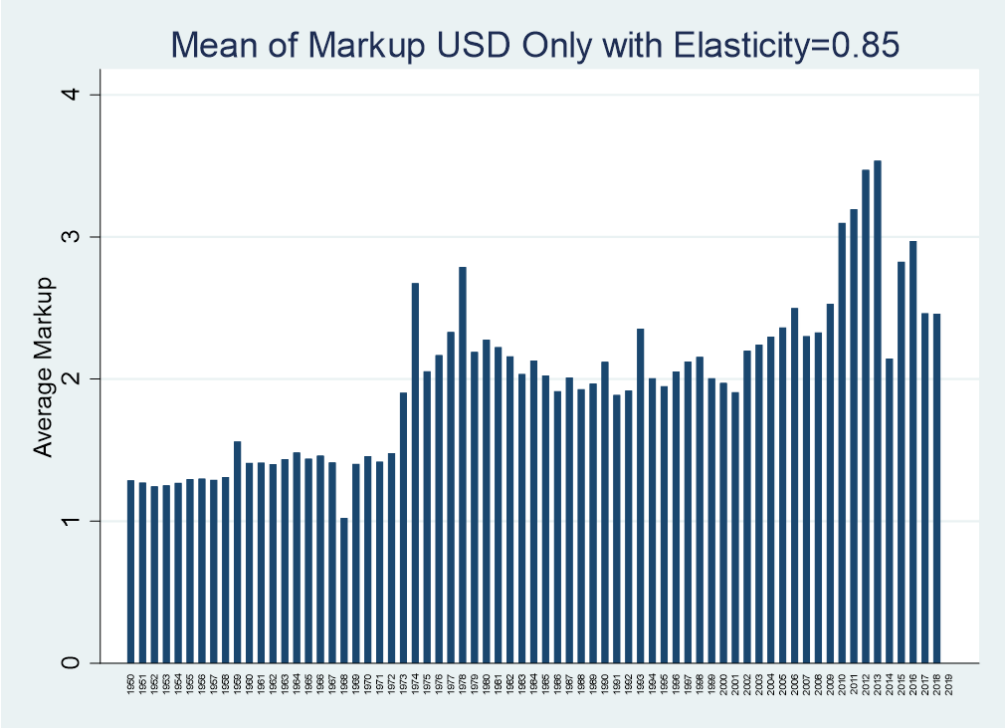
Appendix

Appendix A

A1

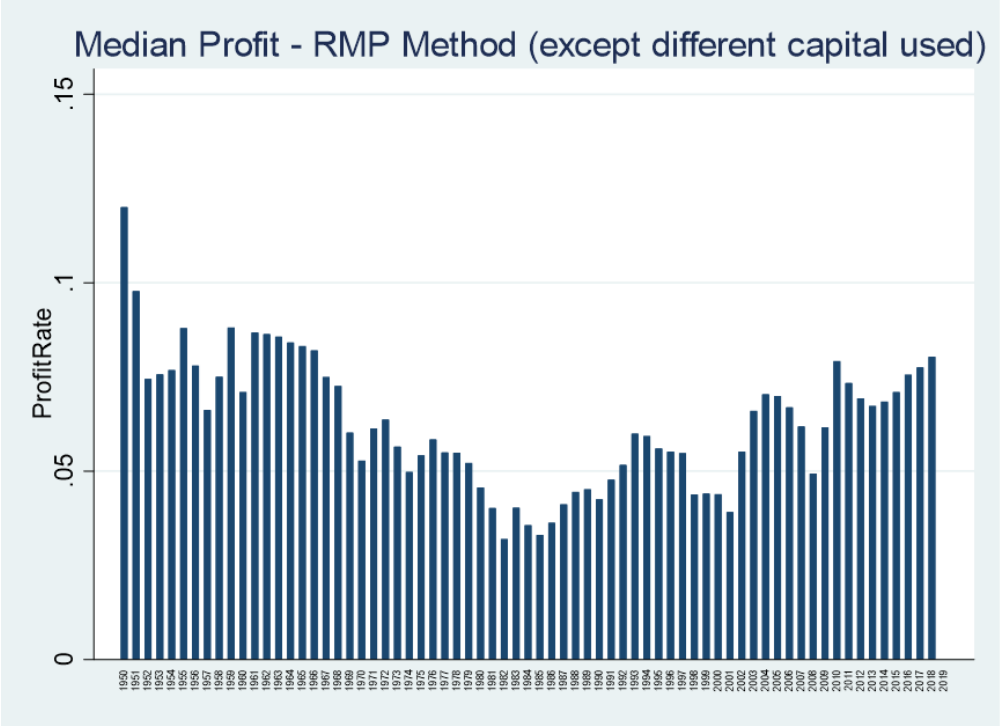


Median mark-up.



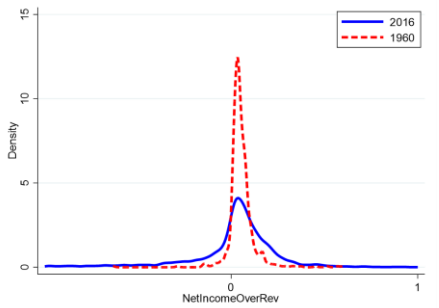
Unweighted mean mark-up.

A2

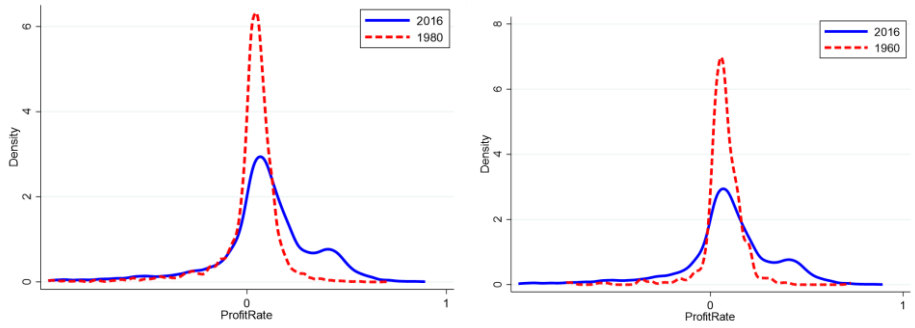


Unweighted median profit rate with outliers.

A3



Accounting Net Profit Rate distribution.



RMP Net Profit Rate distribution 1980&1960.

A4

This section highlights the differentiating trends among industries, and the dynamics that may be shaping them, despite the general increase since 1980 in the aggregate economy.

The Classification Systems

The main difficulty in the industry analysis is determining what industry classification to utilize. RMP used the North American Industry Classification System (NAICS), which categorizes firms into 22 different sectors. These sectors can be further divided, but for our purpose, 22 industries is sufficient. I will use NAICS and repeat the process with another classification system, the S&P Economic Sector Code. This system divides firms into 11 sectors, with the possibility of dividing further, but in our case is it unnecessary. Before summarizing the results, I will briefly explain my selection for each classification system, since in essence, the results are only as good as the classification system utilized.

NAICS was developed by governmental agencies of Canada, the United States, and Mexico (*2017 NAICS Manual*, 2017). It is a comprehensive system, with core industries being assigned a two-digit code (which this paper will use). These two-digit codes can be extended to six-digits, yielding over 1,000 subindustries.

The system splits firms into industries according to their production process and production technologies. This is opposite of a market-based approach, which makes groupings based off the end products/service delivered by the firm. Therefore, we must keep in mind that a firm's final product/service may differ remarkably when using NAICS. For easy recall, remember NAICS as the official governmental production focused classification system.

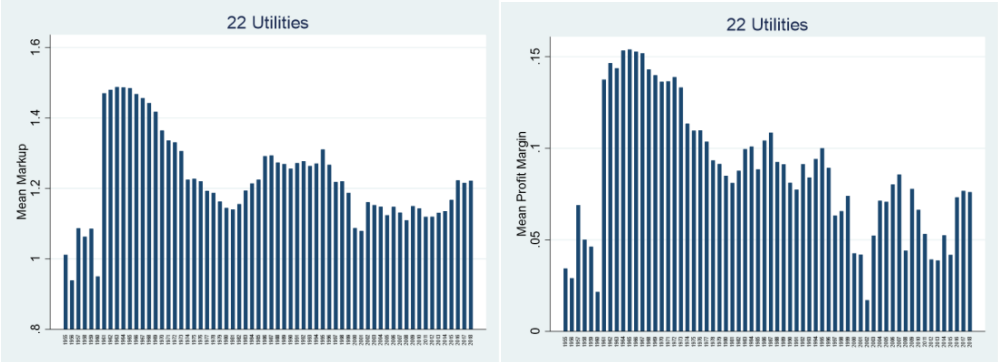
The S&P Economic Sector Code, also known as the Global Industry Classification Standard (GICS), is like NAICS in its hierarchy structure. Although it starts off with less core industries (11) and extends to only 158 subindustries (MSCI, 2020). Thus, it is a broader classification system, extending beyond the three countries in North America. This broader application is reflected in its somewhat opaque methodology. They use a more holistic approach, focusing on the product/service side of classifying industries.

This system is a collaborative project of two large private corporations, MSCI and S&P Dow Jones Indices. The classification system is largely a manifestation of the financial world in developed countries. The eleven core industries informally have become the maxims in business language for industry types of the twenty first century. Therefore, this classification system has not been chosen necessarily for its superior methodology, but for its prevalence and dominance throughout the business world.

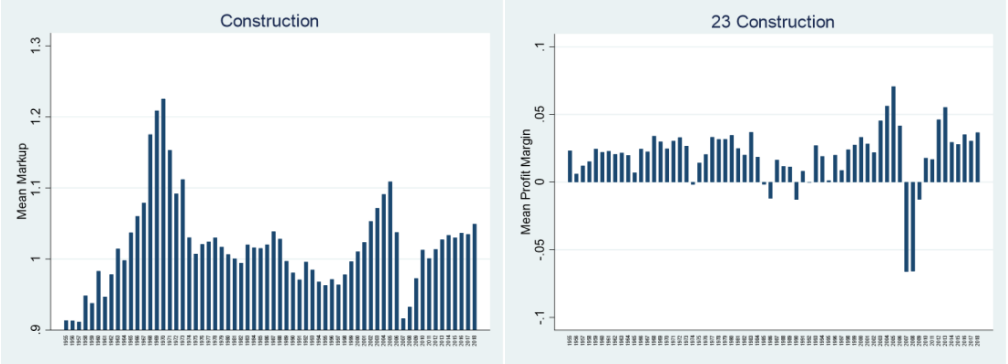
NAICS

Now that the methodology is covered, we will graph profitability measures for each industry. Specifically, for mark-ups on the left graph and accounting net profit rates on the right graph.

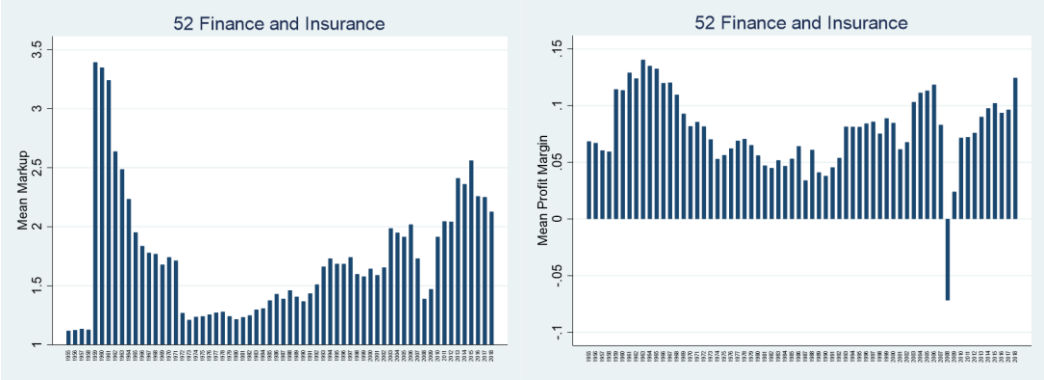
Remember that there are 22 industries, thus I will only highlight some of the major ones below.



Above we can see the trend for the utilities industry, from 1955-2018. The left shows the mark-up, while the right, shows the accounting net profit rate. One key takeaway is that both graphs seem very similar. The main difference being the more exaggerated drops and climbs of the right graph, which reflects the natural volatility of the accounting profit rate relative to the mark-up measure. Also note the general trend since the 60's has been downward, despite the aggregate economy showing the opposite trend.



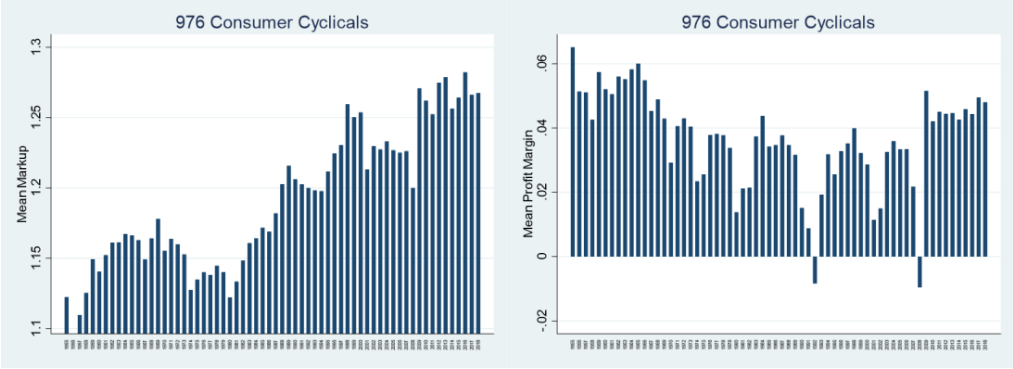
Looking at the construction industry, we see a different dynamic. The two graphs above show much greater volatility than the utility sector. This is likely due to the highly cyclical nature of construction and its cost structure. We also do not see much of a growth trend. This may be due to several reasons, such as a lack of market power in the top firms, or a lack of technological progress in the industry.

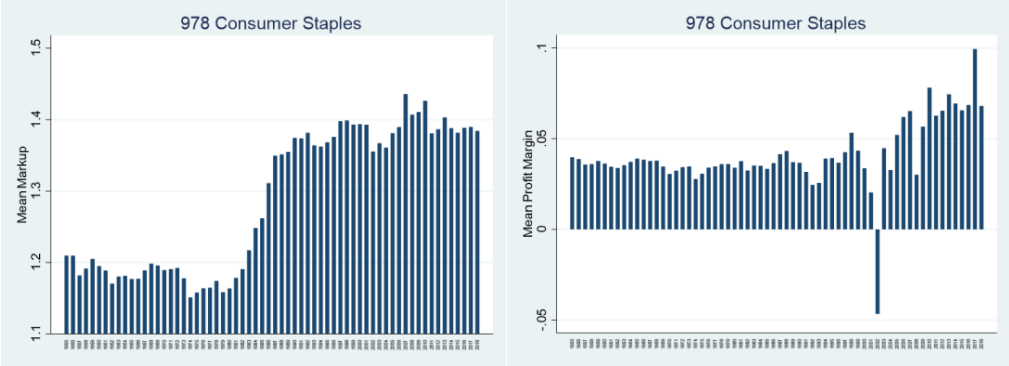


Lastly, above we see the profitability measures for the financial industry. Other than the massive profitability in the 60's, this industry is very reflective of the trend we see across all industries. Since the 80's we have seen the steady rise of profitability measures, with some hiccups along the way, but eventually returning to its steady growth rate. I'm not declaring this industry as the microcosm of the aggregate, but as special importance to understanding the aggregate trend due to its large share of the economy. This is inspected further in the regression section of this paper.

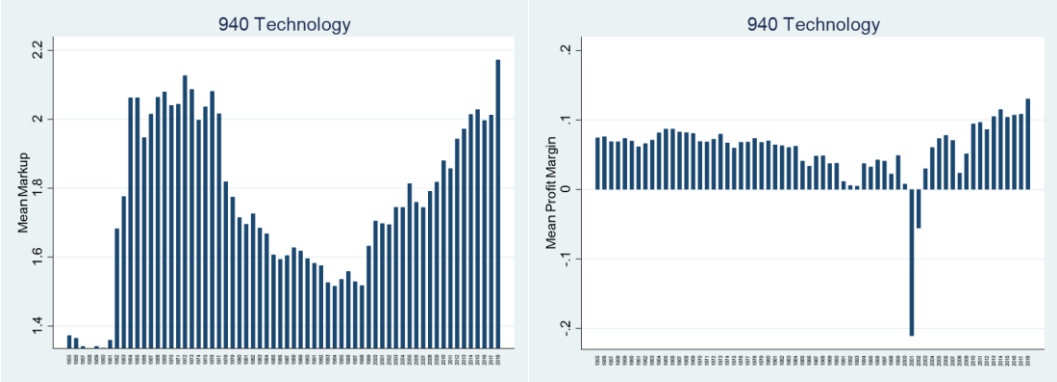
GICS

Now let's look at some prominent GICS industries.



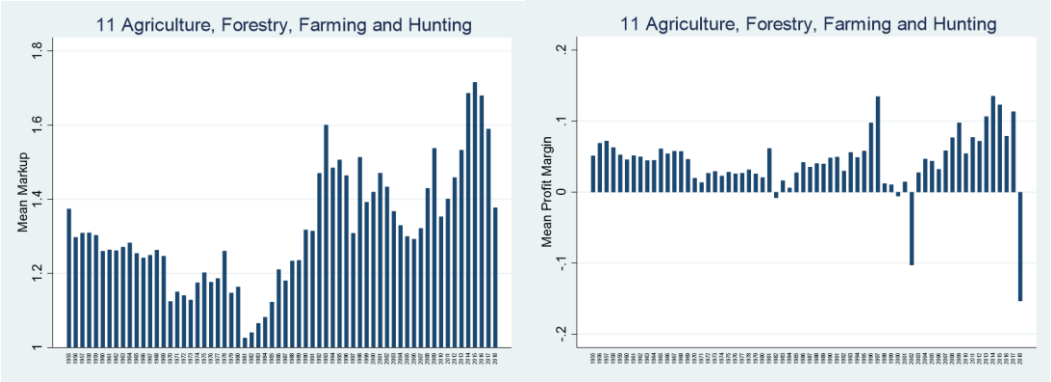


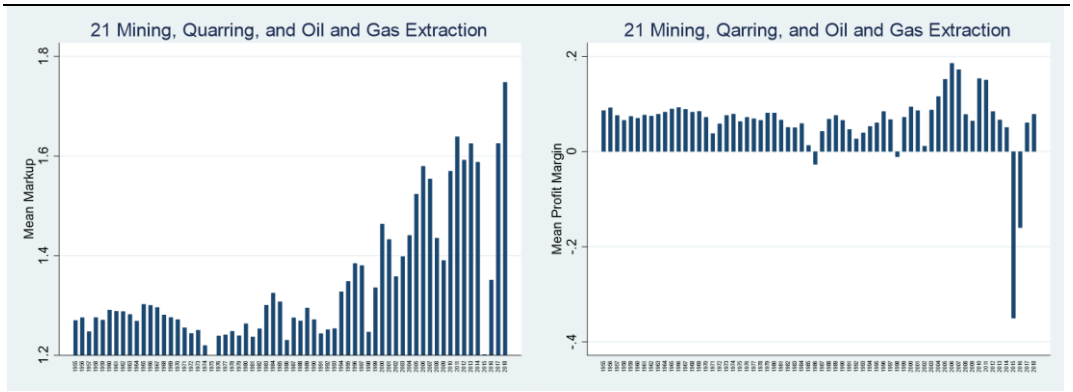
Notice the choppiness of profitability for consumer cyclicals compared to consumer staples. Yet in all four graphs we tend to see an increase in profitably since the 80's, at different rates but nonetheless evident.



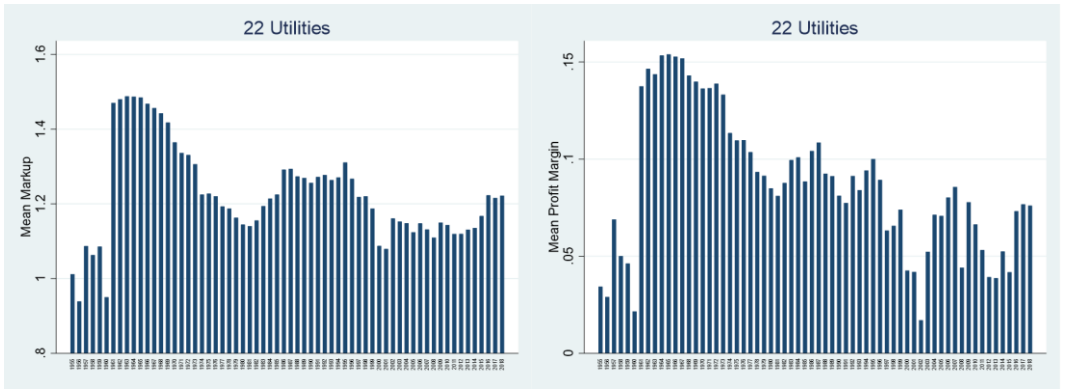
Above we see the technology industry hovering between a 7.5% and 10% profit margin. Now compare this to the consumer staples industry, which hovers around 5% for the last 60 years. This is a significant difference. We see a similar trend over time, but far greater differences in scale.

Below I have included the graph for every industry. The left graphs show the mean mark-up for 1955-2018, and the right graphs show the corresponding accounting net profit rate, using NAICS.

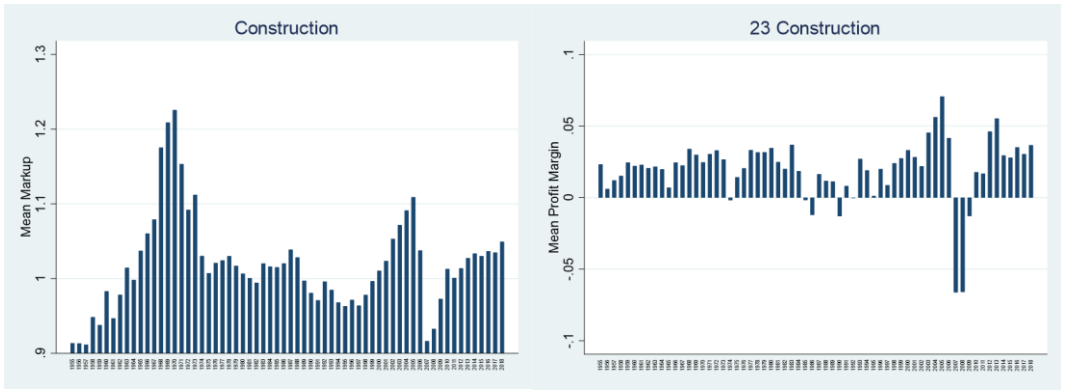



21 Mining, Quarring, and Oil and Gas Extraction
Mean Markup
1.2
1.4
1.6
1.8

21 Mining, Qarring, and Oil and Gas Extraction
Mean Profit Margin
-.4
-.2
0
.2


22 Utilities
Mean Markup
.8
1
1.2
1.4
1.6

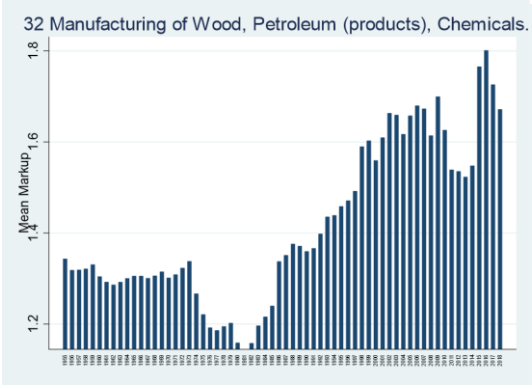
22 Utilities
Mean Profit Margin
0
.05
.1
.15

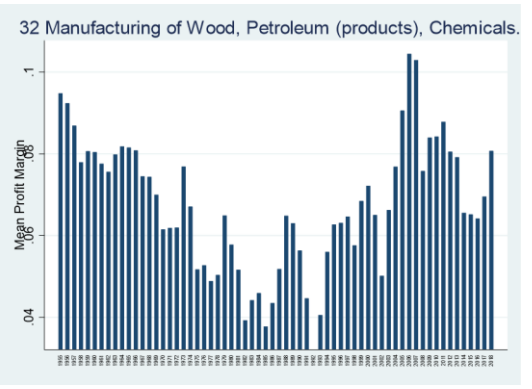

Construction
Mean Markup
.9
1
1.1
1.2
1.3

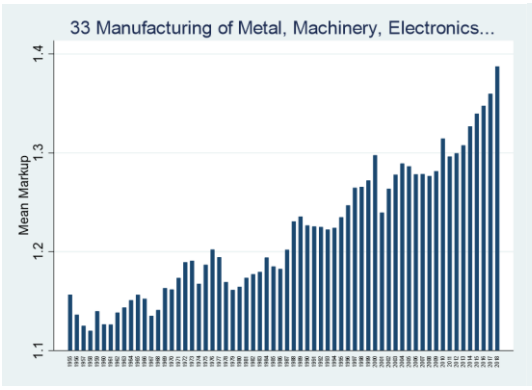
23 Construction
Mean Profit Margin
-.1
-.05
0
.05
.1

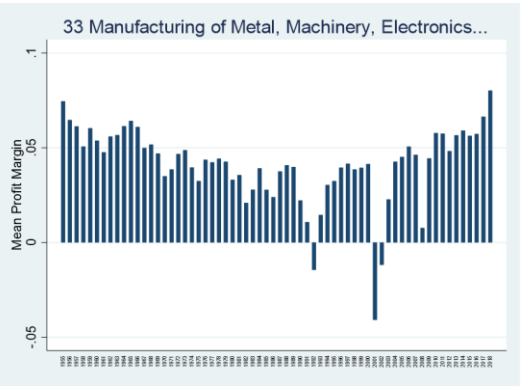

31 Manufacturing of Food and Textiles
Mean Markup
1.2
1.4
1.6
1.8

31 Manufacturing of Food and Textiles
Mean Profit Margin
.04
.06
.08
.1
.12
.14

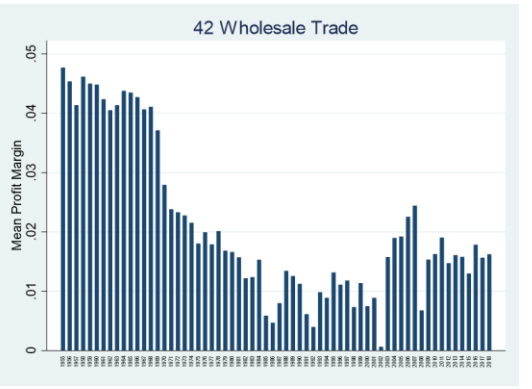

32 Manufacturing of Wood, Petroleum (products), Chemicals.
Mean Markup
1.2
1.4
1.6
1.8

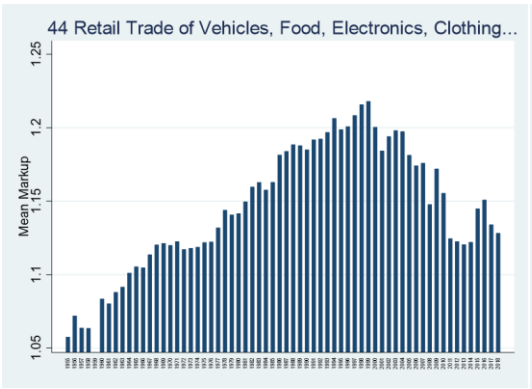

32 Manufacturing of Wood, Petroleum (products), Chemicals.
Mean Profit Margin
.04
.06
.08
.1

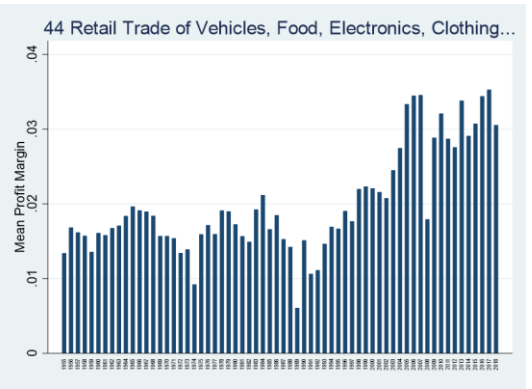

33 Manufacturing of Metal, Machinery, Electronics...
Mean Markup
1.1
1.2
1.3
1.4


33 Manufacturing of Metal, Machinery, Electronics...
Mean Profit Margin
-.05
0
.05
.1


42 Wholesale Trade
Mean Markup
.95
1
1.05
1.1
1.15
1.2

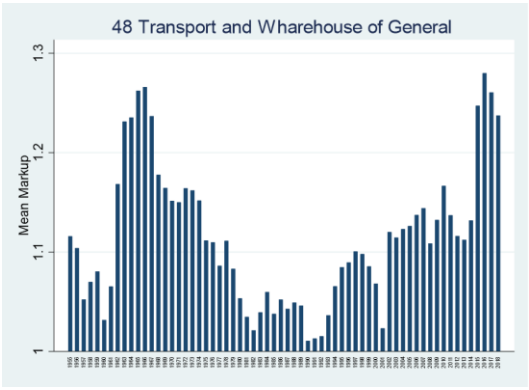

42 Wholesale Trade
Mean Profit Margin
0
.01
.02
.03
.04
.05

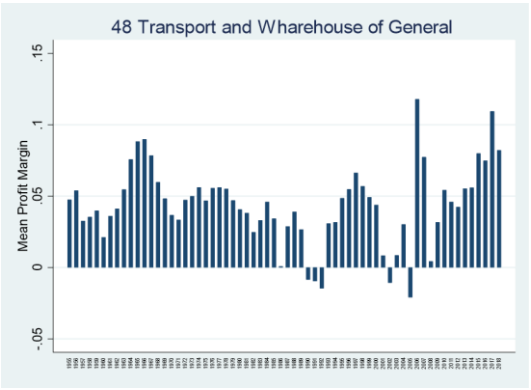

44 Retail Trade of Vehicles, Food, Electronics, Clothing...
Mean Markup
1.05
1.1
1.15
1.2
1.25

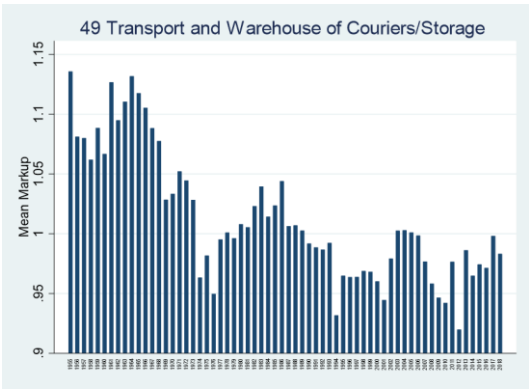

44 Retail Trade of Vehicles, Food, Electronics, Clothing...
Mean Profit Margin
0
.01
.02
.03
.04

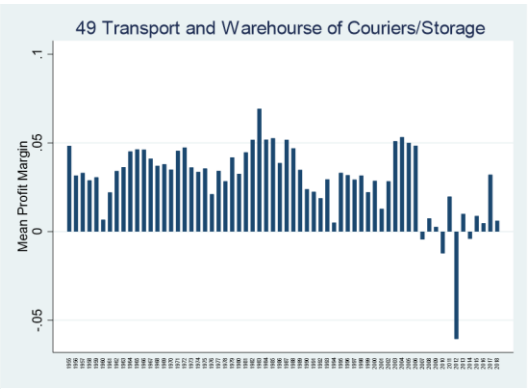

Retail Trade of General Merch, Nonstore Retailers...
Mean Markup
1.1
1.15
1.2
1.25
1.3

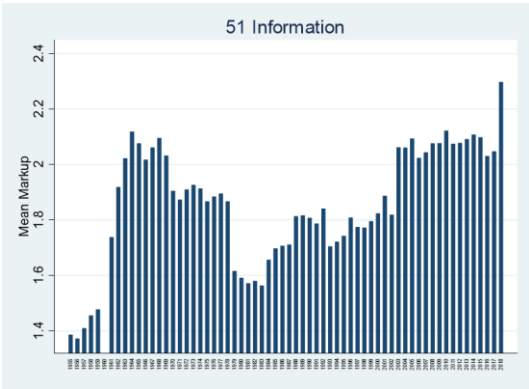
Retail Trade of General Merch, Nonstore Retailers...
Mean Profit Margin
.01
.02
.03
.04

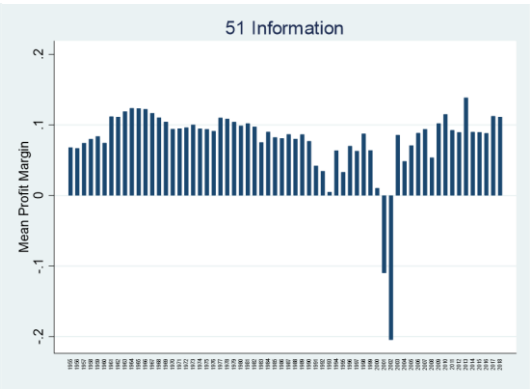

48 Transport and Wharehouse of General
Mean Markup
1
1.1
1.2
1.3

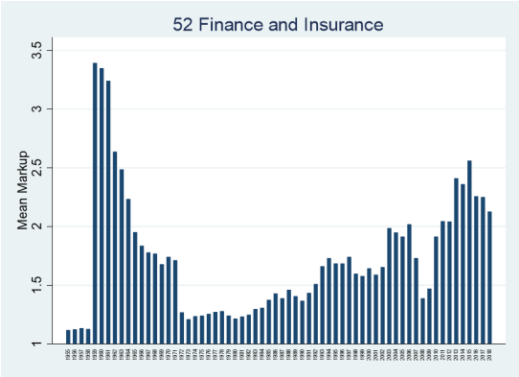

48 Transport and Wharehouse of General
Mean Profit Margin
-.05
0
.05
.1
.15

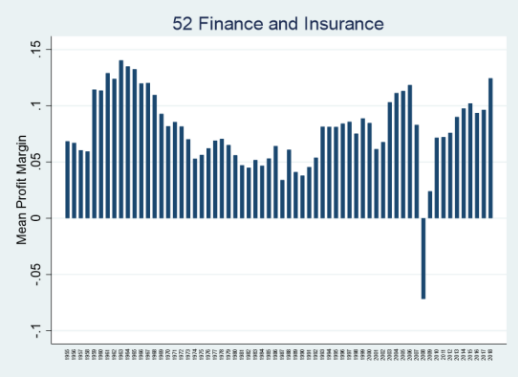

49 Transport and Warehouse of Couriers/Storage
Mean Markup
.9
.95
1
1.05
1.1
1.15


49 Transport and Warehourse of Couriers/Storage
Mean Profit Margin
-.05
0
.05
.1

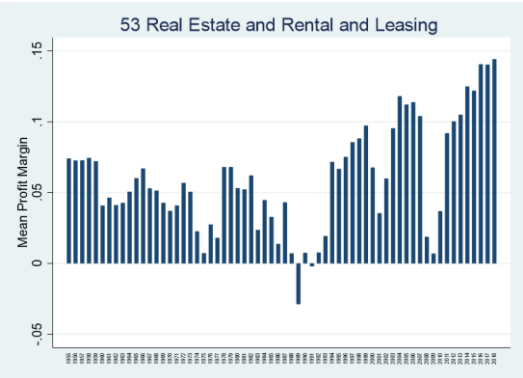

51 Information
Mean Markup
1.4
1.6
1.8
2
2.2
2.4

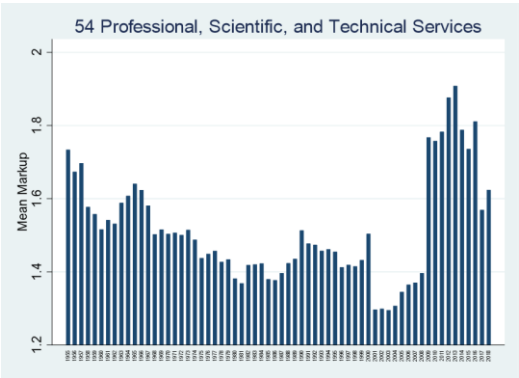

51 Information
Mean Profit Margin
-.2
-.1
0
.1
.2

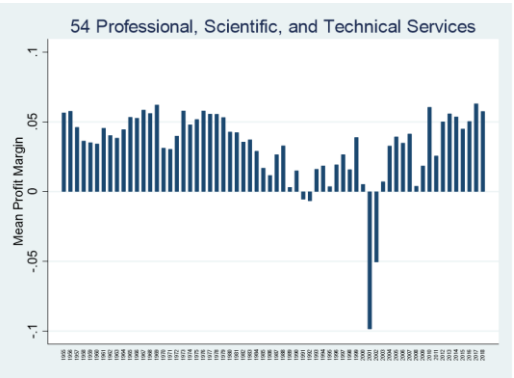

52 Finance and Insurance
Mean Markup
1
1.5
2
2.5
3
3.5

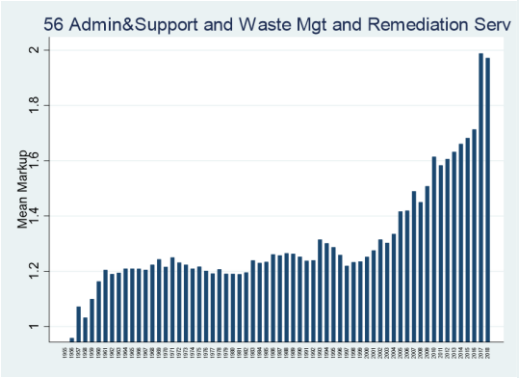

52 Finance and Insurance
Mean Profit Margin
-.1
-.05
0
.05
.1
.15

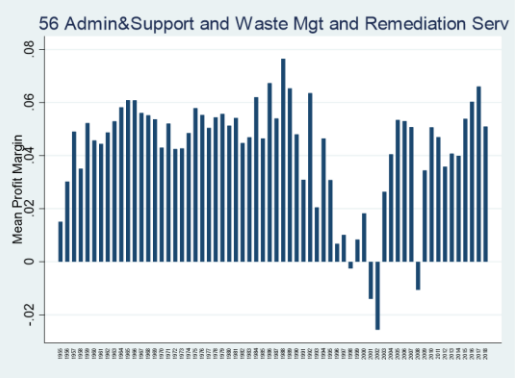

53 Real Estate and Rental and Leasing
Mean Markup
1
1.5
2
2.5

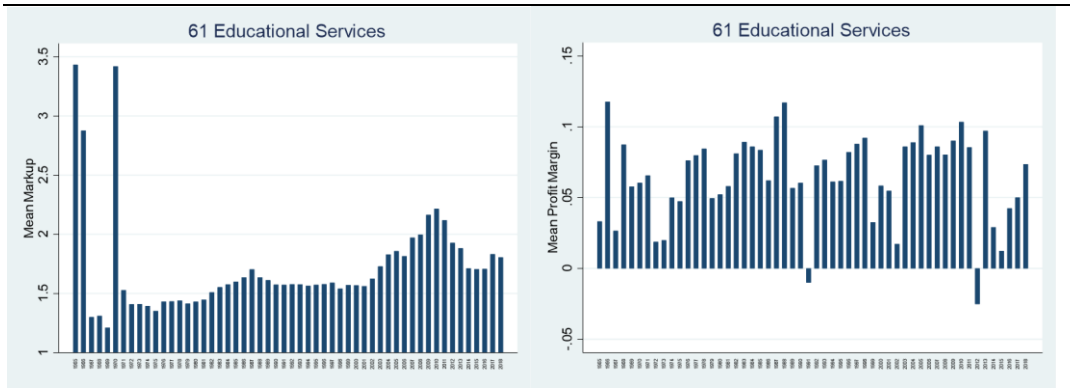

53 Real Estate and Rental and Leasing
Mean Profit Margin
-.05
0
.05
.1
.15


54 Professional, Scientific, and Technical Services
Mean Markup
1.2
1.4
1.6
1.8
2

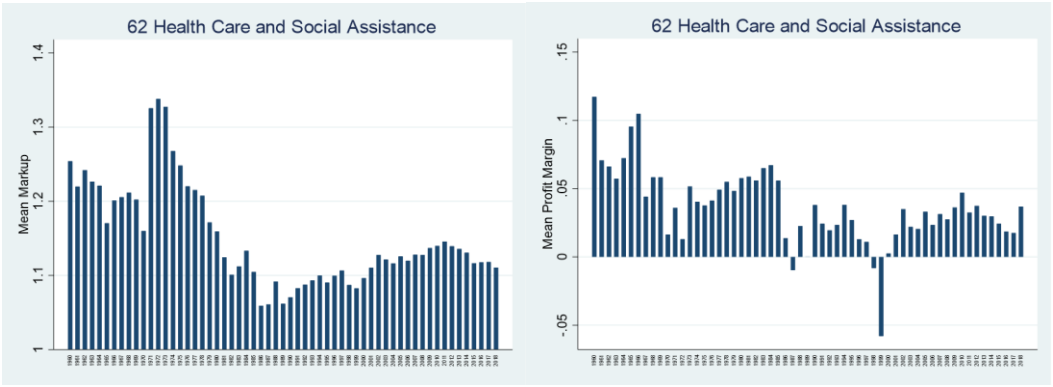

54 Professional, Scientific, and Technical Services
Mean Profit Margin
-.1
-.05
0
.05
.1


56 Admin&Support and Waste Mgt and Remediation Serv
Mean Markup
1
1.2
1.4
1.6
1.8
2

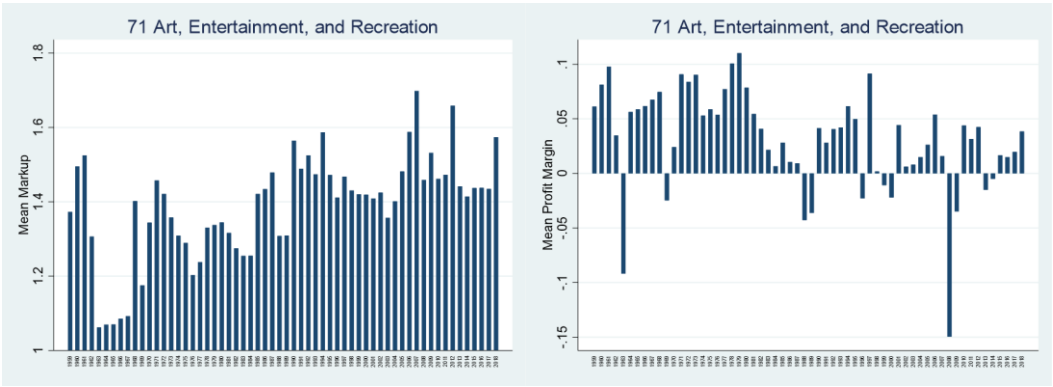

56 Admin&Support and Waste Mgt and Remediation Serv
Mean Profit Margin
-.02
0
.02
.04
.06
.08


61 Educational Services
Mean Markup
1
1.5
2
2.5
3
3.5

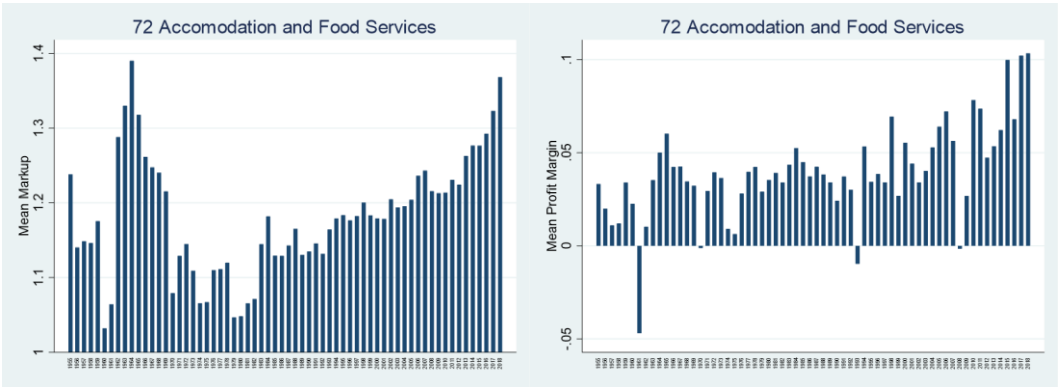
61 Educational Services
Mean Profit Margin
-.05
0
.05
.1
.15


62 Health Care and Social Assistance
Mean Markup
1
1.1
1.2
1.3
1.4

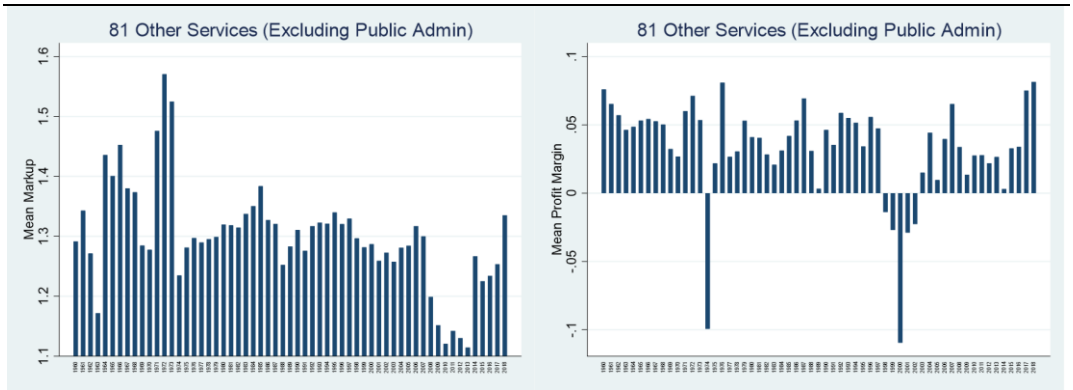
62 Health Care and Social Assistance
Mean Profit Margin
-.05
0
.05
.1
.15


71 Art, Entertainment, and Recreation
Mean Markup
1
1.2
1.4
1.6
1.8

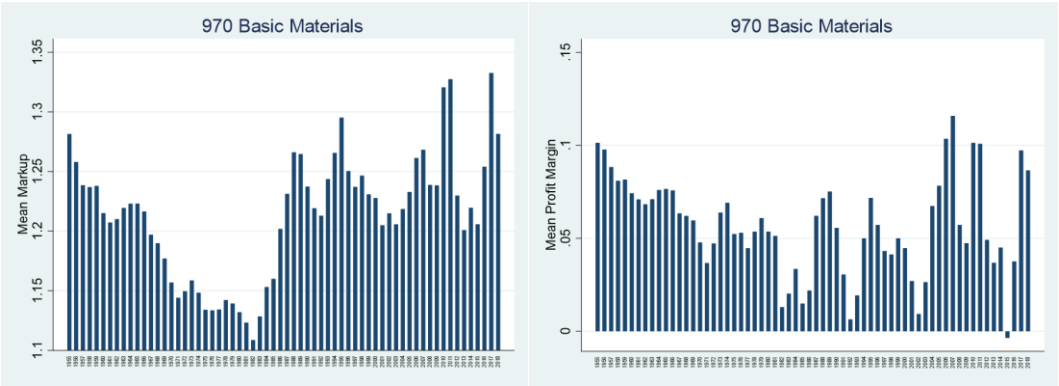
71 Art, Entertainment, and Recreation
Mean Profit Margin
-.15
-.1
-.05
0
.05
.1

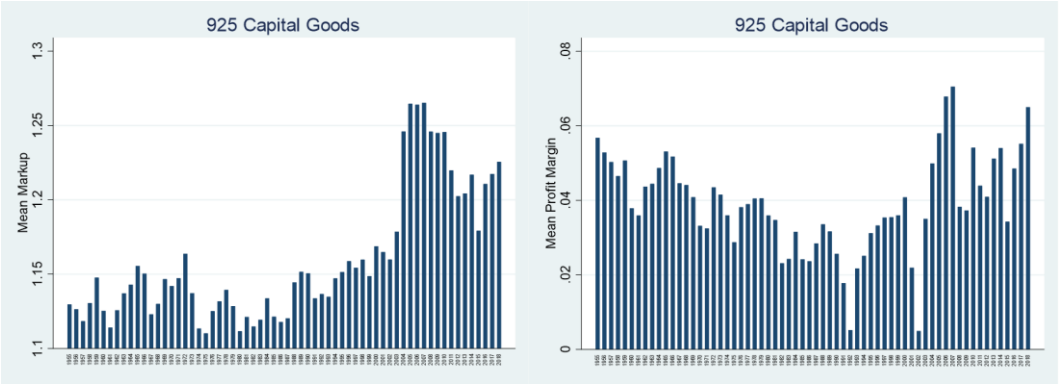

72 Accomodation and Food Services
Mean Markup
1
1.1
1.2
1.3
1.4

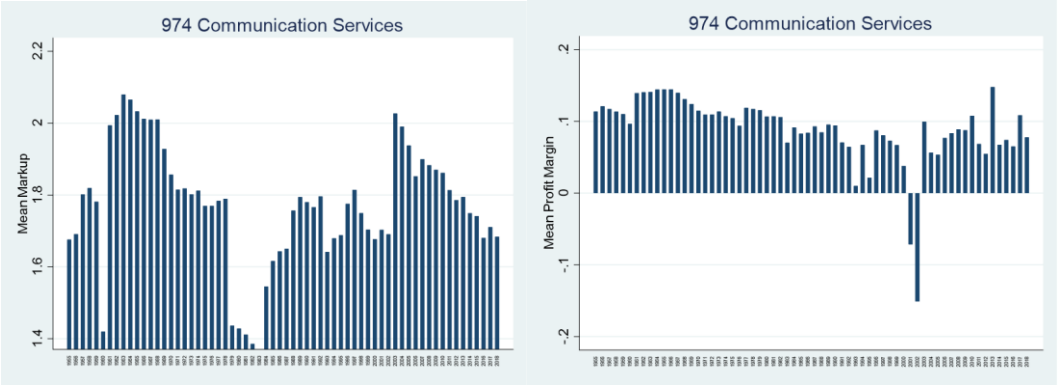
72 Accomodation and Food Services
Mean Profit Margin
-.05
0
.05
.1

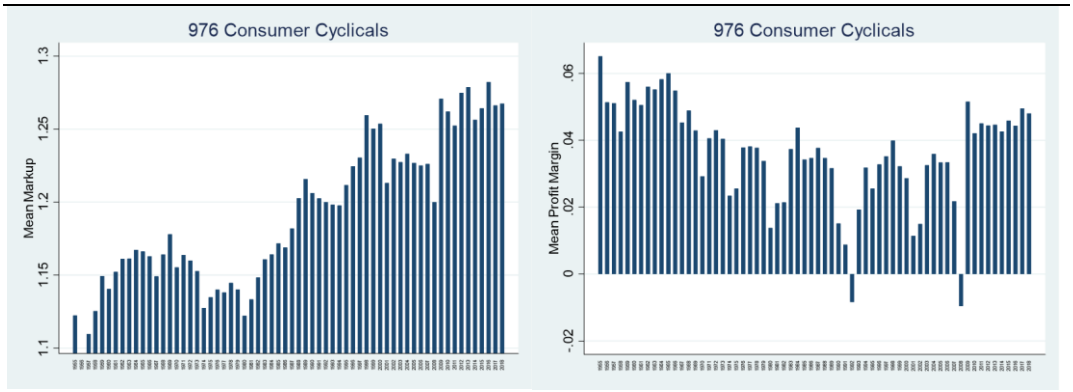


Below is a repetition of the above but using GICS industries.

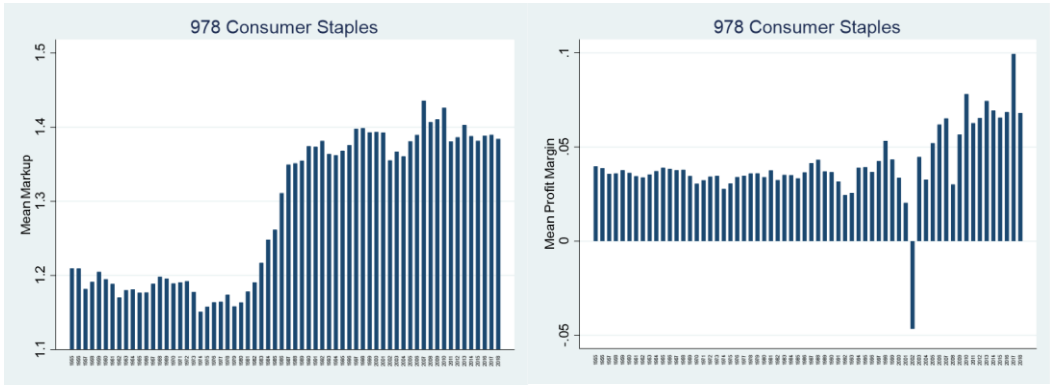




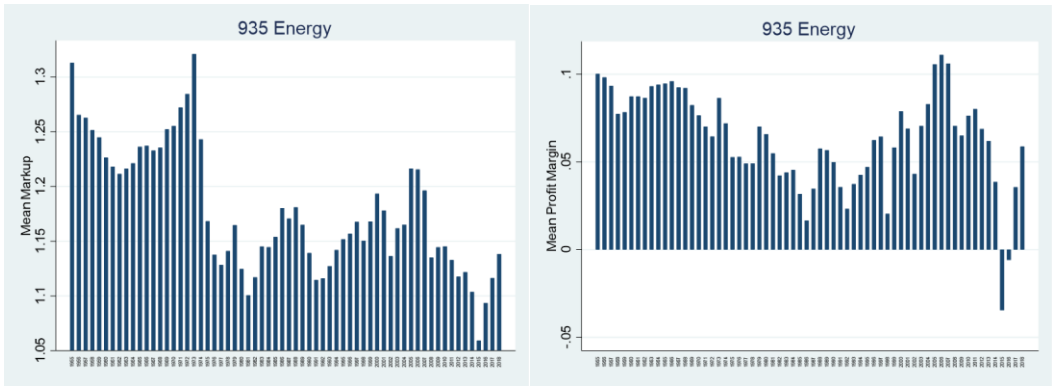



976 Consumer Cyclicals
Mean Markup
1.1
1.15
1.2
1.25
1.3

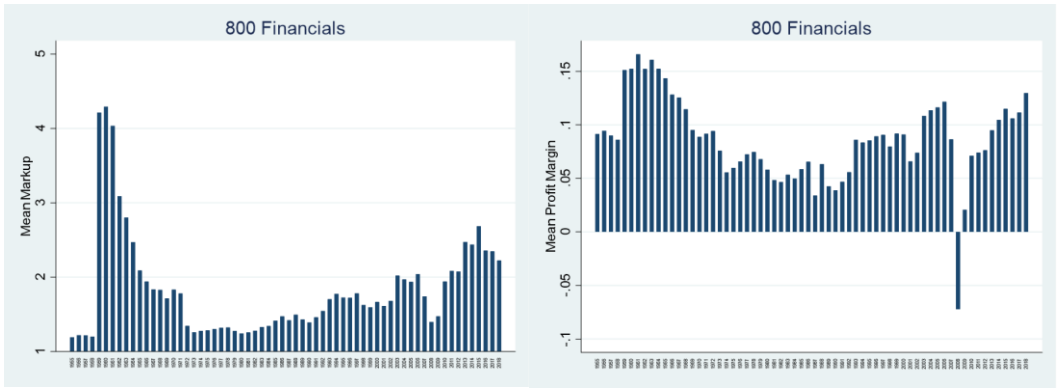
976 Consumer Cyclicals
Mean Profit Margin
-.02
0
.02
.04
.06


978 Consumer Staples
Mean Markup
1.1
1.2
1.3
1.4
1.5

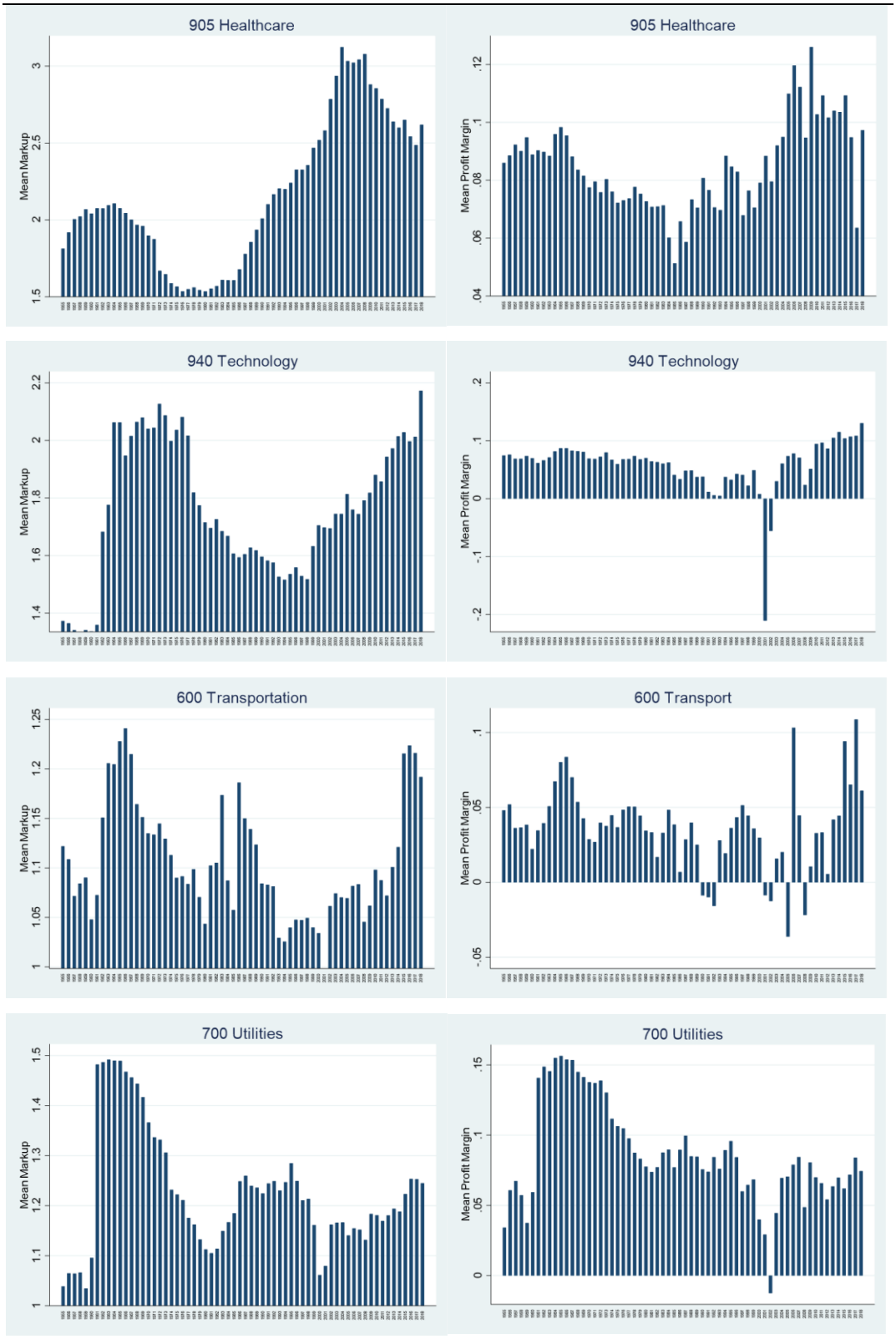
978 Consumer Staples
Mean Profit Margin
-.05
0
.05
.1


935 Energy
Mean Markup
1.05
1.1
1.15
1.2
1.25
1.3

935 Energy
Mean Profit Margin
-.05
0
.05
.1

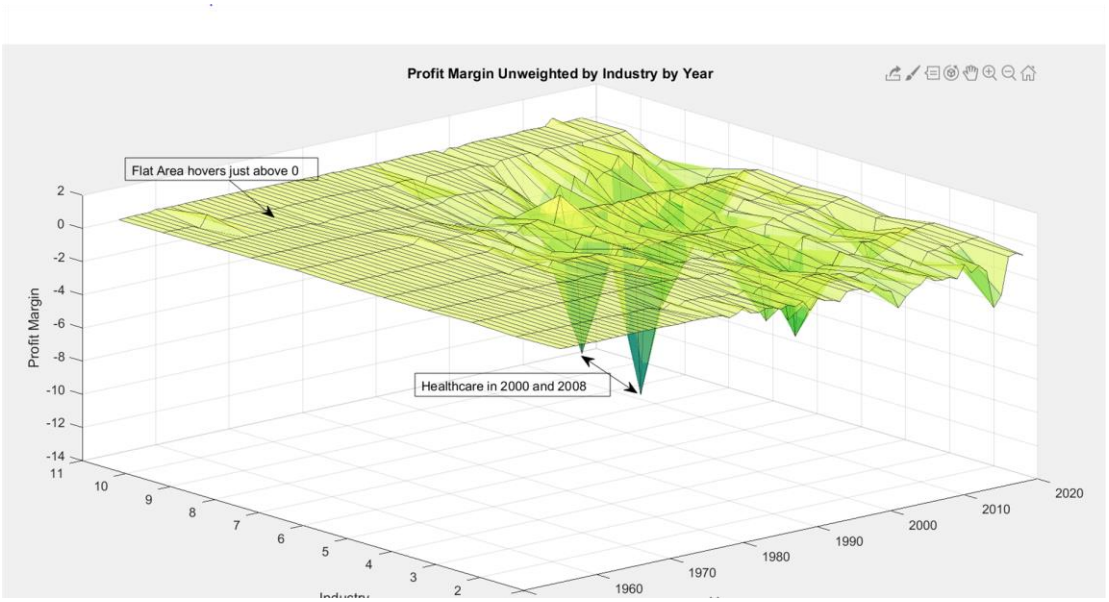

800 Financials
Mean Markup
1
2
3
4
5

800 Financials
Mean Profit Margin
-.1
-.05
0
.05
.1
.15

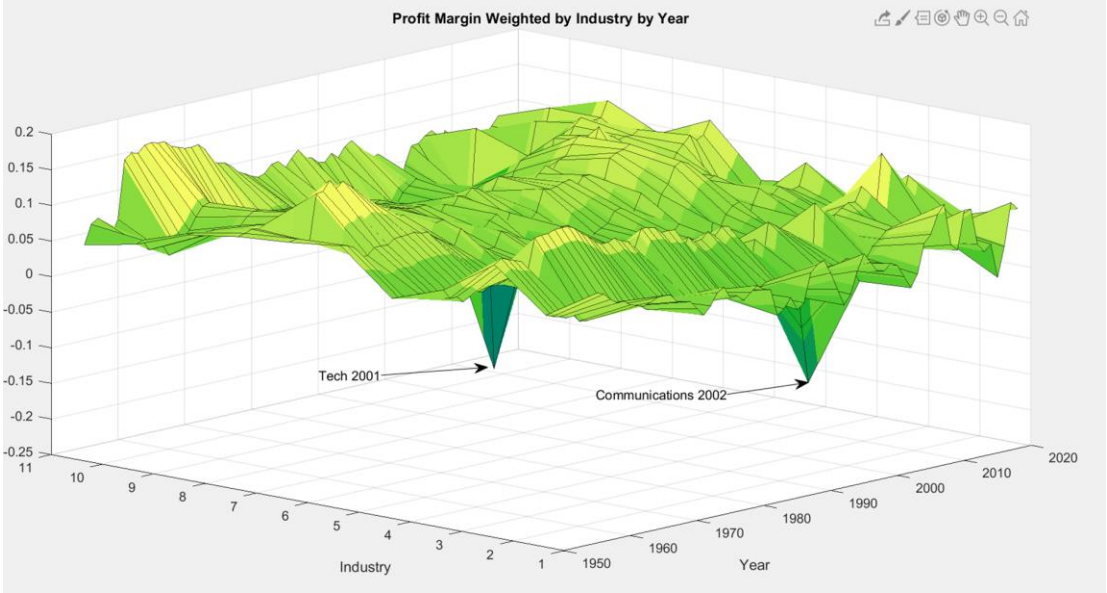


Lastly, the following graphs will help give a big picture of the trend since 1955. The y axis labels the profit margin, the z axis labels the year, and the x axis labels the industry (1-11). The corresponding industry number is shown below.

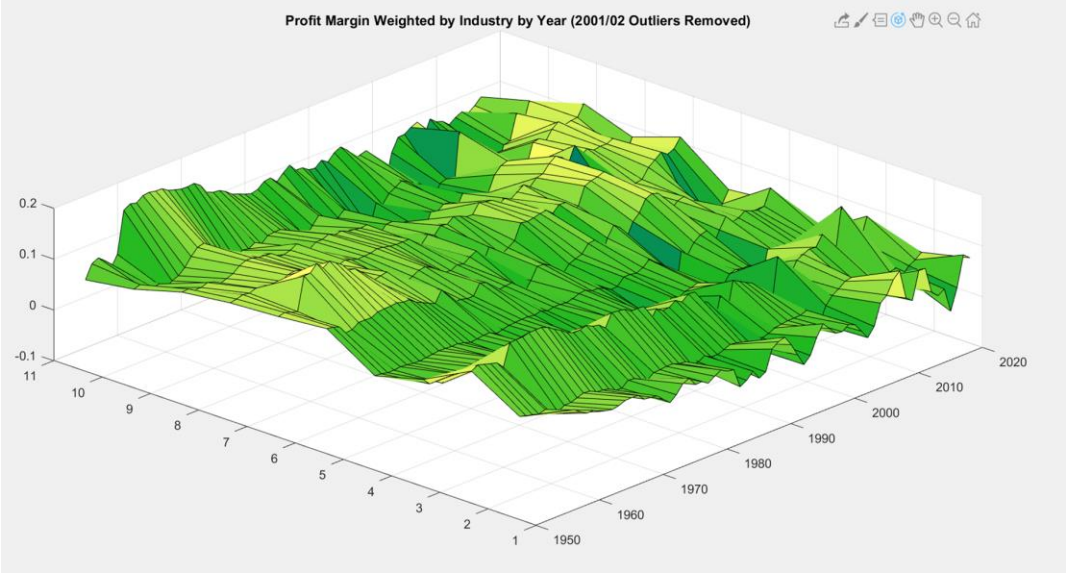
Graph Number	Economic Sector
1	Basic Materials
2	Capital Goods
3	Communication Services
4	Consumer Cyclicals
5	Consumer Staples
6	Energy
7	Financials
8	Health Care
9	Technology
10	Transportation
11	Utilities



The graph above shows one very interesting point. As time elapses it appears that more industries become more volatile, and this effect seems to begin around the 80's.



This graph is the same as the previous but with a revenue weighted profit margin. Now the increasing volatility in later periods is not as prominent. We also see that weighting revenue seems to take care of many outlying drops, although the dot-com crisis is still visible.

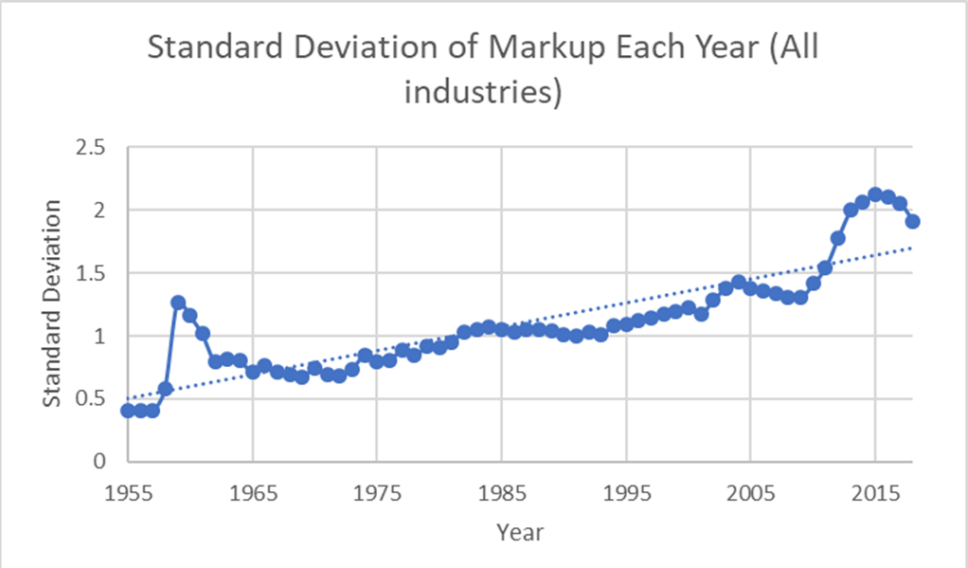


The last graph is identical to the one above but with the outliers of the dot-com crisis removed. The dominance of large firms is seen here, as smaller firms would frequently draw this graph into a negative territory (as seen in the first graph).

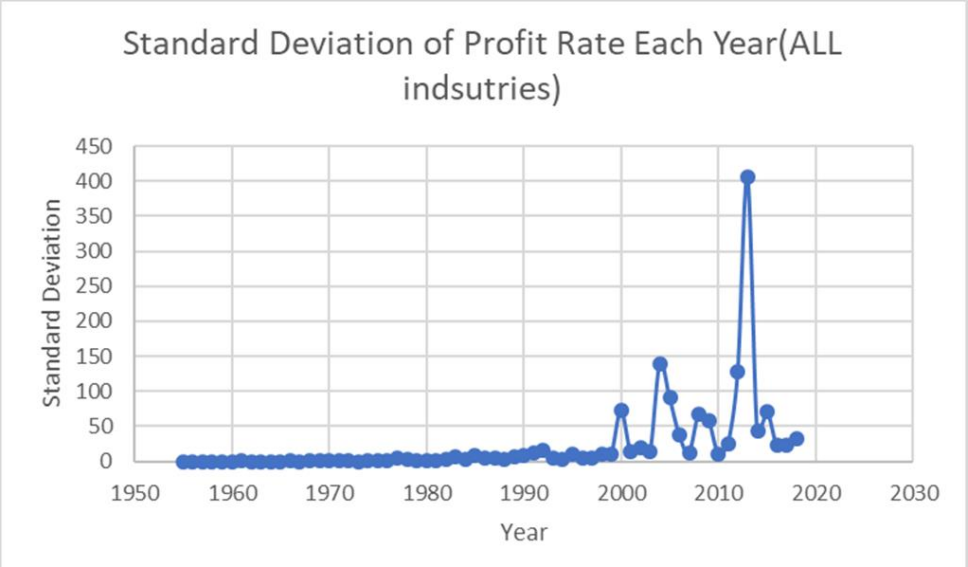
The key takeaway from this analysis is that industries vary greatly in their trend over time, while the aggregate economy steadily increased in mark-up, profits, and volatility as seen in the 3d plots.

Appendix B

B1

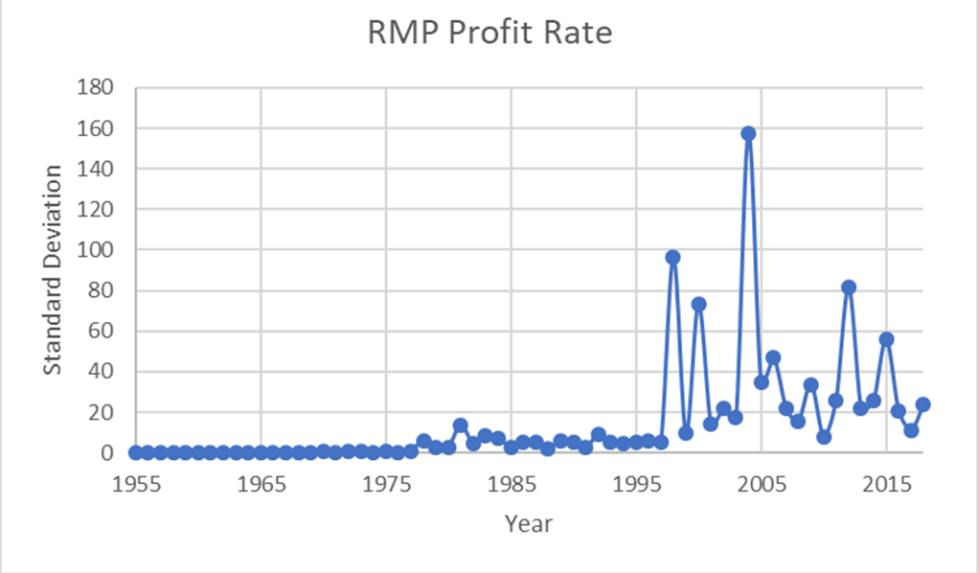


Unweighted mark-up standard deviation measures since 1955.



Unweighted profit rate standard deviation measures since 1955.

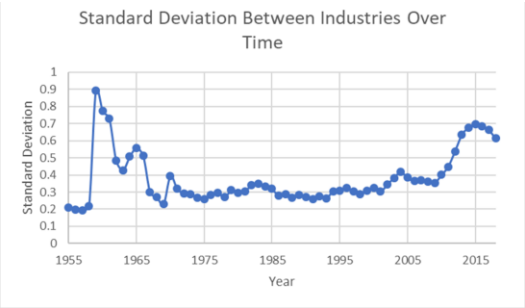
Notice that the 2013 spike corresponds with the plummeting of oil prices. Interesting to note this spike is not found in the revenue weighted graph. Thus, it would be fair to say that non-dominant firms drove the volatility in 2013.

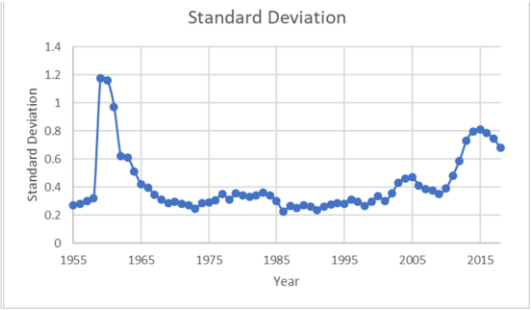


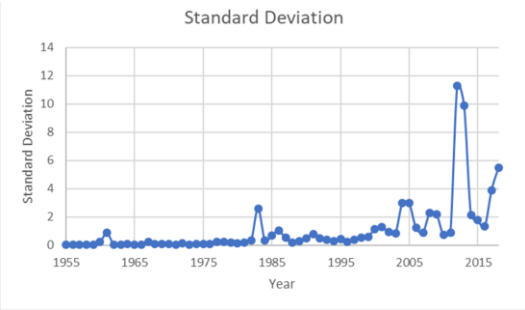
Unweighted RMP profit rate standard deviation measures since 1955.

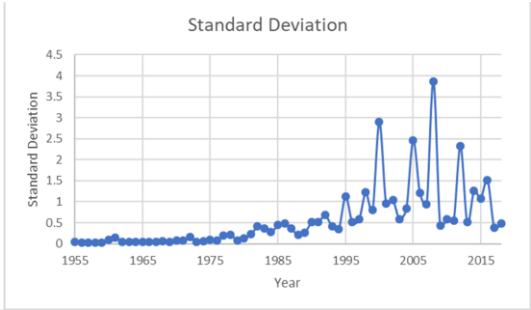
B2

Below you will find the unweighted standard deviation between industries. The left graphs use NAICS, the right, GICS.



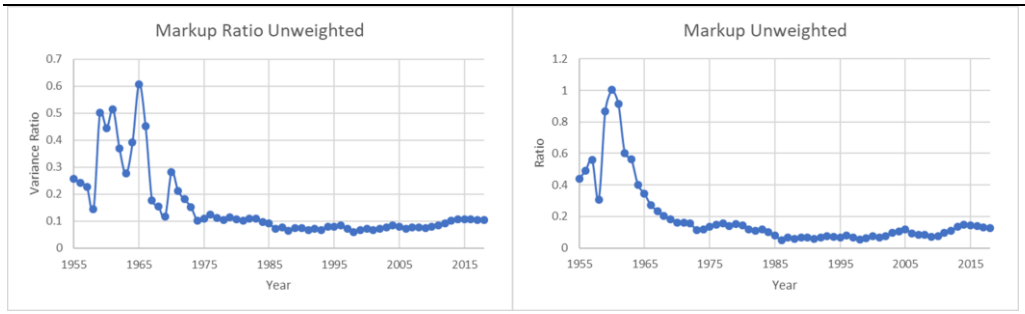


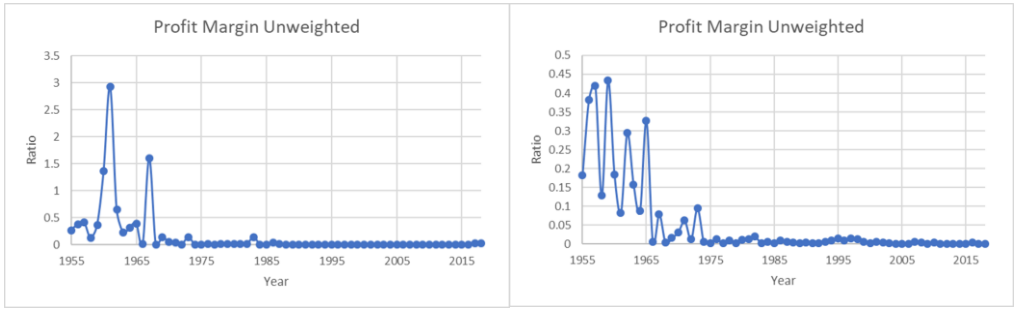




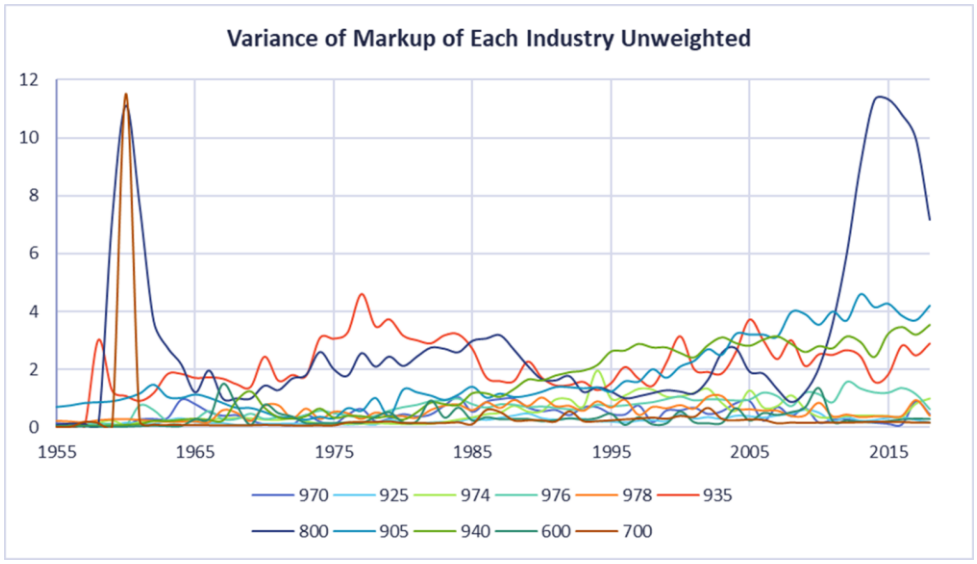
B3

Below you will find the unweighted between industries variance over total industry variance. The left graphs use NAICS, the right, GICS.



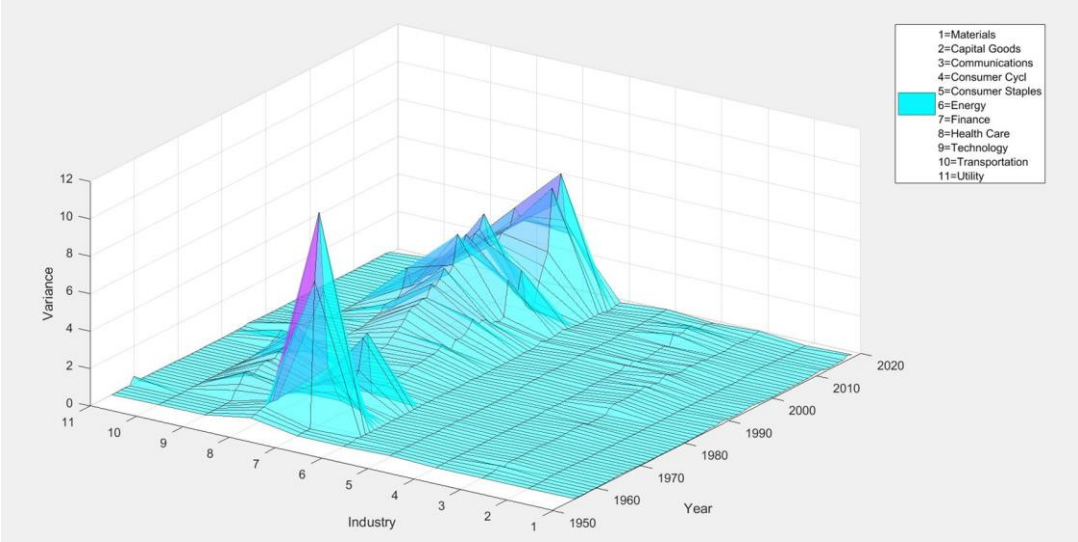


B4

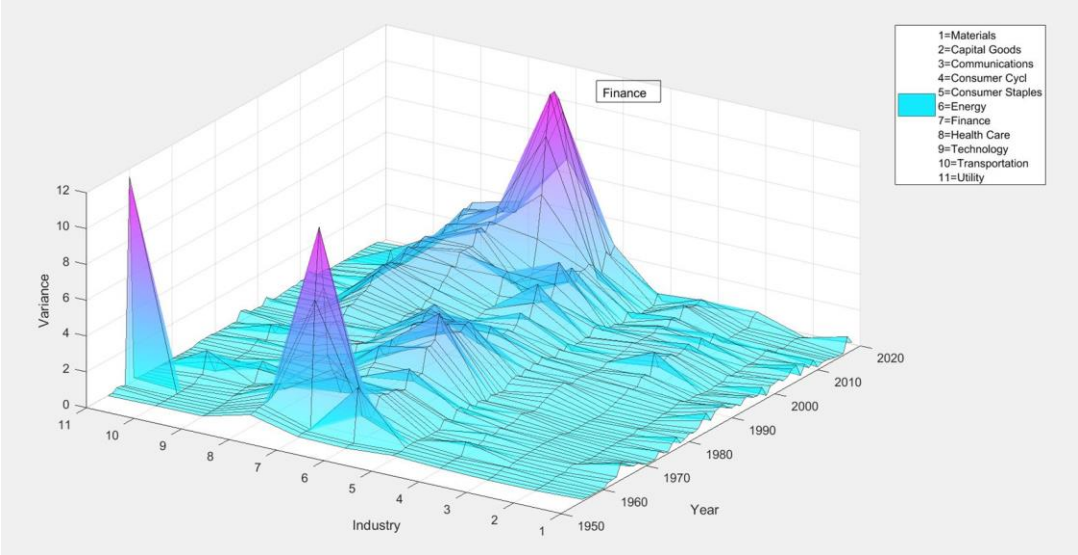


Unweighted variance mark-up by industry.

B5

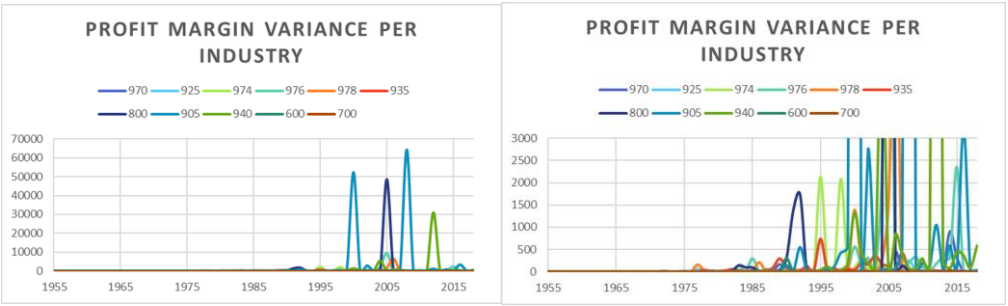


3d surface plots for the weighted mark-up volatility.

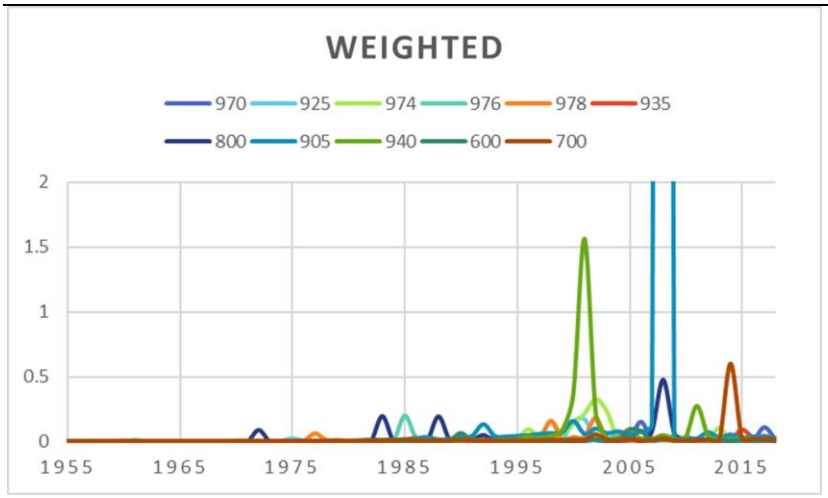


3d surface plots for the unweighted mark-up volatility.

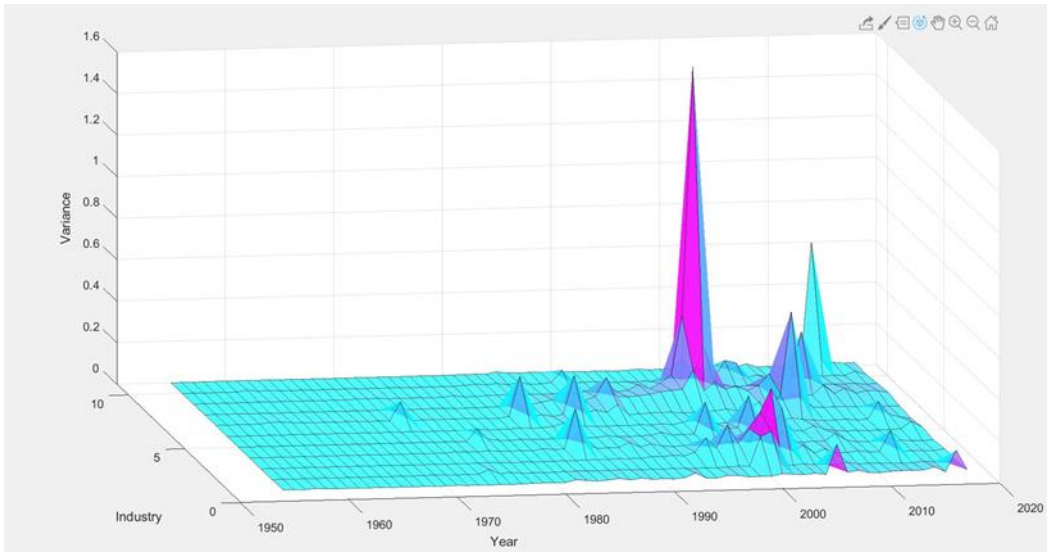
B6



Unweighted variance by industry (right graph is the same but the y-axis is magnified).



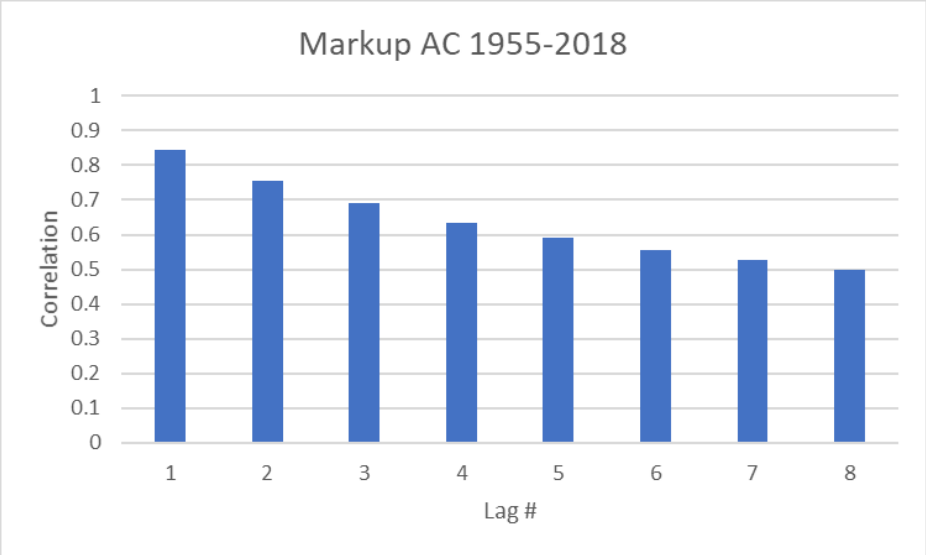
Weighted variance.



3d variance of industry by year.

The key point is that volatility shocks seem to become relatively common after 1980. These shocks occur across all industries, although they are more prominent in the three industries specified before. Thus, another way to interpret the risk profit relationship emerges. Maybe we can gauge risk, and in accordance profits, based off the severity and persistence of past shocks alone. But this is far beyond the scope of this paper.

B7



1955-2018 mark-up autocorrelation.

Appendix C

C1

Note that the first two regressions are weighted according to revenue, and the next two are a replication with an added period using unweighted regressions. Also note that the following regressions include two extra proxies that showed limited effects and therefore were removed from the main analysis. The regression equation is the same as before:

$$y_{it} = \alpha + \beta x_{it} + \gamma z_{it} + \varepsilon_{it}, \quad (3)$$

Table 1 - Profit Rate Regressions. No Controls.

Proxy	(1)	(2)	(3)	(4)
Advertising	**1.93**	2.20	1.92	**2.17**
R&D	**1.04**	1.33	1.03	**1.60**
PPE	**0.05**	0.07	0.05	**0.03**
Industry Var	**4.16**	2.89	4.18	**6.32**
Staff	**-**	-	-	**-0.17**
Observations	**42,432**	9,338	33,094	**3,994**
Period	**1955-2019**	1955-1980	1980-2019	**1955-2019**

Note that these regression models have no controls, therefore nearly all coefficients are greatly statistically significant. For this reason, these measures are not included in the table for now.

Table 2 - Mark-up Regressions

Proxy	(1)	(2)	(3)	(4)
Advertising	**7.27**	5.55	7.34	**7.42**
R&D	**9.93**	4.50	9.94	**9.78**
PPE	**0.12**	0.22	0.12	**0.12**
Industry Var	**10.31**	8.69	10.47	**16.55**
Staff	**-**	-	-	**-0.09**
Observations	**42,432**	9,338	33,094	**3,994**
Period	**1955-2019**	1955-1980	1980-2019	**1955-2019**

Unweighted Accounting Net Profit Rate

Proxy	(1)	(2)	(3)	(4)	(5)
Advertising	**0.02**	0.17	0.05	-13.05	**-1.22**
R&D	**-0.93**	0.00	-0.93	-0.74	**0.23**
PPE	**-0.20**	-0.01	-0.24	-0.42	**0.47**
Industry Var	**8.47**	2.38	9.42	17.43	**0.33**
Staff	**-**	-	-	-	**-1.24**
Observations	**42,432**	9,338	33,094	14,915	**3,994**
Period	**1955-2019**	1955-1980	1980-2019	2000-2019	**1955-2019**

Unweighted Mark-up

Proxy	(1)	(2)	(3)	(4)	(5)
Advertising	**-0.01**	0.71	-0.00	-0.07	**-0.17**
R&D	**0.00**	-0.02	0.00	-0.00	**-0.00**
PPE	**-0.02**	0.01	-0.02	-0.02	**0.00**
Industry Var	**20.27**	6.18	21.10	27.59	**13.92**
Staff	**-**	-	-	-	**0.00**
Observations	**42,432**	9,338	33,094	14,915	**3,994**
Period	**1955-2019**	1955-1980	1980-2019	2000-2019	**1955-2019**

These regressions will be repeated but with controls, thus we will keep the interpretation of these results brief. First, note that all these coefficients are positive, except for staff expense. This is reasonable since all profitability measures seem to rise during each of these time periods. But the negative coefficients for staff expenses in both tables is intriguing, thus it will be included in more regressions in the controlled versions. Another interesting result is that industry risk seems to become more relevant to firms' profitability each period. This can be seen in both mark-ups and accounting profit rate. Thus, risk may be more important to firm profitability than it was in the past.

Baseline Regressions

We will repeat the firm level regressions above, but with added controls and stipulations. One change is the controls for industry and time. Thus, we drop the industry variance proxy since this would effectively be zero. In addition, the

standard errors are clustered to account for autocorrelation. Note that all the following regressions use these controls unless otherwise stated.

The two regression summary tables below are the same except that the second table has only three proxies (staff expenses removed). Since staff expense is the limited data proxy, the second table has a far more observations. Note that all regressions use accounting net profit rate as the dependant variable.

Table 3 – Profit Rate. All controls. 4 variables.

Proxy	(1)	(2)	(3)	(4)
Advertising	**1.90****	2.74**	1.20**	2.10**
R&D	**0.29**	1.14*	0.37	0.01
PPE	**0.00**	0.07**	-0.04	0.00
Staff	**-0.12**	0.08	0.03	-0.26
Observations	**3,989**	1,261	1,721	1,007
Period	**1955-2019**	1955-1980	1980-2000	2000-2019

** for t-value over 1.96 (95%), * for t-value over 1.28* (80%)

Table 4 – Profit Rate. All controls. 3 variables (Staff Expense removed).

Proxy	(1)	(2)	(3)	(4)
Advertising	**1.17****	1.95**	0.88**	1.28**
R&D	**0.73****	1.32**	0.13	0.78*
PPE	**0.01**	0.06**	-0.02	0.02
Observations	**42,427**	8,423	19,089	14,915
Period	**1955-2019**	1955-1980	1980-2000	2000-2019

** for t-value over 1.96 (95%), * for t-value over 1.28* (80%)

Both tables point to similar proxy trends and the ranking between them. The advertising proxy is highly significant over the full period for each table, even within each sub-period. R&D shows a fairly positive relationship with profit rate, although not consistently as positive as advertising. PPE on other hand shows little relationship with profit rate, except for the 1955-1980 period. Staff expense also shows little relationship with profit rate but is the only proxy that may have a negative overall correlation. Now let's interpret each of these proxies individually over time.

In both regression tables, advertising is statistically significant in all time periods. The corresponding time periods in each table also show a similar trend in coefficient size over time. The 1955-1980 time period has the largest coefficient. The 1980-2000 period shows the lowest coefficient, and the last period shows a coefficient that lies in between the previous two. It appears that the aggregate economy has seen a strong relationship between advertising and accounting net profit rate in each period, at a statistical significance level greater than the other proxies used.

R&D has some statistical significance, and a positive relationship with profit rate overall. In both tables, we see a high coefficient in the first period, both with some level of significance. But the following two periods are less certain. The 1980-2000 period seems to show a drop in this relationship, although still positive. Then the final period shows contradictory results. The first table shows next to no relationship, while the second table shows a somewhat significant increase in the relationship. I would speculate that the second table is more accurate, due to the sheer size of observations.

Property, Plant, and Equipment (PPE) appears to have little or no statistical significance in each table, except for the 1955-1980 period. In this period, both coefficients have a high statistical significance, and this relationship appears to be positive. The next two periods are not statistically significant but appear to have a similar trend. In both tables, the second period shows a negative relationship. Then in the final period the relationship seems to increase positively.

Note that all three proxies seem to show a similar dynamic through time. They start off with their highest relationship, in the second period they drop to their lowest relationship, and in the last they rise halfway up to their start point. It appears that a missing factor/proxy in the 1980-2000 period seems to reduce the relationship in the shown proxies.

Before continuing, note that the staff proxy seems to be positive in the first period, dropping to near no relationship in the second, and then develops a conspicuously large negative relationship.

Let’s now look to verify our interpretation with replicating the method above but with mark-ups.

Table 5 – Mark-up. All controls. 4 variables.

Proxy	(1)	(2)	(3)	(4)
Advertising	**6.52****	6.17**	2.39*	8.70**
R&D	**2.15**	4.30**	5.56*	-0.59
PPE	**-0.01**	0.15*	-0.18*	0.05
Staff	**0.72***	0.03	-0.16	0.50
Observations	**3,989**	1,261	1,721	1,007
Period	**1955-2019**	1955-1980	1980-2000	2000-2019

Table 6 – Mark-up. All controls. 3 variables (Staff Expense removed).

Proxy	(1)	(2)	(3)	(4)
Advertising	**4.63****	5.01**	2.78**	6.19**
R&D	**7.38****	4.21**	3.44**	7.42**
PPE	**-0.08**	0.26*	-0.07	-0.07
Observations	**42,427**	8,423	19,089	14,915
Period	**1955-2019**	1955-1980	1980-2000	2000-2019

Both tables above show the same rank of importance among proxy measures, as compared to the accounting net profit rate regressions. Advertising, followed by R&D, PPE, and Staff Expenses. Advertising seems to show a similar trend over the three periods but with one exception. The 2000-2019 period shows advertising has a stronger correlation to mark-ups than accounting profit. R&D also verifies the results from before. In the first period, the coefficient is larger than the average, with the following periods more difficult to interpret. Similar to the accounting profit regressions, it would be fair to take the three variable table as a stronger representation (due to size of observations) and conject that R&D drops in the second period, then jumps in the final period. PPE again seems to show little relationship to profitability, except with the first period. The following period seems to drop into the negative correlation territory, as we have seen before. But the final period shows fewer substantive results than before. Interestingly, staff expenses seem to show a positive relationship with mark-ups,

but a more negative relationship with accounting net profit rate. Also note that these coefficients are statistically insignificant, except for the full period with mark-ups.

The one control that may be reasonable to remove is the industry effect control, if we acknowledge that industry nature will now affect these regressions. The results for these regressions are shown below.

Table 7 - Profit Rate Regressions with Industry Effect Removed.

Proxy	(1)	(2)	(3)	(4)
Advertising	**2.37****	3.54**	3.23**	2.14**
R&D	**2.10****	1.76*	2.48**	1.96**
PPE	**0.07****	0.11**	0.07**	0.06**
Staff	**-0.06**	-0.15*	-0.09*	0.01
Observations	**4,354**	1,261	1,721	1,372
Period	**1955-2019**	1955-1980	1980-2000	2000-2019

Table 8 - Mark-up Regressions with Industry Effect removed.

Proxy	(1)	(2)	(3)	(4)
Advertising	**7.49****	8.21**	8.22**	7.11**
R&D	**10.41****	6.18**	11.47**	9.96**
PPE	**0.17****	0.20**	0.15*	0.18**
Staff	**0.53***	-0.43**	-0.18	1.26*
Observations	**4,354**	1,261	1,721	1,372
Period	**1955-2019**	1955-1980	1980-2000	2000-2019

The coefficients are far more significant, which may show the power of industry type. When the difference among industries is removed, the relationship between all proxies and profitability increase. All proxies, with the exception of staff expense, seem to be fairly statistically significant. Also note that the trend of coefficients across time periods become less discernible and congruent. This may be due to the large differences of these proxies between industries. We can only see the overall effect, which may obscure the underlying trends.

In summary, each proxy has its own dynamic since 1955, although certain patterns begin to develop. Advertising seems to hold a consistent relationship with profitability in each time period, followed by R&D. PPE seems to have little to no relationship, while staff expenses are similarly weaker in significance but point to a possible negative correlation.

C2

A regression was done for each industry. Some industries were not yet assigned by S&P in the beginning periods, thus the number of years for each industry varies. Note that the average profit and mark-up for each year was used for the regression. Thus, the amount of data per regression tends to be around 50 observations.

Accounting Net Profit Rate

Proxy	Transport	Utilities	Financial	Health	CapGood	Energy
Advertising	0.23*	0.24	-2.37	0.96**	0.07	0.19
R&D	-0.64	0.10*	0.41	1.45**	-0.92**	-3.71*
PPE	0.13**	0.05**	0.30**	0.14	0.19**	-0.02**
Staff	-0.35**	0.38**	0.57*	-0.08	-0.14**	1.21**
Years	59	44	50	55	64	52

Proxy	Tech	Basic Mat	Communication	Cons Cyc	Cons Stp
Advertising	0.17	0.39**	0.52*	-0.05	0.08
R&D	0.02	3.14**	0.75	-0.12	0.47
PPE	0.13*	-0.02*	0.21**	0.11**	0.60**
Staff	0.05	-0.34**	-0.71**	-0.19**	0.04
Years	56	59	54	59	64

*Marked ** for 95% confidence, * for 80% confidence*

Mark-up

Proxy	Transport	Utilities	Financial	Health	CapGood	Energy
Advertising	0.24	0.68*	-10.45	01.01	0.25	0.14
R&D	0.35	0.27*	1.65	11.30**	-1.91**	-14.01*
PPE	0.17**	0.09**	2.51**	0.14	0.33**	-0.02
Staff	-0.8**	0.49**	0.44	-0.13	-0.40**	1.95**
Years	59	44	50	55	64	52

Proxy	Tech	Basic Mat	Communication	Cons Cyc	Cons Stp
Advertising	1.87*	0.63**	2.48*	-0.36	0.26*
R&D	2.01	5.14**	5.91**	-1.06*	-0.95
PPE	0.50	-0.03	0.71**	0.20**	0.70**
Staff	0.17	-0.78**	-2.53**	-0.43**	0.51
Years	56	59	54	59	64

We need to be careful with analysing the industry regressions because statistical significance varies largely between proxies and industries. Also, the autocorrelation is not accounted for, so significance is inflated. Despite these drawbacks, there are a few insights that may help us understand profitability dynamics at the industry level.

All significant values for advertising across both tables positively correlate with profitability. There are a few negative values (finance in particular) but they are not significant. R&D on the other hand, seems to have a mixture of positive and negative correlations with profitability for significant values. Thus, we may infer that R&D dynamics may vary greatly depending on industry type. Their also may be a lag effect which may not be accounted for since the investment would likely take time to show up in profitability. For staff expenses we see a mixture of positive and negative correlations. In both tables, Utilities and Energy show a significant positive relationship between staff expenses and profitability. On the other hand, Transportation, Capital Goods, Basic Materials, Communication, and Consumer Cyclicals show a significant negative relationship between staff expenses and profitability.

Appendix D

This section will assess the compatibility of the empirical findings with various theoretical constructs. Each theory will be approached in a systematic order. First, an exposition of the theory will be given. Secondly, the theory will be compared to the empirical data. Lastly, I will conclude with the strength of each theory. Note that the following theories can be very extensive, therefore I aim to provide the details relevant to this analysis. The book, Profit Theory and Capitalism, touched on many of the following theories in detail (Obrinksy, 1983). For transparency, I must say that this book was my primary source for analysing historical theories. I found it the most comprehensive book pertaining to this topic. Although the book may seem outdated, most ideas relating to this area of study were already expressed by the time the book was published.

The Neoclassical Perspective

Neoclassical theory has been central and prominent to the development of economics but has deemed profitability as a second-rate concept. Many neoclassical economists would have slightly differing views on profitability; thus, we will base our fundamental understanding on one of the most prominent neoclassicals, Léon Walras. The following passage from his book Elements of Pure Economics, explains profitability's status in neoclassical theory.

"Equilibrium in production, like equilibrium in exchange, is an ideal and not a real state. It never happens in the real world that the selling price of any given product is absolutely equal to the cost of the productive services that enter into that product." (Walras, 2013)

Essentially, he deems that profits can exist outside equilibrium, but the power of market forces should swiftly tame any considerable profits. The strength of using equilibrium to explain economic phenomena has been so versatile that it has become the core of economics since Walrus's time. This in effect has casted a shadow over profitability. Profits according to neoclassical theory are an exception, not a core concept. Thus, any profits attained by a business should soon vanish.

To test the viability of a pure neoclassical approach to profitability, we should focus on persistency of profits. As we have seen in the autocorrelation measures, accounting profit rate seems to die out after a few years. This is apparent overall and within sub-periods. These finding are supportive to the

neoclassical theory since companies do not sustain their profitability long. In neoclassical terms, the profit acquired by firms dissipates within a few years, due to the market forces that bring it back into equilibrium. On the other hand, the autocorrelation for the top 10% of firms is significantly more persistent overall. This would appear to contradict neoclassical theory, as it seems that perfect competition may not be as ubiquities as the theory suggests. Furthermore, we see that overall profits, as thoroughly investigated in RMP, have been increasing year over year since the 80's. According to the neoclassical approach, an aggregate trend such as this should not exist.

Profitability at the firm level is somewhat inconsistent, which may be a manifestation of numerous ongoing equilibrium forces. But the aggregate trend of profitability and the sustained profitability of large firms shows that more forces are at work than the neoclassical model cares to acknowledge.

The Market Power Approach

Neoclassical theory ushered in some criticism, particularly regarding its avoidance of explaining imperfect markets. The idea of market power was not new, as Obrinsky pointed out that classical economists such as Smith, Ricardo, and Mill had already shed light on the dynamics of collusion and monopoly power. Although evident, these were not developed into comprehensive theories. The one exception is that of French mathematician Antoine-Augustin Cournot. His understanding of oligopolistic competition is still fundamental today and has provided the groundwork for numerous theories. Unfortunately, Cournot's work was not acknowledged for about a century until the Economist Joan Robinson came along (Britannica, 2020). At Cambridge, Robinson and other Economists such as Piero Sraffa seemed to popularize a new undertaking that acknowledged monopolistic competition. Since then, our understanding of imperfect competition has been investigated more than ever before. Today this area of study is often referred to as "Industrial Organization". It encompasses many theories and concepts, all in which relate to imperfect competition.

Verifying the presence of imperfect competition is not necessary. Surely not all markets are perfectly competitive. I will look to use this paper's empirical results to analyse how well imperfect competition explains market behaviour. Firstly, RMP noted that profitability has been growing since the 1980's. This in itself does not point to the prevalence of a rise in market power. In fact, it shows

that dominant firms seem to be responsible for this rise in profitability. Therefore, it appears that market power, in the aggregate, is responsible for these trends. On the micro level, we also see evidence. The persistency measures of mark-ups for the top 10% of firms are far stronger than the following 90% after 1980. In addition, notice that all the results in the main part of this paper are revenue weighted, but in the appendix, I included the unweighted counterparts. It is easily discernible that the weighted measures are not only far less volatile, but they tend to be skewed more to the positive profitability side. Hence, larger firms are not only more stable, but more profitable.

The empirical findings of this paper and RMP display an increasing prevalence of the effect of market power. This effect seems to be relatively large, but it is more difficult in pinning down exactly how market power arises, and the extensiveness of its reach. At the one extreme, maybe market power is evident in all firms and we are simply witnessing the outcome of their complex interactions. Market power may be determined by a multitude of factors, such as product differentiation, geographical differentiation, upfront costs, and competitive strategy. Economists have started to understand each of these factors in isolation, but the main difficulty comes with putting them all together. This task is further intensified by the number of firms in a market, exponentially increasing the number of dynamics at play. Thus, someone looking at the market from the outside may be able to the see manifestation of market power, but the inner workings of that industry remain hidden. This is currently our state. Although we see the importance of market power today, its possible extensiveness will take time to disentangle.

Schumpeter's Creative Destruction

The Austrian Economist, Joseph Schumpeter, proposed that Capitalism is driven by a process he coined as "Creative Destruction" (Schumpeter, 2014). This idea was introduced in his book "Capitalism, Socialism, and Democracy", first published in 1943. He begins with postulating the significance of economic progress during the last forty years. This is a remarkable statement, considering the context of the early 1940's, amid the second world war, when recent memories of the great depression and the first world war were prevalent in the ideas and attitudes of the time. In fact, Schumpeter deemed these events to be just one component of an evolving capitalist system. To him, economic progress was a

relentless system based on creative destruction. Drawing on the field of evolutionary biology, he proposed the idea of an industrial mutation, which would lead mutated firm to outcompete its rivals. Thus, we have the creative aspect, which is advantageous to the firm, leading its competitors to either adopt that "mutation", or be left behind. In essence, we have a process of creation and destruction. The status quo today will not be the status quo of tomorrow. Schumpeter stressed that these creative forces originate from the abstract term of technology (what many later economists would refer to as Solow's residual). He also noted that the dynamics of creative destruction are most evident over the long-run, and that markets were efficient enough to often resemble perfect competition. Therefore, any profit of an advantageous firm is likely short lived.

Creative destruction is an abstract process, and not one to easily back up empirically. But we do have a few tools at our disposal. First off, Schumpeter acknowledged that some firms led the way of the evolutionary process through innovation. Therefore, we would expect to find the most innovative firms leading the way in profitability. Using the proxy of r&d for innovation, we see that it has a significant relationship with profitability, but when we compare this to the unweighted version, the relationship tends to be weaker. Thus, maybe the large firms are profitable not because of their size but because of their innovation. Secondly, creative destruction would imply that industries with the most innovation, would consistently see higher aggregate profits. Thus, we would expect the technology industry in particular to see high profit margins, and in fact we do. We also see high volatility in the technology industry, which may be representative of the constant creativity and destruction of a cutthroat environment.

Although r&d seems to be correlated with profitability, this does not imply cause and effect. It is entirely plausible that firms spend more money on r&d because they are profitable. In fact, both forces might be present, profitability may feed r&d and r&d may feed profitability. Either way, more detailed research would be needed. Also note that r&d may not be the best proxy for innovation. Innovation is an abstract concept and not easy to put a number on. Furthermore, investing in technology at the firm level may show little influence, while the exchange of information between parties and the aggregate quantity of economic technology may be the real drivers. Therefore, it is entirely possible that the

effects of innovation are not properly accounted for in these regressions. Despite this, r&d is the best and simplest proxy available to represent this aspect. If we ignore the r&d factor and assume that the technology industry is highly innovative, we may be able to adopt a different viewpoint. The high volatility and profitability of this industry would seem to support the theory of creative destruction. But notice that other industries, such as finance, also show a degree of high volatility and high profitability, yet the innovative nature of this industry is more debatable. Overall, Schumpeter's creative destruction has some empirical backing in explaining profitability, but the evidence is far from solid. Proposing an abstract theory, will often yield abstract results.

Labour Theory of Value

More of an approach than a specific theory, many economists have aimed to explain profitability through labour. Its intuitive nature appealed to classical economists such as Adam Smith, David Ricardo, and Karl Marx. Although using a similar approach, each drew radically different results. Thus, we will summarize each economists' theory, and then look at the empirical findings.

Adam Smith, as you would expect, merged labour with the idea of supply and demand. In the Wealth of Nations, he deems that there are two types of prices, natural price, and market price (Smith, 2007). Natural price equates to the laborers cost of producing the good. Market price equates to the value that the customer attributes to that good. Smith reasoned in terms of a labourer and his product, deeming "if he sells it at a price which does not allow him the ordinary rate of profit in his neighbourhood, he is evidently a loser by trade; since by employing his stock in some other way he might have made that profit". This is where the idea of opportunity cost arises. Smith essentially declares that opportunity costs in a perfect market will result in a "ordinary profit" for everyone. I should also note that Smith does not involve the entity of a middleman such as a business or investor which organizes the labour and sells the products. This is exactly where the controversy tends to lie. I would argue that we can extend Smith's logic to include modern corporations. The labourers in a perfect market would be compensated for exactly what they add to the production process. If they are undercompensated, they will leave to another firm, and capture their "ordinary profit". The labourer in this case could be a factory worker, executive, or an investor. In the investor's case, their "ordinary profit" would be their return on

profit. While the factory worker and executive would likely be compensated with salaries and stock options. Smith's logic of free markets is undeniable, and we conclude that only market imperfections can explain variations in profitability. But this leads us to question of what these market imperfections are, and how extensive they are.

David Ricardo had a very similar method as Smith. In his book Principles, Ricardo noted "the market price of a commodity may exceed its natural or necessary price, as it may be produced in less abundance than the new demand for it requires. This, however, is but a temporary effect."(Ricardo, 2001) Ricardo, along with Smith, focused on the strength of free markets. This in effect casted a shadow over analysing the temporary effects where equilibrium has not been established yet. How long these effects lasted or whether they are open long enough for parties to become rich was not acknowledged. Although they both brought to light certain market imperfections that would affect profitability. Ricardo noted that any taxes imposed on goods would decrease profitability of those parties. Smith noticed the power and enticing nature of companies to collude and drive up prices at the detriment of the consumer.

In Karl Marx's opinion, the key market imperfection that would lead to the downfall of capitalism was labour exploitation. As you may have noticed, this has not happened. But the dramatic failure of communism does not mean the world's current labour markets are perfect. Simply put, it is possible for labour to be exploited and thus directly affect profitability. Let us not forget that the opposite is also possible. Finely compensated labourers may increase profitability. This brings us to the money as a motivator debate, which is far beyond the scope of this paper. Either way there seems to be some worth in investigating the effects of employee compensation on profitability.

Now switching over to the empirical application, we will attempt to understand how Smith and Ricardo's view of labour markets relates to our data. Firstly, the staff expense proxy shows the weakest relationship with profitability out of all proxies. This indication of little to no relationship could be representative of strong free markets, with little imperfections. But it should be noted that this lack of relationship may be a result of a few different factors. One factor is that the staff expense data is somewhat lacking since it is not a required entry in financial statements. The problem is not necessarily the lack of data, but

the selection bias that would naturally evolve and change over time. Secondly, the staff expense data excludes the compensation to executives. In fact, the voluntary nature of declaring staff expenses may allow for variability in which specific employees are accounted for in this measure. This paper initially planned to include executive compensation as a proxy, but numerous difficulties emerged. For example, executive compensation is not easily measured, and it can be difficult to classify employees as executives. The process is not impossible, but heavily intensive, which would be better left for a paper of its own. In summary, it would appear that the strength of Smith and Ricardo's ideology towards free labour markets is affirmed by the empirical results of this paper, although this does not rule out market imperfections all together. What has been shown is that the aggregate labour market seems to adhere to the free market forces strongly.

Although the overall relationship was weak, it is interesting to note the prevalence of negative coefficients compared to the other proxies. This may hint at the possibility of unfair labour compensation. When firms become more profitable, they may not distribute part of that surplus to employees. But this is far from empirically supported evidence. A negative to zero correlation may in fact point to many dynamics. For example, it may be the result of stable compensations, where an increase in profitability takes time to be compensated for by the workers, or that wages are simply inelastic to company profitability, while the executives or investors take the extra surplus to compensate them for their additional risk. But also keep in mind the voluntary nature of reporting staff expenses. A company that poorly compensates their employees would likely not report this expense. Hence, the negative correlation may be more significant than reported here. Lastly, notice the significant variations amount correlations for different industries. Only analysing the aggregate economy can overshadow what is happening in each industry. For example, we may have well paid employees in one industry while another industry exploits their labour. Taking the average would yield no relationships. Unfortunately, the limited data for the staff proxy (along with the other problems of the proxy), has made it too difficult to draw more concrete results regarding industry compensation. But when you consider the zeitgeist of the past few decades, maybe there is some truth behind the overpaid employees in the financial sector, and the underpaid factory workers (see correlation of finance and basic materials industry).

Hawley's Risk Theory of Profit

Federick B. Hawley proposed that profit is the residual revenue which is attributable to the risk taken by the entrepreneur (Hawley, 1893). He furthered classified the entrepreneur in the modern corporate world as the shareholder. Thus, profit or loss is a residual term, which accounts for the risk took by the owner(s). Notice that the executives are controlling the business operations and risk directly, but they are not necessarily the owner(s). But in today's world, many executives are shareholders and therefore are also entrepreneurs. Even some entry level employees are shareholders, and thus entrepreneurs. Thus, the line between a firm's employees and owners has become increasingly blurred, especially when considering the movement towards compensation via stock options. The best way to keep Hawley's theory straight in our modern context is to view any shareholder as the taker of excess revenue (due to risk), while the pure employee does not have a right to this excess revenue (bounded to a predetermined wage). This risk can be thought as the residual which accounts for the difference of forecasting and reality. This difference is amplified or lessened depending on the going rate of risk, which in itself is a very perplexing factor. I may have understood Hawley incorrectly, but my interpretation is that part of this risk profit, is what he called a "monopoly profit" (not to be confused with the traditional idea of firm monopoly profit). This "monopoly profit" I would compare to what we now call a risk premium. It is essentially a premium which tends to push profits toward the positive side. Thus, overall a shareholder would expect a positive return for lending their capital.

Empirically, it appears that industry risk seems to fit the trend of increasing profitability. After the 1955 level, we see the correlation between risk (variance) and profitability continue to steadily grow. This is very similar for both accounting net profit rate, and mark-ups. Unfortunately, assigning standard risk measure for each firm based on the industry type, does not allow significance levels to be gauged properly. Thus, we cannot compare it directly with the other proxies. Outside of the regression results, we should note that the replication part following RMP also saw high volatility develop, particularly once the 1980's was reached. In that section we discovered that the volatility was driven by within industry fluctuations after we reach 1980, thus adding further support to the regression results. I also alluded to the increasing scale of shocks that began to

develop after the 1980's. This may indicate the rising volatility of today's world, not only at the microlevel, but also at the macrolevel. Lastly, an apparent paradox seems to arise from the fact large corporations have climbed the profitability ladder, yet they are often more persistent than their counterparts. They have large profits, but less volatility. I would argue that firm risk and industry risk are two separate concepts, thus this paradox is an illusion. Belonging to a riskier industry tends to boost profits, but only if the firm manages their own risk well enough along with becoming a dominate firm of their industry.

Risk appears to play a crucial role in determining profitability. But we must be careful with assigning cause and effect, even if the intuition is alluring. It is completely feasible that risk and profitability indirectly affect each other. Utilizing the abstract term of risk, for finding another abstract term, profitability, introduces grey areas which may lead us to draw faulty dynamics. In other words, risk akin to profitability, are not exact concepts. Therefore, stating that one leads to the other is not accurate, and requires further explanation to the details and context of both concepts. Although this paper does shed light on the apparent relationship encouraging further research into these dynamics.

Robinson's Critique

Joan Robinson was highly critical regarding the prevalence of neoclassical theory. In direct contrast to the prevailing perfect market mentality, she outlines the inadequacies of free markets in her book the Economics of Imperfect Competition (Robinson, 1969). Her book does not read as wholly neglecting key neoclassical principles, but more as a disapproval of the neglection to explore the path of differing assumptions. She believed that the foundation of assumptions that built economic models was becoming far too complacent. As she insightfully noted "A simple analysis can only be made upon simple assumptions, and the more complicated the analysis, the more complicated the assumptions upon which it will work, and the nearer the assumptions can be to the complicated conditions of the real world"(Robinson, 1969). In particular, she stressed analysing the point between the two extremes of perfect competition and pure monopoly. We can draw logical conclusions off these two extremes, but she argued that taking either of these two extreme assumptions did not allow for the advancement of economic models towards real world practicality. Hence the complexity of assuming a structure in between the two extremes, will allow economists to start creating

complex models which are more fruitful regarding the real economy. Robinson carried the idea over to postulate that in the context of an imperfectly competitive manufacturing industry, the dynamics of price is not what creates profit, but it is the shifting consumer demand that is a major driver. She goes on to state that even when a firm can raise prices, they strategically choose not to in fear of driving away customers. Throughout the paper she also alluded to the importance of psychology in the context of short-term imperfect markets but left that as requiring its own analysis. Thus, we begin to understand what Robinson means when she points to the limits of stagnant assumptions. Overall, we can see that Robinson's view of profitability is highly dependent on the firm's context, such as the industry type, level of competition, and the pertinent parties' psychology. Another economist who held a similar approach was John Commons. In fact, he suggested a completely new approach to economics he coined as "institutional economics"(Commons, 1931). Institutional economics has a rather indistinct way of approaching markets. Commons attempted to popularize the idea of context in economics, particularly regarding society's attitude as a collective of the individuals. Although never developing into mainstream economics, Commons is just another of many economists who noted the abstract yet powerful nature of contextual factors.

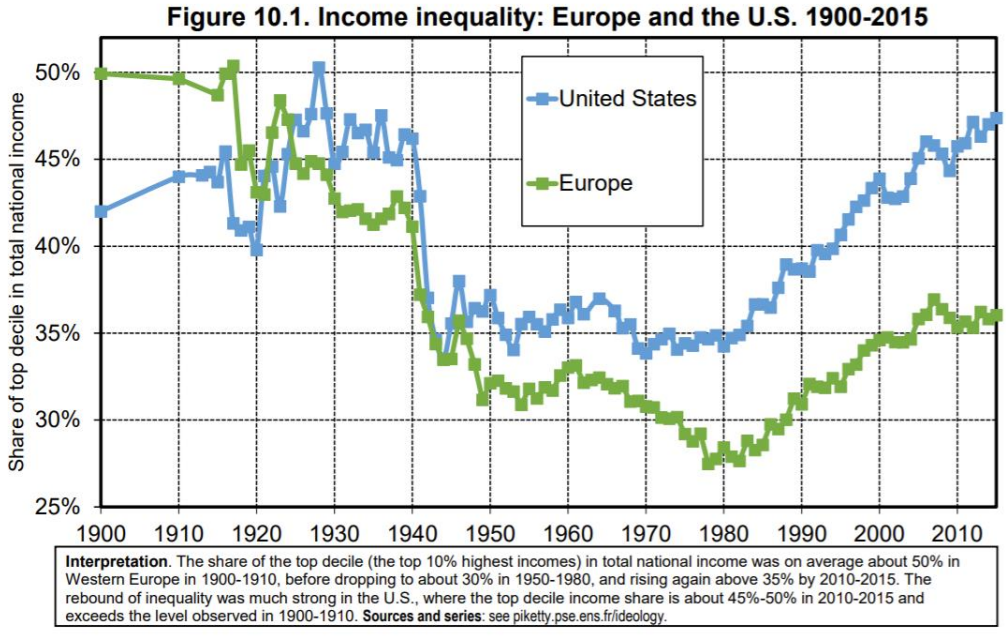
The contextual effects of profitability are not easy to measure, as each case calls upon different underlying factors. But we can test some of the contextual factors Robinson proposed. One of these being industry types. As we see in the empirical industry analysis part of this paper, volatility, trend, and scale of profitability vary extensively, depending on the industry. In fact, the dynamics of each industry point to numerous insights that would be neglected at the aggregate level. This is paramount when interpreting profitability-factor relationships. Essentially, we cannot assume what we find at the aggregate level will necessarily hold at the industry level. Another contextual factor is firm strategy, and although this paper is lacking in the area of direct measures of strategy, we could use advertising as a proxy for strategy towards marketing/sales. Although advertising expenses are highly correlated with profitability measures, applying cause and effect logic is confounding. The main reason being we do not know whether advertising is a result of high profits, or if advertising creates profits. One can viably argue that advertising only correlates highly with profit because high profit

firms have the reserves necessary to pay for advertising. Equally as logical another may argue that advertising is a key driver of sales, resulting in higher profit. Therefore, advertising expenditure may be too difficult to apply cause and effect (at least in this paper), nonetheless apply to firm strategy. We can see that contextual factors make the process far more daunting and require more specific and detailed work for each environment being analysed.

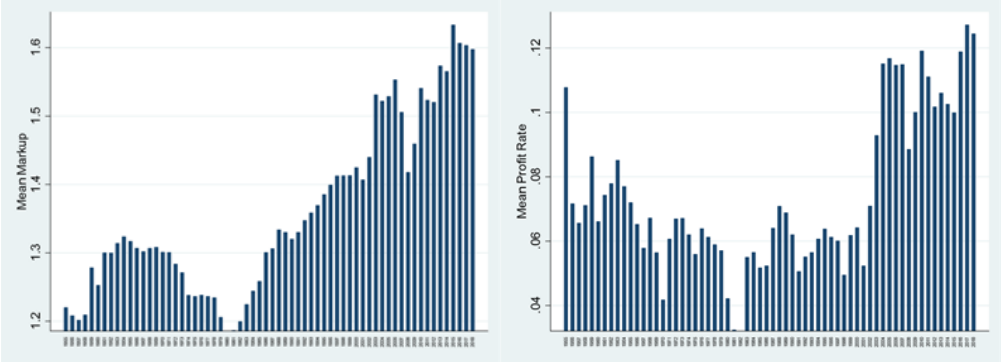
In summary, Robinson's critique is more of a framework towards understanding profitability, then a model for determining the factors of profitability. Empirically we can see the truth of what Robinson was suggesting, despite the abstractness of her critique in terms of profitability. In short, context is critical, despite how complicated it may be. That is why understanding profitability has been an immense endeavour.

Picketty Based Approach

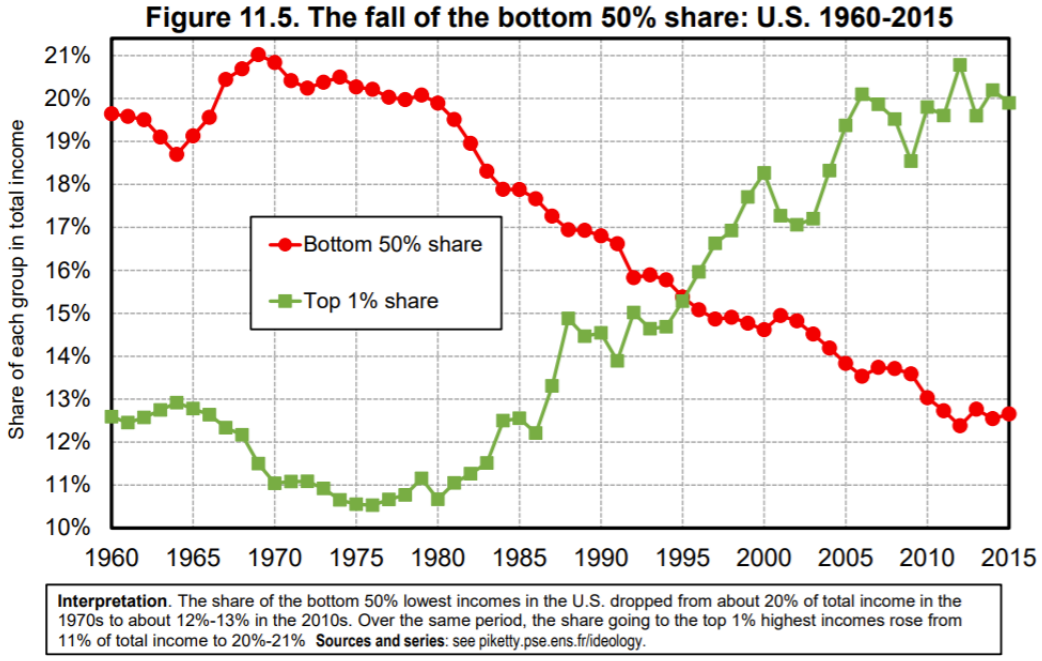
This approach has been developed through the principles established by economist Thomas Picketty. Via coincidence of reading Picketty's most recent works I noticed inequality trends oddly similar to the trends of profitability in this paper and RMP. His reasoning and principles regarding the dynamics of inequality led me to realize the pragmatism it had in explaining corporate profits. I must note that Picketty has never applied his ideas directly to profitability (as far as I am aware). Thus, what follows is my extension of his concepts but with the aim of elucidating profitability.



First let's take a look at the graph above, took from Picketty's most recent book, Capital and Ideology (Piketty, 2020). The graph essentially shows the share of the top decile of citizens in relation to the rest of the economy. Now take notice of the U.S. trend from 1955-2015. It's nearly identical to the profitability trends in this paper. We see the slight hump shape around the 1950 to 1980 period, then a steady increase ever since then. See the profitability comparison below.



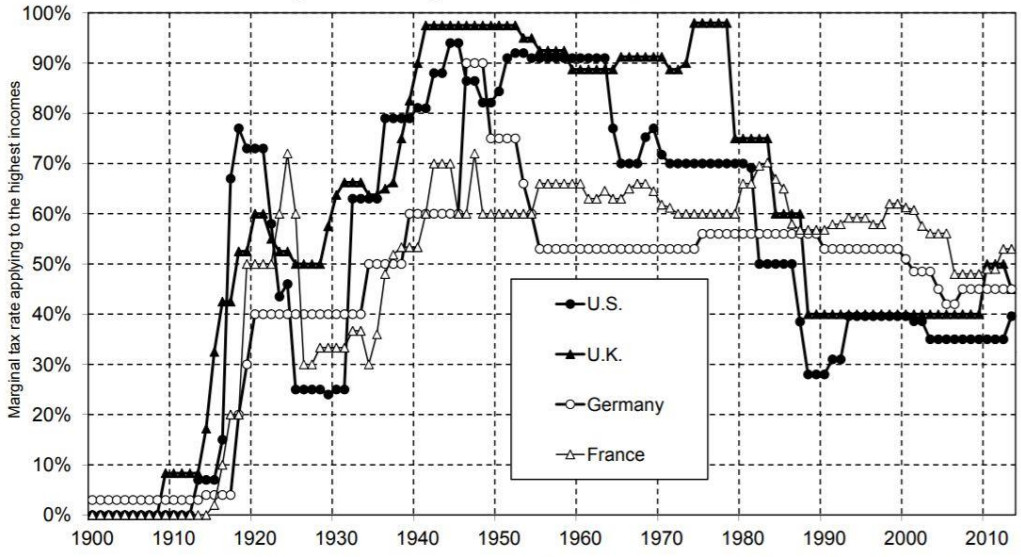
Keep in mind that this trend is common across many inequality measures and I would refer the reader towards Picketty's work for more details. For example, below we can see the same trend for the top 1%, and the opposite trend for the bottom 50%. All the measures warrant further investigation into uncovering the driving factors and relationships.



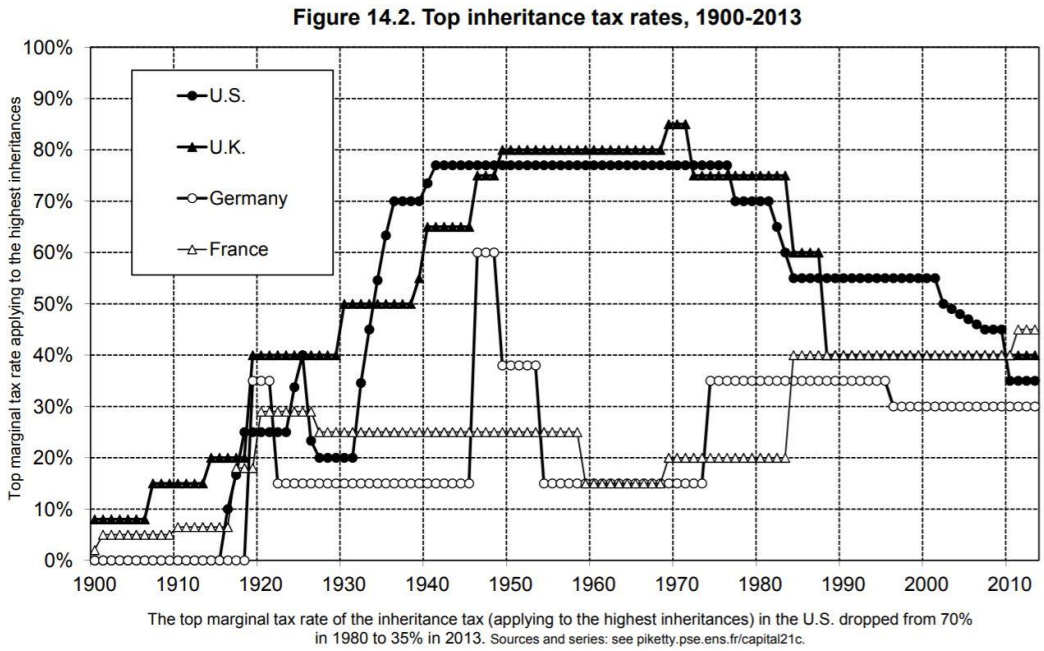
For our purpose we will look at the strong upward inequality and profitability trend since the year 1980. Piketty goes into great depth explaining the rising trend of inequality, but for the sake of time, I will highlight and apply the ideas that are pertinent to profitability.

I would reason that the transmutation of political attitudes during the 1980's was paramount to not only explaining the increase in inequality but the increase in profitability. Piketty claimed that 1980 marked the beginning of a shift to what he calls "hypercapitalism". This was displayed in the rhetoric of strong right winged parties elected around 1980, such as the election of Ronald Reagan in the U.S. and Margaret Thatcher in the United Kingdom. The laissez-faire ideology began to take a strong hold not only in the U.S. but through capitalistic countries worldwide. Note that this came about ten year before the fall of the Berlin Wall. Piketty in his bestselling book, Capital in the Twenty-First Century, also showed how the zeitgeist of this period manifested itself through the immediate cut in taxes that followed in 1980 (Piketty, 2017). The first graph below shows the immediate drop of income tax rates starting in 1980 for the U.S. and likewise in other rich countries. The second graph shows the same drop in taxes but for inheritance tax rates.

Figure 14.1. Top income tax rates, 1900-2013



The top marginal tax rate of the income tax (applying to the highest incomes) in the U.S. dropped from 70% in 1980 to 28% in 1988. Sources and series: see piketty.pse.ens.fr/capital21c.



The immense economic-political shift towards the right wing in the 1980's is well backed, and it seems to have a lasting effect on society. Piketty alluded to the impact of the cold war on shaping this new age but did not go into the details of its effects. It is not difficult to see how the competition between the two global powers, the U.S. and the U.S.S.R, effected society. As he alluded to, hypercapitalism is a significant remnant left by the cold war. Overreaction is a common tendency among humans, and when paired with the slow adaptation of societal beliefs, we are still dealing with the pervasive attitudes left over from the fierce competition between capitalism and communism. As even the slightest movements towards more government involvement today are commonly criticized as being socialist. We can further explain our predicament by the fallacy of individuals to think in black and white terms. You are either an introvert or extravert, minority or majority, democrat or conservative. Today's politics seems to be the epitome of this mechanism. As a result, we have seen an increase in inequality. Akin to inequality at the individual level, we see the same dynamics at the firm level. Bigger firms are more profitable. Around the world countries have been slashing corporate tax rates and easing business regulations, just like they have done for individual income and inheritance taxes.

I would argue that the inequality at the individual versus firm level originates from the same 1980's movement, but they are nonetheless partly independent of each other. Although they do reinforce each other. I'd propose a system of dynamics, with three main balancing factors. First, the richest of

individuals have the most accessible amount of free capital to invest, as a result they invest more in stocks of large firms. Secondly, these large firms receive more capital which gives them the ability to expand and further dominate their industry. This first and second effect feed off each other in an endless loop. Thirdly, the loop effect is limited since investing is also made by the less well off, but to a lessened extent then the rich. In summary, the rich individuals and firms get richer by reinforcing each other at the top while the less well-off invest what they can, taming the overall effect but not overcoming it. In addition, the scale of these effects may increase with further tax cuts and the withering of business regulations. I admit this is all theoretical and has its flaws, but whether my intuition is correct or not, it is difficult to deny any relationship between the trend of inequality at the individual and firm level since the 1980's. This relationship requires further research.