INDUSTRY CLASSIFICATION, INDUSTRY CONCENTRATION AND EXPECTED

STOCK RETURNS

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Abstract

I find that industry classification plays an important role in analyzing industry competition level and its relationship with expected stock returns. It also affects the outcome of industry momentum strategy.

In general, industry concentration level is positively correlated with expected stock returns. This supports Schumpeter's (1942) theory that states society must accept certain level of imperfect competition to have technology advancement. However, an industry classification that has definitions that are too narrow can artificially increase the concentration level and exposes industry portfolio strategies to undiversified firm risks. This research finds that the conflicting results on the relationship between industry concentration and stock returns in current literature are caused not only by not using unified industry classifications, but also by using different sample periods that can be characterized as industry expansion and consolidation eras.

In addition, I find that classic industry momentum strategy does not work under all popular industry classifications used in current literature, especially during 1998-2016. This research, particularly, focuses on 3-digit SICCD, 2-digit SICCD and Fama French 48 industry classifications because these three classifications, among all industry classifications, strike certain level of balance between having reasonable number of industries and number of firms per industry. Not only does classic industry momentum strategy suffer short-term reversal in immediate post portfolio formation returns, but also does the weighting scheme affect the profitability of such strategy. Nevertheless, seasonality plays an important role in outcome of industry momentum strategy.

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List of Abbreviations

AT   Asset

BM   Book to Market Ratio

COMPUSTAT Name of a database of financial, statistical and market information on active and

                inactive global companies throughout the world

CRSP   The Center for Research in Security Prices

ME   Market Equity

FF   Fama-French

ICL   Industry Concentration Level

JT   Jegadeesh and Titman

Mom   Momentum

R&D   Research and Development

SICCD   Standard Industry Classification Code

1. Introduction

Since the earliest asset pricing model introduced by Sharp (1964), Lintner (1965) and Black (1972), there have been various milestone researches discovering risk factors that can help predict the future stock return. Fama and French (FF hereafter) (1992, 1993) show that beta is dead, and size, book to market ratio play important roles in predicting stock returns (12 month). Jegadeesh and Titman (1993) (JT hereafter) discovered momentum and its power predicting future stock return. JT find that by ranking stocks based on past 1 to 4 quarter momentum returns, buy the winners and sell the losers, and then hold such portfolio for next 1 to 4 quarters with/without one week gap can generate significant monthly return as high as 1.49% per month (JK 6-6 portfolio). Later on, Moskowitz and Grinblatt (1999) find that momentum strategy formed by buying top 3 winning industries and selling bottom 3 losing industries can generate positive and statistically significant difference in returns, even after adjusting for size, BM and momentum returns from individual stocks.

Meanwhile, there has been a steam of literature focuses that industry effects on stock returns. Intuitively, industries have different characteristics based on its nature of operation. For example, manufacture industries require purchasing and maintaining higher amount of fixed assets to sustain their operations compared to software industries. Finance and utility industries have stricter regulations than other industries.

The competition level of each industry and the correlations among industries affect how much market power firms in each industry have, thus influence their future accounting performances.

Schumpeter (1942)[1] argues that imperfectly competitive market creates better environment for technical advances and society must accept imperfect competition in order to achieve rapid technology advances. Industry concentration can affect stock returns via two channels. First, firms in highly concentrated industries, via strong market power, can obtain higher profit by manipulating price, compared to firms in competitive industries. I call this the monopoly rent channel. A series of paper in accounting literature has well documented that high industry concentration leads to high level of profitability. This includes but not limited to Qualls (1972), Weiss (1974) and Rhoades (1979).   Subrahmanyam and Thomadakis (1980) develop a theoretical model suggesting that the positive relationship between high profit and industry concentration is caused by the fact that highly concentrated industries are riskier than low concentrated industries, thus investors demand a higher return for the riskier industries.

The other channel is through innovation. However, in this channel, there are conflicting theories and empirical results that present both positive and negative relationship between industry concentration and innovation outcome. Hou and Robinson (2006) find firms in highly concentrated (measured by Herfindal index) industries (classified by 3-digit SICCD) earn lower return than the competitive industries in US. The difference is 4% annually between the highest and lowest concentration quintiles. They incorporate industry organization theory and argue that because firms in highly concentrated industries are insulated from distress risk due to high entry barrel; those firms are less likely to engage in innovation activities, thus likely to have a lower future stock returns than firms from competitive industries. Their findings indeed prove such hypothesis because they find R&D/Asset is negatively correlated with industry concentration

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[1] Schumpeter (1912) also mentions that innovation activity is a form of creative destruction. It is likely to happen at small firms that challenging the status quo of established firms in existing industry. However, this does not necessarily mean firms in monopolistic industries do not have the incentive to innovate.

level measured by net sale from COMPUSTAT. Meanwhile, Aghion at al. (2005) argue that the negative correlation between industry concentration and innovation is caused by simply using number of patents as proxy for innovation outcome. They believe that the major technology breakthroughs from big firms should be treated differently than the minor innovations generated from product differentiations in competitive industries. Indeed, when they use citation weighted patents as proxy for innovation outcome, they find that the relationship between industry concentration and innovation has an inverted U-shape (positive correlation). More importantly, they use 2-digit SICCD to classify industries, resulting in a small sample with 311 firms grouped into 23 industries. Their number of industries is significantly lower than the one under 3-digit SICCD classification.

After Hou and Robinson, there are several extension studies that use same strategy on country level data outside US but with mixed results. For example, Gallagher and Ingnatieva (2015) find firms in highly concentrated industries actually earn a higher future stock return than competitive industries in Australia. They state that this can be caused by the unique characteristics of Australia economy and by the monopoly/duopoly firms extracting the economic rent via manipulating the firms under imperfect competition.

Because these studies use different samples and different industry classifications, it is not practical to compare their empirical results. Hou and Robison use 3-digit SICCD to classify industries, which gives us on average, 297 industries per year during 1963-2001. Gallagher and Ingnatieva (2015) classify firms in Australia into only 25 industries that are from 11 sectors by using S&P Global Industry Classification system as of December 2008. Kahle and Walking (1996) find powerful evidence that shows industry classification is inconsistent between CRSP and COMPUSTAT database as 36% classifications disagree at 2-digit level, and 80%

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classifications disagree at 4 digit level. And they believe that COMPUSTAT matched sample are more powerful in detecting abnormal returns and that 4-digit SIC code matches are more powerful than 2-digit matches. Moskowitz (1999) uses a special 20 industry classification to form industry momentum portfolios. His justification is that the 20 industries categorized based on 2-digit SICCD create well diversified portfolios that have negligible firm-specific risk. They also think this maximize the coverage of NYSE, AMEX and NASDAQ while maintaining a manageable number of industries and ensuring that each industry contains a large number of stocks for diversification. However, I find the industry momentum effect is not consistent under other industry classifications. It is very important for us to understand the characteristics of different industry classifications and its impact on the significance of empirical finance research results.

The rest of my dissertation contains five chapters. Chapter one describes the data sources and standard procedures that I use to clean datasets. Chapter two analyzes the difference among different industry classifications and its effect on industry competition level. Chapter three demonstrates the relationships between industry competition level and expected stock return under different industry classifications, and explains the causes of the conflicting results in current literature. Chapter four analyzes the effect of industry classification on outcome of industry momentum strategy. Chapter five discusses the results further and concludes my research.

2. Data Descriptions

I use monthly stock return data downloaded from CRSP and annual firm fundamentals downloaded from COMPUSTAT. Following standard practice in literature, I include stocks from

NYSE, AMEX and NASDAQ with share code as 10 or 11 only in my sample. A stock must have a positive market capitalization (ME>0) measured by the product of absolute value of alternative price and absolute value of shares outstanding at end of month t to be included into portfolio formation. Observations with return value that is less than -1 are deleted from the sample. I also follow Shumway (1997) to correct the de-listing bias based on data availability. These adjustments, however, does not affect the quality of my research outcomes.

There are two systems of industry classification code in CRSP: North American Industry Classification (NAIC) and Standard Industry Classification Code (SICCD). Because NAIC system started in 1997 and my research is from 1963 to 2016, and the literature related to this research uses SICCD only, thus I choose to use SICCD in order to compare and analyze their results with mine. Firms have missing SICCD are excluded from the sample. It is only a 3% sample size deduction. Besides, categorizing these 3% into "Other" industry instead of deleting it does not affect the analytical outcome at all.

The formula below shows how to calculate Herfindal industry concentration/competition level (ICL hereafter).

$$Herfindahl_{j,t} = \sum_{i=1}^{I} Market\ share^2_{ij,t}$$

ICL can be calculated using any variables represent firm's market power. Hou and Robinson (2006) mainly use net sale from COMPUSTAT. They also use asset and equity from

COMPUSTAT as alternatives and generate consistent results. However, I argue that sales performance from product market does not full reflect the competition for resources on stock market. Investors' decisions are not solely based on the firms' product/service market share. And sales revenue itself does not provide investors with information on profitability (typically measured by earning/share) that is important to predict company's potential growth.

Based on the Herfindal Concentration Index formula, at the end of each month from 1963 to 2016, I calculate the sum of ME/sale for all stocks in each industry j; and then calculate the market share of each stock's ME/sale against the industry total ME/sale. After that, I square the weighting for each stock and then calculate the sum of squared weightings of all stocks in each industry to obtain the Herfindal industry concentration index of that industry at the end of month t based on ME/sale accordingly. Both ICL (ME) and ICL (sale) generate consistent results. The advantage of ICL (ME), however, is that it varies at monthly frequency. This means ICL (ME) includes much more information especially from the stock market movement. ICL (sale) varies at annual frequency so this puts it at great disadvantage compared to ICL (ME). Post-ranking betas are calculated by forming 100 size & pre-ranking beta portfolios first, and then using the full sample to regress the time series of portfolio returns on value-weighted market return for each portfolio. The 100 post-ranking betas are then assigned back to each portfolio. This is standard procedure following Fama and French (1992).

I download additional variables from COMPUSTAT to calculate book equity, leverage, R&D and asset scaled R&D expenses, and Tobin's Q. Book equity is calculated by using common equity quantity plus deferred tax minus preferred stocks and post-retirement contributions. Book to market ratio (BM hereafter) is calculated by using book equity divided by ME from the fiscal year end of previous fiscal year. This is standard procedure following Fama and French (1992).

A firm must have positive asset value, common shareholder equity and book equity values at the end of month t to be included in portfolio formation. Thus, after merging CRSP and COMPUSTAT datasets into one file, all firm years from CRSP that do not have valid accounting information available from COMPUSTAT are excluded from the sample.

3. Industry Classification and Industry Concentration/Competition Level

3.1 Industry Classification and Industry Group Distribution Based on Number of Firms per Industry

There is various industry classifications (based on SICCD) used in current literature. Fama and French (1988) use 17 industry classifications to analyze the permanent and temporary components in stock price. Later on, Fama and French (1997) develop a 48 industry classification system to analyze the cost of equity. The FF 48 industry classification then becomes the standard classification for many research papers conducting industry analysis. Their classification code can be downloaded from Kenneth French's website[2]. Moskowitz (1999) uses 20-industry classification to analyze industry momentum effect. They find that industry momentum effect (buying top 3 winning industries and selling bottom 3 losing industries) can generate significantly positive returns that cannot be explained by size, book to market ratio or individual stock momentums. Aghion at al. (2005) uses 2-digit SICCD classifications and citation weighted patents and find out the relationship between industry concentration and innovation outcome displays an inverted U-shape. Hou and Robinson (2006) use 3-digit SICCD classifications and discover a negative relationship between industry concentration level and stock returns. Gallagher and Ingnatieva (2015) classify firms into only 25 industries that are from

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[2] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library

11 sectors by using S&P Global Industry Classification system as of December 2008, and they find that ICL and stock returns have a positive relationship in Australia. They explain such contradictory results from Hou and Robinson is caused by the unique characteristics of Australian economy.

However, I find the reason that these researches generate different results is caused by using different industry classifications. My research focuses on industry concentration and its time series variations, on one hand, the classifications that have too broad definitions such as 10, 12 and 15 industries mathematically induces much lower industry concentration level for each industry and a much lower ICL volatility as well. On the other hand, 4-digit SICCD classification has industry definition that is too narrow that it artificially gives us too many single-firm industries. It is very important to analyze the relationship between ICL and expected stock returns under 3-digit SICCD, 2-digit SICCD and Fama French 48 industry classifications.

I break industries under each classification into 5 groups each year from 1963 to 2016 based on the number of firms in each industry. This shows a clear distinction of distributions under 3 different classifications. In Table 1, under 3-digit SICCD classification, 42% of firms throughout the sample period have 1 to 3 firms, in which 50% of the industries have just 1 firm. This means almost half of the industries in the sample have ICL either equal to 1 or very close to 1, and throughout the entire sample period, there is about 60 industries on average, per year, have only 1 firm for that industry. Meanwhile, industries that have more than 20 firms take up only 13% of the sample. The top group only exists 85% of sample period. This clearly shows that using 3-digit SICCD system creates a strongly left-skewed ICL distribution. Figure 1 gives us a clear illustration of that.

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[Insert Table 1 about here]

[Insert Figure 1 about here]

In Table 1, 2-digit SICCD classification displays a much more normal distribution where most industries (60%) have the number of firms between 4 and 50. Only 14% of industries have just 1-3 firms. At last, under FF 48 classification, it gives us about 90% of the industries have 4 and more firms. And only 8% of the time that 1-3 firms exist in one industry. This means that ICL volatility is much higher under 2-digit SICCD and FF 48 industry classification.

[Insert Figure 2 and 3 about here]

3.2 Time Series Variation of Industry Concentration Level under Different Classifications

Although both 2-digit SICCD and FF 48 classifications give us a reasonable level of division, I argue that FF 48 system is better because it gives us a fixed (since 1971) number of industries throughout the sample period so that volatility of ICL is isolated to reflect the entries, mergers, acquisitions and exit of firms on stock market. Using 3- or 2-digit SICCD classifications, the number of industries fluctuates over time, with the number of firms in each industry changes along with it. This makes it difficult to isolate the effect of ICL volatility. As Figure 4 shows, under 2- and 3-digit SICCD classifications, the number of industries increased sharply in 1960s, from lower than 100 to 250 industries in 1970; and then it stayed relatively stable from mid 1970s to mid-1980s. After that it increased sharply again during 1990s from 315 to 350 industries at the height of the economic boom. Since 1998, the number of industries sharply decreased, and then stabilized for a few years until the 2008 financial crisis, during when it started to decrease again to 299 industries at the end of 2013.

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[Insert Figure 4 about here]

The average number of firms per industry follows a similar but quite different pattern. During the 1960s and early 1970s, the average number of firms was not increasing as much as the number of industries. This tells us there were more new industries with few firms started to appear. And then, since the middle 1970s until the 2008 financial crisis, the average number of firms per industry followed with a similar magnitude of change as the industry curve. Since the 2008 financial crisis, the number of firms per industry decreased much faster than the number of industries.

In Figure 4, 2-digit SICCD and FF 48 industry classification give us a quite different picture of industry evolutions. Under 2-digit SICCD classification, the number of industries increased sharply from 54 to 70 until middle 1970s, and it became very stable, and varied little around 70. FF 48 industry classification completely isolates the volatility of ICL within each industry from 1971. The number of industries increased steadily to 48 in 1971. After that, it stays at 48. Thus FF 48 industry system is the best classification to analyze the volatility of ICL and its effect on stock returns. However, both FF 48 and 2-digit SICCD classifications are better alternatives than 3-digit SICCD classification because they focus more on the volatility of ICL within established industries, and with much more normal distributions among industry groups as presented in Table 1.

Figure 5 gives us a clear picture of time series variation of industry concentration levels under 3 different classification schemes. Based on Figure 4 and 5, it is clear that the average number of firms per industry reached the historical high in 1997 before it started to decrease sharply. With both number of industries and the average number of firms per industry rising during 1963-1997,

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I characterize this period as the stock market industry expansion era. Since 1998, both number of industries and average number of firms per industry started to decline sharply (except for FF 48 classification, which gives us a fixed number of industries since 1971). I characterize this period as the industry consolidation era.

[Insert Figure 5 about here]

4. Industry Concentration and Expected Stock Returns

4.1 Firm and Industry Characteristics under Different Classifications

What Figure 4 and 5 show translates into big difference of firm/industry characteristics under different classifications. As demonstrated in Section 3.2, 3-digit SICCD classification gives us, on average, 297 industries per year during 1963-2016. This inevitably reduces the average number of firms grouped into each industry.

In the top section of Table 2, during 1963-2016, we can see the average ICL under 3-digit SICCD is 0.567. However, the average ICL dropped to 0.302 under 2-digit SICCD classification; and it is only 0.206 under FF 48 classification. The 80% breakpoints of ICL under 3-digit SICCD is already 1. This means more than 20% of industries in the sample, under 3-digit SICCD, are single-firm industries. Because of the narrow definition under such classification, many single-firm industries are artificially created. This leads to an abnormally high level of ICL. Compared to 3-digit SICCD classification, the 80% breakpoints under 2-digit SICCD and FF 48 classifications are less than 0.500.

In addition, the Pearson correlation matrix of ICLs under 3 different classifications tells us the pattern and distribution of ICLs under the 3 classifications is very different. Even between 2-

digit SICCD and Fama French 48 industry classifications, the correlation coefficient of the two ICLs is only 0.347.

[Insert Table 2 about here]

In this research, I calculate ICL of each industry using both ME and sale and use both ICLs to conduct all analyses; the results and patterns are consistent for both. In Section one of Table 2, during 1963-2016, the ICL is calculated using ME and the firm level statistics under each ICL quintile is displayed for all three classifications.

It is clearly that, when using ICL (ME), during 1963-2016, under all three classifications, the firms in highest concentrated industries earn higher average monthly return than the ones in most competitive industries. For example, in Section One Panel A, the highest concentrated industry quintile earns 1.419% per month, while the most competitive industry quintile earns only 1.331%. I also follow Hou and Robinson (2006) to form 125 benchmark portfolios created by sorting all stocks, at the end of each month, by ME into quintile first, and then sort the stocks in each ME quintile further into quintiles by BM, and then sort the stocks in each of the 25 size BM groups further into quintiles by past year individual stock momentum return. Then the equal weighted return is calculated for each of the 125 size-BM-momentum portfolios. I subtract the benchmark portfolio returns from each individual stock's raw return based on the return of the portfolio each individual stock belongs to. In Section One Panel A, the most competitive industry quintile earns the highest adjusted return as -0.016%, compared to -0.026% from the highest concentrated industry quintile. However, the different is only 1 base point. Such HML difference becomes much larger under 2-digit SICCD and FF 48 classifications. It proves again that the firms in highest concentrated industry quintile earn higher return than the ones in most competitive

industry quintile. Under 2-digit SICCD classification, the adjusted return for 5th quintile is 0.030 VS -0.013 from 1st quintile. The difference is positive 4.3 base points, which is much bigger than the HML difference under 3-digit SICCD classification. And, the HML difference goes up to 28.5 base points under FF 48 industry classification (0.191 in 5th quintile VS -0.106 in 1st quintile).

Besides the HML return difference, Section One displays two other interesting stories. For Industries/year and Firms/year, in Panel A, under 3-digit SICCD classification, in the highest concentrated quintile, the number of industries is 67 while the average number of firms per year is only 69. This clearly shows that almost all industries classified as highest concentrated industries under 3-digit SICCD classification are single-firm industries during 1963-2016. Majority of the firms are located in the most competitive quintile, where the average number of firms per year is 1759. Apparently, 3-digit SICCD classification gives us a highly left skewed distribution because of large number of single-firm industries. Meanwhile, industry portfolio trading strategy based on such classification will inevitably expose investors to undiversified firm risk. 2-digit SICCD and FF 48 classifications do not have such problems because even in highest concentrated industry quintile, cases of single-firm industry is very rare, as displayed in Table 1.

The size (ME) of each ICL quintile also tells us quite different stories under different classifications. Under 3-digit SICCD classification, in Section One Panel A, the average ME of the highest concentrated industry concentration is also the smallest among all quintiles. This tells us that not only does this classification generate a lot of single-firm industries, but also do these firms represent for the smallest firms on the stock market. So the question becomes that is it the negative relationship between ICL and stock returns under 3-digit SICCD classification caused

by industry concentration or size? Meanwhile, under 2-digit SICCD and FF 48 classifications, the highest concentrated industry quintile consists of either the biggest firms or the second biggest firms on the market. It is intuitive to think the highly concentrated industries would have mega size firms as it/they possess dominant/monopoly market power. So the size pattern under 3-digit SICCD classification is counterintuitive.

The R&D and R&D/Asset of each concentration quintile under different classifications also present us different patterns. In Section One Panel A, The R&D/Asset is monotonically decreasing as industry concentration increases under 3-digit SICCD classification, but such pattern does not exist under the two other classifications in Panel B and C. Also the absolute amount of R&D expenses under FF 48 classification shows a clear increasing pattern along with increase in industry concentration level. What is more interesting is that under FF 48 classification, the 2nd and 3rd concentration quintiles seem to have the highest scaled R&D expenses. In summary, the patterns of R&D/Asset are distinct under different industry classifications. What seems to be supporting the industry organization theory under 3-digit SICCD classification actually supports Schumpeter's theory under FF 48 classification. However, expected stock return is not only influenced by firm's R&D expenses. Thus the relationship between ICL and expected stock return cannot be simply determined by the variations of R&D expense.

At last, the average sales display similar pattern as ME's under 3 different classifications. It also represents for the market power firms have on product/service market. This shows that, under 2-digit SICCD and FF 48 classifications, firms in highest concentrated industry quintiles have the biggest market share/strongest market power.

Section Two in Table 2 shows the firm statistics by ICL (sale) quintile. Regardless of what I use to calculate ICL, the patterns of ME, Sale and R&D/Asset tell us the same story.

As mentioned in 3.2, Figure 4 and 5 show clearly that 1998 is a turning point of industry evolution on stock market. Not only does the number of industries under 3- and 2-digit SICCD classifications start to decrease sharply, but also does the number of firms per industry drop sharply. It is important to test whether such patterns displayed in Table 2 are still the same under subsample period 1963-2001 (the same sample period with Hou and Robinson (2006)).

In Table 3, the patterns are mostly consistent with the ones in Table 2. The differences are, in Section Two Panel A, under 3-digit SICCD classification, both raw and adjusted returns show a decreasing pattern, which supports Hou and Robinson's finding during the same sample period. However, the opposite pattern (increasing from low to high) still exists under 2-digit SICCD and FF 48 classification. The single-firm industries in the highest concentrated quintile under 3-digit SICCD still expose investors to firm specific risks and they are also the smallest stocks across all quintiles. The HML differences of both raw and adjusted returns under 2-digit SICCD and FF 48 classifications still display the same patterns.

[Insert Table 3 about here]

4.2 Industry Concentration Quintile Portfolio Return Analysis

Table 2 and 3 show us the different patterns of returns across ICL quintiles under 3 different industry classifications. At the end of June each year, I sort all stocks based on its ICL into quintiles and then hold each quintile portfolios under the end of next June to rebalance the

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portfolios. The equal weighted portfolio return of each quintile portfolio and the HML difference are calculated and displayed in Table 4 and 5.

In Table 4, I create ICL quintile portfolios based on ICL (ME). Panel A, B and C display the results using different sample period. In Panel A, during 1963-2016, clearly the HML returns are positive and significant under all 3 classifications. Under 2-digit SICCD classification, the ICL quintile HML difference is 0.24% per month with a t-value of 4.80 (an equivalent of 2.88% annual difference). Such difference is similar under FF 48 classification as 0.23% with a t-value of 4.56. The adjusted return HML differences are also positive and statistically significant under both 2-digit SICCD and FF 48 classifications. The adjusted return HML difference under 3-digit SICCD classification becomes indifferent from zero, this means the size-BM-momentum 125 benchmark portfolios can potentially explain the cross sectional differences among ICL quintiles under such classification. Again, this is probably due to the fact that 3-digit SICCD generates too many industries with mostly single-firm industries taking up the entire 5th ICL quintile, the portfolio return of the highest concentrated quintile becomes the equal weighted return of a small number (around 65 per year) of firms that are also the smallest firms on the market. It is not surprising that the return of such group of firms could be explained by the 125 benchmark portfolio returns.

[Insert Table 4 about here]

Panel B shows the HML returns of same strategy during 1963-2001. It is still positive and significant as 0.15% per month with a t-value of 2.91 under 2-digit SICCD classification, but the HML raw return differences, although still positive, are not statistically significant under 3-digit SICCD and FF 48 classifications. The HML adjusted return difference under 3-digit SICCD is

negative as -0.12% per month with a t-value of -2.96. The adjusted return HML difference seems to support the industry organization theory under this specific sub sample period that ICL is negatively correlated with expected stock return.

However, in Panel C, during 2002-2016, the HML quintile differences for both raw and adjusted returns are not only all positive and statistically significant; the HML magnitude is also much bigger. Under 3-digit SICCD classification, the HML difference is 0.32% per month with a t-value of 5.73. Such difference increases to 0.49% per month under 2-digit SICCD, and to 0.73% per month under FF 48 classification. The HML difference under FF 48 classification translates into an annual difference of 8.76%. Even the adjusted return HML difference is as high as 0.58% per month of a t-value of 5.44.

The difference between Panel B and C means different eras of industry evolution plays an important role is shaping the relationship between industry concentrations and expected stock returns. The negative relationship between ICL and expected stock returns under 3-digit SICCD classification during industry expansion (1963-2001) can simply be the case that the newly born industries with small single firms are earning lower returns than relatively matured industries with more firms and competition.

Using ICL (sale) to analyze the cross sectional variations among industry concentration quintiles gives us the same pattern displayed in Table 5 except for that under 3-digit SICCD classification, during 1963-2001, the HML difference of both raw and adjusted returns are negative and statistically significant. This seems to support Hou and Robinson's (2006) finding. However, the HML differences under such classification are positive and significant when using full sample period (1963-2016) and sub sample period (2002-2016). In Panel A, all HML raw return

differences are positive and significant. In Panel B, during 1963-2001, HML difference under 2-digit SICCD classification is 0.18% per month with a t-value of 3.32. And the magnitude increases to 0.21% per month during 2002-2016. The HML difference is the highest under FF 48 classification during 2002-2016. It is 0.46% per month with a t-value of 5.57. Even after adjusting for 125 benchmark portfolio returns, the HML difference is still 0.37% per month with a t-value of 5.92. This tells us size, BM or momentum cannot explain the cross sectional variations created by ICL (sale) under all 3 classifications during the full sample period, and during 2002-2016.

[Insert Table 5 about here]

4.3 Do Size, BM and Momentum Explain the Relationship Between Industry Concentration and Expected Stock Returns?

Previous section demonstrates that the cross sectional variations of stock return generated by ICL quintiles in table 4 and 5 cannot be explained the 125 size-BM-momentum benchmark portfolios. To test whether size, BM or momentum can explain the HML difference on its own, I sort all stocks in the sample, at the end of June, by their size, into quintiles, and then within each size quintile, I sort stocks further into quintiles based on their ICL (ME) or ICL (sale). This gives us 25 size-ICL dependently sorted portfolios at the end of June each year. I then hold each of the 25 portfolios for 12 months, and calculate the equal weighted returns of each portfolio, and cross sectional HML ICL quintile return difference within each size quintile as well.

In Table 6 Panel A, using size and ICL (ME), we can see size is able to explain the HML difference under 3-digit SICCD classification, as all HML differences across 5 size quintiles become statistically insignificant. However, 2 out of 5 size quintiles under both 2-digit SICCD

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and FF 48 classifications, the HML returns remain positive and significant. Within the smallest size quintile, the HML difference is 0.12% per month with a t-value of 2.12 under 2-digit SICCD classification and 0.17% per month with a t-value of 3.57 under FF 48 classification. Some may argue because ICL in Panel A is calculated based on size itself, thus this might be the reason.

[Insert Table 6 about here]

In Panel B, when I use ICL (sale) instead to form the 25 size-ICL portfolio, the HML difference indeed becomes much more prominent. Under 3-digit SICCD classification, it is very interesting that the HML difference is negative and significant in 1st and 2nd size quintile, but such difference becomes positive from the 3rd size quintile, and then it becomes positive as 0.13% per month with a t-value of 2.83 from the 4th size quintile. This shows that indeed the negative relationship between ICL (sale) and expected stock returns is probably caused by the differences among small stocks. It echoes my previous findings that the single-firm industries that takes up the entire 5th ICL quintile are also the firms that are the smallest among all ICL quintiles. Again, 2 out of 5 size quintiles under 2-digit SICCD classification and 4 of 5 size quintiles under FF 48 classification show that the HML difference remains positive and significant. It is clear that size cannot explain the cross sectional variations generated by industry concentration quintiles.

The patterns displayed in Table 6 are generally consistent with Table 7, which uses subsample period 1963-2001. In Panel A, it shows although the HML ICL quintile differences become mostly negative under 3-digit SICCD classification, but all of them are still statistically insignificant except for the 2nd size quintile. 3 out of 5 size quintiles under 2-digit SICCD classification, the HML differences are positive and significant. The highest is 0.21% per month with a t-value of 2.97 within 3rd size quintile. Size can also explains the HML ICL quintile

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differences under FF 48 classification as Panel A shows. In Panel B, when using ICL (sale), it is clear that under 3-digit SICCD classification, for the small firms in 1st and 2nd size quintile, the HML differences are negative and statistically significant. However, such difference becomes positive and significant from the 3rd to the last size quintile. And, consistent with Table 6, 2 out of 5 size quintiles under 2-digit SICCD classification, the HML ICL quintile differences are positive and statistically significant.

[Insert Table 7 about here]

Now, controlling for BM instead, I find much stronger patterns of positive HML differences, especially under 2-digit SICCD and FF 48 classifications. In Table 8 Panel A, all HML ICL quintile differences are positive. 2 out of 5 BM quintiles under 3-digit SICCD classification, 3 out of 5 under 2-digit SICCD classification and 4 out of 5 under FF 48 classification show positive HML differences with very high t-values. The general pattern is that the lowest BM quintile seems to have insignificant HML differences, and the difference increases its magnitude as BM increases until the 5th quintile, where HML differences are slightly smaller than previous quintile. For example, under FF 48 classification, the HML difference increases from 0.15% per month under the 2nd BM quintile to 0.38% per month under the 4th BM quintile, and then drops slightly down to 0.32% per month in the 5th BM quintile.

[Insert Table 8 about here]

The patterns are consistent when using ICL (sale) instead. Panel B shows all HML differences are positive except for the 1st BM quintile under 3-digit SICCD classification. And the HML differences under most BM quintiles are positive and statistically significant under 2-digit SICCD and FF 48 classifications. During subsample analysis of 1963-2001, I find consistent

pattern with ICL (ME) and ICL (sale) HML quintile differences. In Table 9 Panel A, most BM quintiles have the HML difference as positive, and 3 out of 5 BM quintiles under 2-digit SICCD and FF 48 classifications display a positive and statistically significant HML difference. The highest HML difference belongs to the 4th BM quintile, the same results with full sample period. When using ICL (sale) to form the 25 BM-ICL portfolios in Panel B, I find very similar HML patterns except for that the HML return magnitude is slightly smaller than when using ICL (ME). It is clear the HML differences across BM quintiles display an inverted-U shape.

[Insert Table 9 about here]

So far, the results show that neither size nor BM can completely explain the cross sectional variations of stock returns by ICL quintiles. But can momentum explain such variation? I construct 25 momentum-ICL portfolios under each classification using the same method with size-ICL and BM-ICL 25 portfolios. Momentum is the past 2nd to 12th month return of individual stock. In Table 10 Panel A, momentum seems to explain the ICL HML difference under 3-digit SICCD classification, but it cannot do so under 2-digit SICCD and FF 48 classification. When using ICL (ME), in Panel A, the HML differences are positive and significant in 4 out of 5 momentum quintiles under 2-digit SICCD and FF 48 classification. Also, the highest HML differences belong to the 4th momentum quintile under 2-digit SICCD and FF 48 classifications. This inverted U-shape is similar to what I find in BM-ICL analyses.

[Insert Table 10 about here]

In Panel B, almost identical patterns are found when using ICL (sale). And the HML difference in the 4th momentum quintile under 3-digit SICCD classification also becomes positive and statistically significant. The magnitude of HML differences is smaller compared to the ones

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when using ICL (ME); but the inverted U-shape with peak at 4th momentum quintile is consistent. The subsample period analysis of 1963-2001 in Table 11 shows that momentum can explains the cross sectional variations generated by ICL (ME) or ICL (sale) under 3-digit SICCD classification except for the 4th momentum quintile when using ICL (sale). However, momentum cannot explain all the HML differences under 2-digit SICCD and FF 48 classification. The winner-loser momentum spreads in Table 11 are much bigger than the ones in Table 10. This shows that momentum effect weakens during industry consolidation era (1998-2016). The regression analysis I conduct later will explain the pattern as well.

[Insert Table 11 about here]

To summarize all the findings from this section, the pattern difference under 3 industry classifications shows industry classification that has narrow definition is not the best choice to analyze the time series variation of industry concentration levels and its relationship with expected stock returns. Because such industry classification creates a large number of single-firm industries that takes up more 20% of the industries in the sample, the HML differences between highest concentrated and most competitive industries can be caused by the differences between small firms that emerged on the stock market as new single-firm industries and the big firms that exist on the market in matured industries that have already developed from a long period of time.

4.4 Fama MacBeth Regression Analyses of ICL and Stock Returns

In previous sections, I find that the relationship between ICL and stock return can be affected by industry classifications and sample periods. In general, the relationship is positive, but during 1963-2001, under 3-digit SICCD classification, when use sale to calculate the industry concentration level, the relationship becomes negative. However, such negative

relationship is likely caused by the fact that 3-digit SICCD classification artificially creates a very large of industries on the stock market, which mathematically increases the average concentration level among all industries. And the highest concentrated quintile is consisted of single-firm industries that are also the smallest firms on the market. Thus, the seemingly negative relationship between ICL and stock return can simply be caused by small firms in newly established industries earning lower return than big firms in well-established and more competitive industries. Using both ICL (ME) and ICL (sale) I find consistent patterns that demonstrate the positive relationship between ICL and stock return under 2-digit SICCD and FF 48 classifications. What is more important, such positive and significant HML ICL quintile difference cannot be explained by size, BM or momentum.

To further support my findings, I conduct Fama MacBeth (1973) regressions of stock return on ICL (ME) and ICL (sale) separately, with size, BM, leverage, momentum and post-ranking beta (Fama French (1992)) controlled. The results strongly support the findings that ICL and stock returns have positive relationship that is statistically significant, and the negative relationship pattern between ICL and stock return is unique under 3-digit SICCD classification during 1963-2001 subsample period only.

In Table 12, during 1963-2016, it is apparent that, after controlling size, BM, momentum, leverage and post-ranking beta, the coefficient of ICL (ME) is positive and significant under both 2-digit SICCD and FF 48 classifications. The impact level of ICL (ME) on expected stock return is even higher as 0.474 with a t-value of 3.42 under FF 48 classification. At the same time, the relationship between ICL (ME) under 3-digit SICCD classification and stock return is positive but statistically insignificant. The negative coefficient of size, positive coefficient of BM and momentum is consistent with findings in the literature.

[Inert Table 12 about here]

Why is the relationship between ICL (ME) and stock return under 3-digit SICCD classification insignificant? The answer is in Table 13. In Panel A, during 1963-2001, ICL (ME) and stock return, under 3-digit SICCD classification, show a negative relationship as ICL (ME)'s coefficient is -0.293 with a t-value of -2.93. The relationship under the other two classifications, however, becomes the insignificant. This tells us the negative relationship between ICL (ME) and stock return is unique to sample period 1963-2001 under 3-digit SICCD classification only. In Panel B, when I conduct the same regressions for sample during 2001-2016, the relationship between ICL (ME) and stock return all become positive and statistically significant. Another interesting finding is the coefficient of momentum becomes negative and post-ranking beta's coefficient becomes positive and statistically significant. This explains why the momentum winner minus loser spread in Table 10 and Table 11 is much higher during 1963-2001.

[Insert Table 13 about here]

Some people may argue that the positive relationship between ICL (ME) and stock return under 2-digit SICCD and FF 48 classifications is influenced by sub sample period 2002-2016, but when I use ICL (sale) instead ICL (ME) in regression analyses, it is clear that the positive relationship between ICL and stock return under the two classifications is not unique to the sub sample period 2002-2016.

First of all, the results in Table 14 show the positive relationship between ICL and stock return is consistent when using ICL (sale) as well. The coefficient of ICL (sale) under 3-digit SICCD classification remains positive, but statistically insignificant. And, the positive coefficients of ICL (sale) under the other two classifications remain statistically significant. The coefficients are,

however, much bigger than the ones in Table 12 (when use ICL (ME)). The coefficients of control variables show consistent patterns.

[Insert Table 14 about here]

In subsample period analyses, as Table 15 shows, during 1963-2001, ICL's coefficient is negative under 3-digit SICCD classification while the coefficients under 2-digit SICCD and FF 48 classifications are positive and statistically significant. However, during 2002-2016, under 3-digit SICCD classification, the coefficient of ICL (sale) becomes positive but statistically significant. The coefficient under 2-digit SICCD becomes insignificant; but it is still statistically significant under FF 48 classification.

[Insert Table 15 about here]

It is clear that, based on the results from Table 12 to Table 15, during 1963-2016, the relationship between ICL and stock return is positive and statistically significant under both 2-digit SICCD and FF 48 classifications for both ICL (ME) and ICL (sale). The negative relationship between ICL and stock return is unique to 3-digit SICCD classification and sub sample period 1963-2001 only. This strongly supports my findings from portfolio analyses in previous chapters.

5. Industry Classification and Industry Momentum

5.1 Industry Momentum Strategy and Its Limit

Moskowitz and Grinblatt (1999) find that, out of 20 industries based on 2-digit SICCD classification, a momentum strategy formed by buying top 3 winning industries and selling

bottom 3 losing industries can generate positive and statistically significant difference in returns, even after adjusting for size, BM and momentum returns from individual stocks.

However, classifying all stocks into only 20 industries based on 2-digit SICCD poses a potential issue that the industry definitions are too broad. This means that stocks actually from different industries that do not directly or indirectly compete with one another can be bundled into the same industry group artificially, which then achieves the purpose of diversification. However, industry momentum strategies established on very broad industry definitions may not stand under other industry classifications such 3-digit and 2-digit SICCD classification. The broader the industry definition is, the harder it is to isolate the persistent performance of a sub level industry in that group. Diversification is achieved through these artificial groupings. This means if we simply use 2-digit SICCD to classify all firms into 10 industries instead of 20, and buy the top one and sell the bottom one based on momentum returns, it would be very similar to the relative strength strategy established by Jegadeesh and Titman (1993).

On the other hand, short-term reversal effect has been well established for over 40 years now. Jegadeesh (1990) find that buying losers and selling winners based on past month performance and hold the portfolio for just one month can generate as high as 2% return. Such phenomenon does not exist in Moskowitz's result. However, after testing industry momentum strategy under the three classifications (2-digit SICCD w/o grouping, 3-digit SICCD and Fama French 48), I find that not only the immediate returns of using industry momentum strategy suffer from short-term reversal effect under 3-digit SICCD, but also, in general, such strategy does not work well during 1998-2016 (industry consolidation era).

In addition, I test the strategy under both equal and value weighting schemes and find that weighting schemes also affect the outcome of industry momentum strategy.

5.2 Industry Momentum Strategy under Different Classifications

Using the same sample from previous industry concentration research, I include stocks from NYSE, AMEX and NASDAQ with share code 10 or 11 only. Stock/industry's momentum return is defined as past accumulative returns of various horizons. I use past month and past 1 to 4 quarters as five different horizons to rank industries' historical performance. Regardless of the industry classification systems, at the end of each month, I always buy the top 15% winner industries and sell the bottom 15% loser industries to calculate the WML differences as the hedging portfolio return. This is equivalent of taking the 3 winning industries and 3 losing industries from the 20 industry classification used by Moskowitz (1999). Once the portfolio is formed, I hold it for 1 month, and 1 to 4 quarters and calculate the average monthly return of each of the holding periods with both value and equal weighting schemes. Individual stock's returns are winsorized at 0.5% and 99.5% level at the end of each month to mitigate outliers' impact on test results.

To adjust for size & BM 25 benchmark portfolio returns, at the end of each month, I rank stocks into 5 groups by size (ME), and then rank stocks in each ME quintile further into 5 groups by BM. This gives us the 25 ME & BM benchmark portfolios, the equal weighted benchmark portfolio returns are calculated for various holding periods. After that, the 25 benchmark portfolio returns are merged with the sample by year, month and CUSIP. At last, the benchmark portfolio returns are subtracted from the individual stock returns so that the adjusted industry portfolio returns can be calculated based on the adjusted returns.

In previous sections, I explained why 3-digit SICCD classification exposes investors to undiversified firm risks. Because it has 21% Industries that are single-firm industries and represent for the smallest stocks on the market. Thus having industry portfolios based on 3-digit SICCD classification will inevitably generate portfolios that are much less diversified than 2-digit SICCD or FF 48 classification.

First of all, I test industry momentum strategy under 3 different classifications using value weighted returns. As Table 16 demonstrates, except for using past 12-month momentum returns to identify winners and losers, industry momentum strategy suffers from short-term reversal from the 1st to 3rd month immediately after portfolio formation. Under 3-digit SICCD classification, during 1963-2016, when using past month momentum to rank industries, the 1st month WML return is -0.73% with a t-value of -4.36. The reversal pattern starts to disappear from the 3rd or 6th holding month. If investors hold such portfolio for 9 or 12 months, the industry momentum strategy can generate 0.15% or 0.22% per month during 1963-2016. It is clear that using any historical returns that have horizon shorter or equal to 9 months will lead to short-term reversal or immediate WML returns statistically indifferent from zero

 [Insert Table 16 about here]

Nevertheless, as mentioned at the beginning of my dissertation, not only does the number of industries start to decline in 1998, but also does the average number of firms per industry decreases sharply from the same year. When industries are expanding, it means economy looks prospective, more firms are joining existing industries and new industries are established. Investors tend to be more optimistic about the future and believe the winners will most likely continue to be winners. However, when industries are consolidating, it means that either the

market competition is driving some of the firms out of the game or simply that economy is in recession. Post 1998 era includes two major recessions, it is important to test whether industry momentum strategy works during both industry expansion (1963-1997) and industry consolidation (1998-2016) era.

Table 17 shows two very different pictures. On one hand, in panel A, under the same industry classification, during 1963-1997, industry momentum strategies still display short-term reversal pattern in immediate 1 to 3 month post portfolio formation, but in general, for most medium investment horizons (6 to 12 month holding periods), the industry momentum strategy works very well. Using past 9 month momentum return to form industry momentum WML portfolios can generate 0.81% per month with a t-value of 8.20 for 6-month holding period, which translates into 9.72% per year. On the other hand, in panel B, during 1998-2016, not only do industry momentum strategy returns display short-term reversal patterns in immediate holding period returns, but also that none of strategies generate positive returns with statistical significance except for a few medium horizons when using past 6 or 9 month industry momentums to form the portfolio and for hold for 3 to 9 months. Again, this tells us that when using classifications that have very narrow definitions of industries, industry momentum strategy exposes investors to firm specific risks because the single firm or 2-3 firm industries takes up 42% of the entire sample (1963-2016) under 3-digit SICCD classification. It is clear that the industry momentum strategy does not work very well under 3-digit SICCD classification during industry consolidation era (1998-2016).

[Insert Table 17 Here]

However, I argue that, compared to 20-industry classification, 3-digit SICCD classification is the other end of extreme. It is useful to test whether same strategy (buying top 15% industries and selling bottom 15% industries) works well under 2-digit SICCD and FF 48 classifications that give us industries with concentration level more evenly distributed.

From Table 18 to Table 21, in general, it shows that under industry classifications that have broad definition, the short-term reversal effect seems to disappear. Although none of the VW WML returns are negative from all 4 tables, the immediate 1st to 3rd month holding period returns are still most statistically insignificant except for when using past 12 month momentum to identify winner and loser industries.

[Insert Table 18 and Table 19 about here]

However, regardless of industry classifications, it is clear that, during 1998-2016 industry momentum strategy does not work nearly as well as during 1963-1997. In Table 19 Panel B, when using past month momentum to identify winners and losers, regardless of holding periods, WML returns are all indifferent from zero. Using past 3 month momentum suffers the same fate except for when holding the portfolio for 12 months, which gives us 0.25% return per month with a t-value of 2.09. And, the immediate 1st month holding returns of all strategies are indifferent from zero during 1998-2016.

Under FF 48 classification, industry momentum strategy gives us very solid positive returns most of the time. And its performance is also the strongest amongst the 3 industry classifications. It is surprising that, as Table 20 shows, the immediate 1st month holding period return is 0.65% with a t-value of 3.70 when using past month momentum to identify winners and losers. This is a big contrast from the results under 3-digit and 2-digit SICCD classifications. In addition, the WML

returns are very steady across different investment horizons. For example, when using past 3 month momentum to form portfolios, the monthly return is most around 0.44% with t-value greater or equal to 2.26. It is apparent that, under FF 48 classification, during 1963-1997 as Table 21 Panel A shows, the industry momentum strategy does not suffer any short-term reversals like under 3-digit and 2-digit SICCD classifications. All immediate 1st month holding period month are positive and statistically significant. This strongly supports my reasoning earlier. Using industry classifications that have broad industry definitions, such as FF 48 or Moskowitz's 20-industry classification, each industry is already diversified enough because the average number of firms per industry is much larger than under 3-digit and 2-digit SICCD classifications. As the Pearson correlation matrix shows in Table 2 and 3, although the number of industries is not much different between FF 48 and 2-digit SICCD classification, but the correlation of the competition level that the two systems represent for is very low.

Table 21 Panel B shows that industry momentum strategy performs quite well even during 1998-2016. This is very different from the results under 3-digit SICCD and 2-digit SICCD classifications. Based on the results I discussed so far, it is clear that industry momentum strategy works well only if the industry portfolios is already diversified under a specific industry classification. But, when grouping firms into mega industries artificially, such as 10 or 20 industry classifications, the definition of industry is already broad enough to serve the purpose of diversification. Thus such industry momentum strategy might be the same as the classic momentum strategy based on individual stock momentums.

[Insert Table 20 and Table 21 about here]

5.3 Industry Momentum Strategy under Equal Weighted Scheme

When using value weighted scheme to calculate portfolio returns, the results will be driven by the big stocks in every portfolio as the weights is determined by firm's market equity VS ME of the industry that it belongs to.

From Table 22 to Table 27, I recalculated the WML returns of each strategy using equal weighted scheme under all 3 industry classifications. In general, the results show that WML returns are smaller than the ones under 3-digit SICCD classification with value weighted scheme. But under FF 48 classification, the equal weighted scheme performs much better than value weighted scheme in general. The short-term reversal patterns are mostly the same with value weighted scheme that it is prominent in immediate horizons under 3-digit SICCD classification. And the strategies do not work well during 1998-2016 under 3-digit SICCD classification as Table 23 Panel B shows. Again, out of 3 classifications, the industry momentum strategies perform the best under FF 48 classification. The contrast of results between value weighted and equal weighted scheme tell us that industry momentum strategy returns are also partially driven by the performances of big stocks under 3-digit SICCD and 2-digit SICCD classifications.

[Insert Table 22 and Table 23 about here]

[Insert Table 24 and Table 25 about here]

[Insert Table 26 and Table 27 about here]

The performance of both value weighted and equal weighted strategies are consistent after controlling for 25 Size & BM benchmark portfolio returns. The results from Table 37 to Table 42 show that, in general, the adjusted return from all strategies earn slightly higher returns under

3-digit SICCD, 2-digit SICCD and FF 48 classifications. The difference is higher though, under

3-digit SICCD and 2-digit SICCD classifications, compared to FF 48 classification. This indeed

supports Moskowitz's claim that industry momentum cannot be explained by size or BM.

[Insert Table 28, 29, 30, 31, 32, 33 about here]

[Insert Table 34, 35, 36, 37, 38, 39 about here]

5.4 Seasonality in Industry Momentum Strategy

The conventional portfolio strategy, following Fama and French (1992), is to form

annually rebalanced portfolios at the end of June each year, and then hold portfolios for the next

12 months before it is rebalanced.

My strategy follows Jegadeesh and Titman (1993)'s relative strength strategy that form monthly

rebalanced portfolios. Thus, the industry momentum strategy based on past 12 month momentum

to identify winners and losers, at the end of any month, there are 12 portfolios in hand. Thus the

industry momentum strategy returns displayed from Table 16 to Table 27 are the average

monthly return of all concurrent rolling portfolios.

Jegadeesh and Titman also identify the January effect when the short-term reversal is most

prominent. Thus, it is important to test whether seasonality affects the profitability of industry

momentum strategy. Using the strategy that identifies winner and loser industries based past 12

month returns and hold WML portfolio for 1 month and 1 to 4 quarters, I test the annually

rebalanced value weighted industry momentum strategy with formation at the end of each

calendar month under 3-digit SICCD, 2-digit SICCD and FF 48 classifications from Table 40 to

Table 42.

In Table 40 Panel A, the WML returns from the strategy formed from January to June clearly demonstrate that Industry momentum strategy under 3-digit SICCD classification does not work all the time. If the annually rebalanced is formed at the end of January, February or March, regardless of the holding periods, all WML returns are statistically insignificant. From April to June, as portfolio formation months, the strategy works well in general, except for the immediate 1st to 3rd holding month when portfolios are formed in April or June.

[Insert Table 40 about here]

However, if investors choose to use same industry momentum strategy at the end of July each year, as Table 40 Panel B shows, it will not generate any WML returns that are statistically significant. August, September and October are generally good months to use the strategy except for the immediate 1st to 3rd month holding periods from August. From November, industry momentum strategy stops working again, except for the 1.85% short-term return when portfolios are formed the end of November. Consistent with Jegadeesh and Titman's findings, in general, the winter season that includes November, December, January, February and March are not good time to use industry momentum strategy. The rest of year, except for July, the strategy works well except for some immediate horizons.

The seasonality under 3-digit SICCD classification does not necessarily exist under 2-digit SICCD and FF 48 classifications as the latter 2 systems give us much more diversified industry portfolios. However, I still find that the strategy does not work all the time. In Table 41 Panel A, January effect that exists under 3-digit SICCD classification disappears under 2-digit SICCD classification. All horizons have positive WML returns with t-values that greater or equal to 2.33. When holding for 12 months, the WML return is 0.67% per month. After January, the strategy

stops working for about three months from February to April except for the 9 to 12 month horizon in April and 3 month horizon in March.

[Insert Table 41 about here]

The seasonality pattern is complex under 2-digit SICCD classification. Right after May, June gives us WML returns that are not statistically significant (I consider the bottom line as 5% significance). July's portfolio performance is also miserable as the only statistically significant WML return belongs to the 12 month horizon. Medium horizons work well if portfolios are formed between August and December with the exception that immediate horizon in August, September and December do not generate statistically significant WML returns.

As FF 48 classification gives us the most diversified industry portfolios, I expect the strategy to perform better under it. In Table 42 Panel A, it is apparent that it does not suffer from January effect either. However, From February to April, it is not a good time to use industry momentum strategy as all WML returns are statistically insignificant expect for the 3 month horizon when portfolios are formed at the end of April. All horizons in May perform really well; the annually rebalanced industry momentum portfolios with 12 month horizon can generate 0.54% per month.

[Insert Table 42 about here]

In contrast with the performance under 3-digit SICCD classification, June is not a good month for either 2-digit SICCD or FF 48 classification. As Table 42 Panel A and B show, all WML returns in June and July are statistically insignificant. However, for the next 4 months, from August to November, industry momentum strategy works really well except for immediate horizon under FF 48 classification. The annually rebalanced portfolio with 12 month holding

period can generate 0.58% per month with a t-value of 2.52 if portfolios are formed at the end of August. This translates into 6.96% annual return during 1963-2016. In December, the strategy suffers the same fate as under 3-digit SICCD classification.

To summarize, the seasonality patterns are very different under 3 different classifications. Thus the outcome of industry momentum strategy is highly dependent on the classification that groups firms into industries. In general, the same strategies under 2-digit SICCD and FF 48 classifications perform better than under 3-digit SICCD classification because the industry portfolios are more diversified, but all 3 classifications have significant seasonality issues that almost half of 12 calendar months does not generate statistically significant WML returns. It is safe to say that from August to October, industry momentum strategies work well under all 3 classifications. For the rest of year, the patterns are very different from one another.

6. Conclusion and Discussion

Microeconomic and industry organization theories seem to have different interpretations on the relationship between industry concentration and expected stock returns. Monopoly rent theory indicates that firms in highly concentrated industries can manipulate price to obtain abnormally high profit margin, which predicts higher expected stock returns. Industry organization theory indicates that because of high entry barrel, firms in highly concentrated industries are less likely to engage in innovation activities, thus lead to lower future stock returns than the ones in competitive industries. Current literature in both accounting and financial fields seems to support both theories with mixed results.

To my knowledge, this is the first research that discovers that not only does industry classification play an important role in determining the relationship between industry

concentration and stock returns, but also does it influence the outcome of industry momentum strategies. Such relationship is also influenced by different sample periods that represent for industry expansion and consolidation eras. It is also the first research to consolidate the mixed results from current literature on the relationship between ICL and expected stock returns; and points out the caveat of 3-digit SICCD classification.

Because 3-digit SICCD classification generates not only too many industries (about 300 industries on average per year), but also too many single-firm industries (21% of industries in entire sample), using such classification to form industry portfolios faces firm specific risks. It also gives us a left skewed ICL distribution because more industries are created with fewer firms in each industry. This artificially increases the average level of industry concentration in the sample. Using 3-digit SICCD classification to analyze industry concentration does give us a negative relationship with stock return, but only when using ICL (Sale) and during sub sample period 1963-2001. The relationship becomes positive during the industry consolidation era (1998-2013) under 2-digit SICCD and FF 48 classifications, for both ICL (ME) and ICL (sale).

On the other hand, 10-, 15- or 20-industry classifications have too broad industry definitions that they are not efficient to analyze the cross sectional variations of stock returns based on industry concentration level. Thus, 2-digit SICCD and Fama French 48 industry classification are the happy middle grounds.

Not only is FF 48 industry classification able to isolate the time series variation of industry concentration with a fixed number of industries throughout the past 50+ years, but also does it give us the most consistent performance under ICL (sale) during both expansion and consolidation era, compared to 3-digit and 2-digit SICCD classifications. The cross sectional

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variations of stock returns generated by ICL cannot be explained by existing risk factors such as size, BM and momentum based on the results from dependently sorted 25 portfolios and Fama MacBeth regressions.

Classic industry momentum strategy suffers from short-term reversals when used under 3-digit and 2-digit SICCD classifications. And such strategy does not work well during industry consolidation era (1998-2016). I find that not only does industry classification influence the outcome of industry momentum strategy, but also does seasonality play an important role. In general, from August to October, it is safe to use industry momentum strategy under 3-digit, 2-digit SICCD and FF 48 classifications. For the rest of year, each classification has its unique seasonality pattern. Investors should use it with caution.

I consider 2-digit SICCD and FF 48 classifications are the top 2 industry classifications for industry related analysis including industry concentration and industry momentum. Because 3-digit SICCD has industry definition that is too narrow, it generates too many industries with over 20% single-firm industries that also represent for the smallest firms on the market. 10-, 15- or 20-industry classifications have too broad industry definitions that group firms artificially into mega industries. Because of this, the real competition level is very hard to measure. It is very important to establish standard industry classifications to conduct industry related studies; otherwise it would be very difficult to compare and analyze the results from different studies and discuss the implications of the findings.

Table 1. Industry Groups by Number of Firms Per Industry Under Different Industry Classification System 1963-2016

	3-digit SICCD Classification			2-digit SICCD Classification			Fama French 48 Industry Classification		
Industry Group	% of Time Existed	% of Total Number of Industries In Sample		Industry Group	% of Time Existed	% of Total Number of Industries In Sample		Industry Group	% of Time Existed	% of Total Number of Industries In Sample
1-3 firms	100%	42%		1-3 firms	99%	14%		1-3 firms	10%	9%
4-10 firms	100%	29%		4-10 firms	99%	18%		4-10 firms	83%	15%
11-20 firms	100%	16%		11-20 firms	100%	16%		11-20 firms	100%	13%
20-50 firms	100%	9%		20-50 firms	100%	26%		20-50 firms	100%	27%
>50 firms	85%	4%		>50 firms	99%	27%		>50 firms	97%	47%

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Figure 1. Industry Groups By Number of Firms/Industry Under 3-digit SICCD Classification 1963-2016

■ % of Total Number of Industries In Sample

42%   29%   16%   9%   4%

1-3 firms   4-10 firms   11-20 firms   20-50 firms   >50 firms
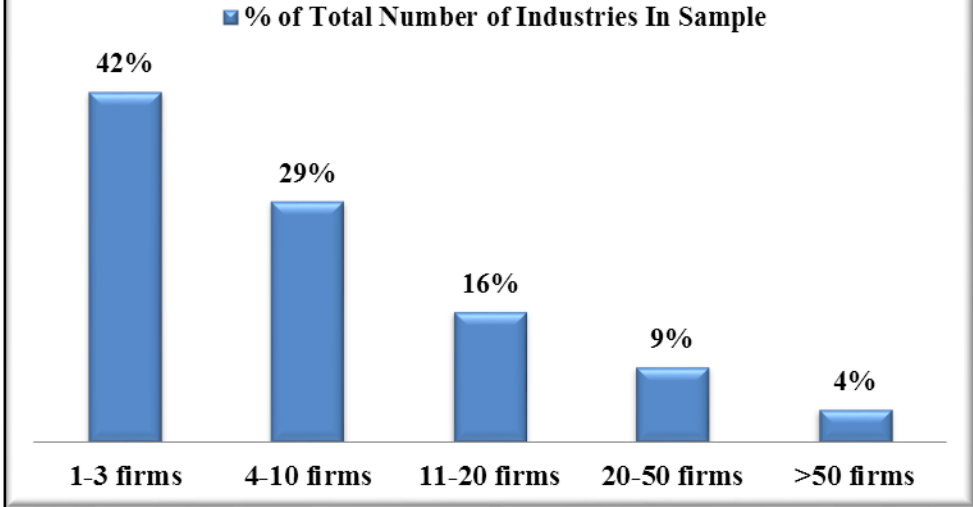
Figure 2. Industry Groups By Number of Firms/Industry Under 2-digit SICCD Classification 1963-2016

■ % of Total Number of Industries In Sample

14%   18%   16%   26%   27%

1-3 firms   4-10 firms   11-20 firms   20-50 firms   >50 firms
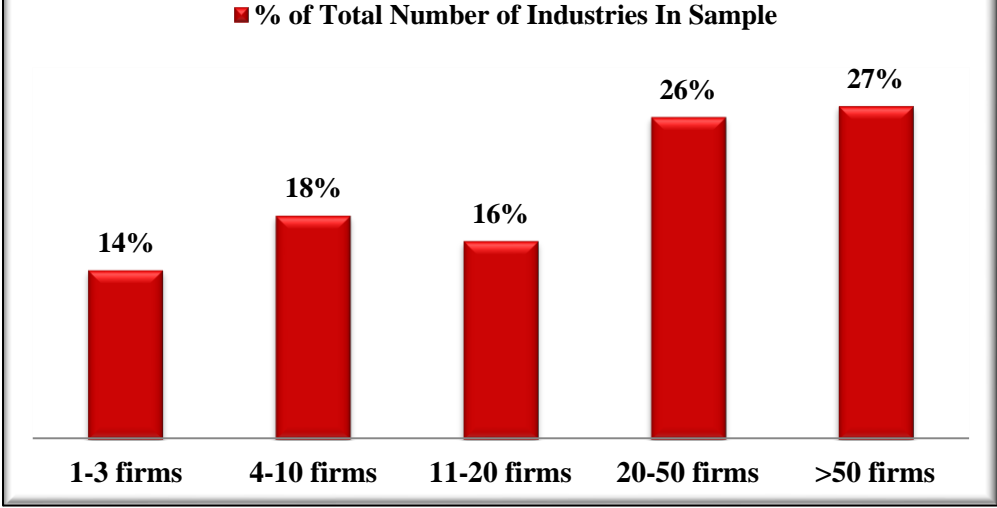
Figure 3. Industry Groups By Number of Firms/Industry Under Fama French 48 Industry Classification 1963-2016

■ % of Total Number of Industries In Sample

1-3 firms	4-10 firms	11-20 firms	20-50 firms	>50 firms
9%	15%	13%	27%	47%
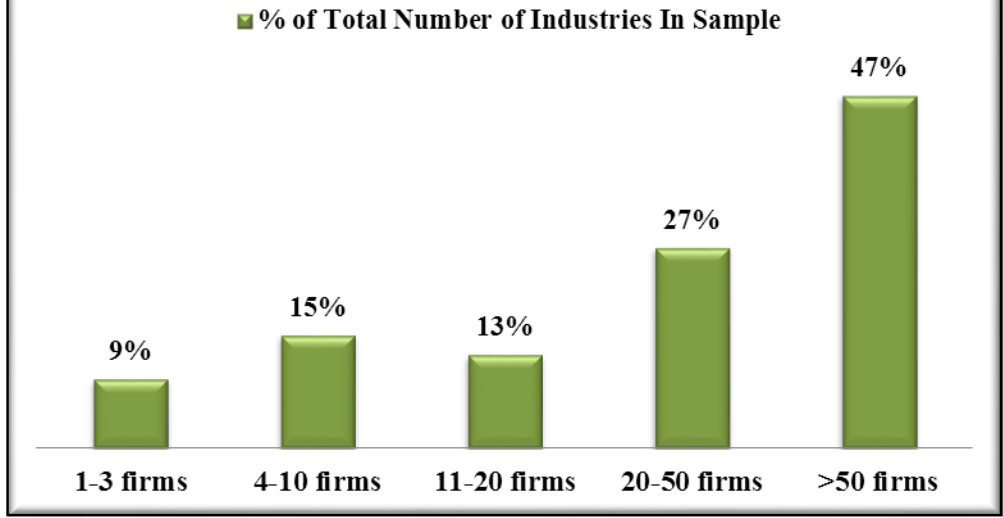
Figure 4. Industry Development - Number of Industries Under Different Classifications 1963 -2016

- - - 3-digit SICCD

—— 2-digit SICCD

• • • FF 48
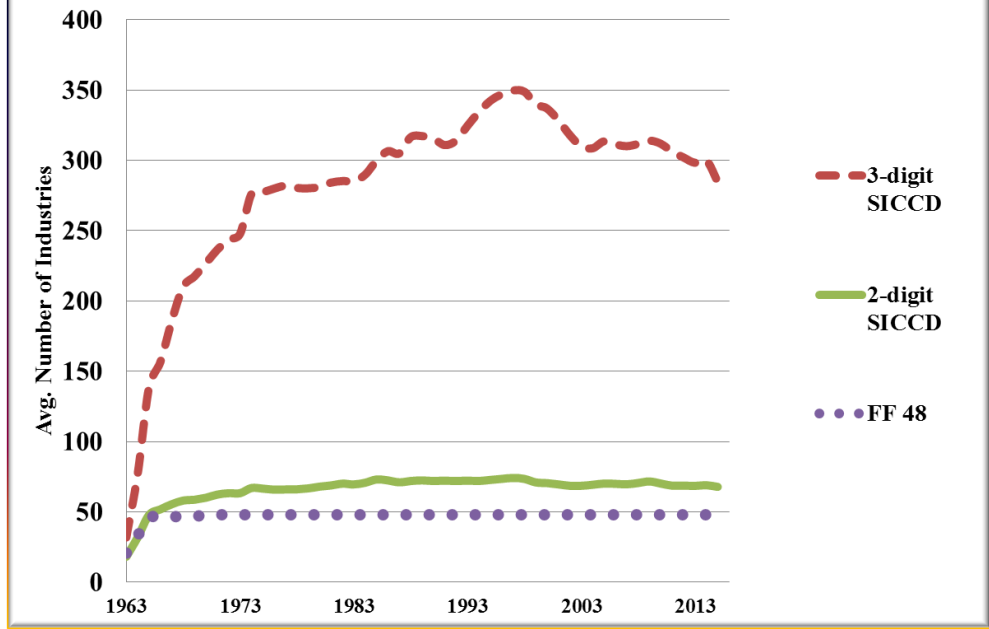
Figure 5. Industry Development - Average Number of Firms Per Industry Under Different Classifications 1963 - 2016
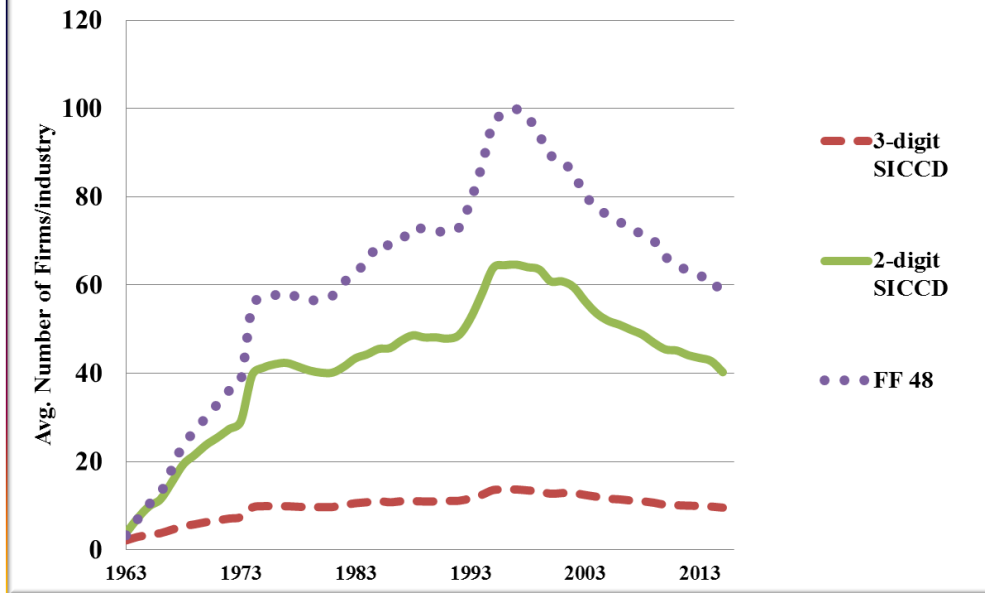
Table 2 Summary of Firm Level Statistics By Different Industry Classifications 1963-2016

Classification	Avg. ICL	STDEV	Min	20%	40%	60%	80%	Max	Pearson Correlation of ICLs SICCD(3)	SICCD(2)	FF 48
3-digit SICCD	0.567	0.315	0.019	0.253	0.406	0.615	1.000	1.000	1	0.494	0.309
2-digit SICCD	0.302	0.276	0.016	0.091	0.155	0.250	0.471	1.000		1	0.347
FF 48	0.206	0.170	0.015	0.076	0.119	0.188	0.307	1.000			1

Section One - Industry Concentration Index Calculated by ME

Panel A Quintile Statistics Under 3-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	56	1759	0.192	1.331	-0.016	1159	0.570	1933	1303	9.186	0.017
2	57	620	0.362	1.371	-0.029	1366	0.573	1590	1764	9.772	0.011
3	57	348	0.549	1.344	-0.046	1276	0.578	1497	1365	8.290	0.010
4	47	206	0.809	1.355	-0.059	1490	0.572	1693	1619	12.537	0.010
High	67	69	0.999	1.419	-0.026	945	0.573	1324	833	4.484	0.007

Panel B Quintile Statistics Under 2-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	12	1430	0.079	1.344	-0.013	1221	0.567	2054	1185	12.495	0.022
2	13	829	0.146	1.313	-0.076	1165	0.582	1712	1429	9.007	0.013
3	13	410	0.224	1.443	0.039	1147	0.579	1523	1434	4.023	0.007
4	13	249	0.366	1.364	-0.039	2053	0.578	2568	2932	4.218	0.005
High	13	81	0.765	1.393	0.030	1501	0.536	1641	1413	5.321	0.007

Panel C Quintile Statistics Under Fama French 48 Industry Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	8	1129	0.069	1.232	-0.106	1211	0.594	2413	1341	7.481	0.014
2	9	804	0.110	1.449	0.072	1341	0.553	1700	1308	16.494	0.028
3	9	517	0.163	1.381	-0.014	1279	0.556	1558	1388	13.860	0.018
4	9	353	0.277	1.329	-0.027	1358	0.533	1441	1306	16.810	0.018
High	10	203	0.537	1.568	0.191	2702	0.531	2633	2201	22.668	0.017

Section Two - Industry Concentration Index Calculated by Sale

Panel A Quintile Statistics Under 3-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return t+1	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	56	1755	0.177	1.346	-0.015	1262	0.574	1912	1475	9.963	0.017
2	57	670	0.323	1.361	-0.033	1284	0.575	1492	1457	9.447	0.012
3	57	325	0.504	1.371	-0.032	1290	0.576	1533	1424	7.458	0.010
4	47	181	0.790	1.355	-0.046	1426	0.569	1784	1716	13.138	0.010
High	67	69	0.999	1.406	-0.037	947	0.571	1335	849	4.533	0.007

Panel B Quintile Statistics Under 2-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	12	1410	0.072	1.336	-0.024	1285	0.571	1889	1162	12.527	0.024
2	13	909	0.129	1.307	-0.089	1061	0.582	1535	1272	8.345	0.013
3	13	424	0.195	1.457	0.040	1545	0.582	2216	2437	6.857	0.006
4	13	189	0.327	1.439	0.040	1689	0.576	2144	2068	2.336	0.005
High	13	67	0.748	1.326	-0.021	1512	0.532	1716	1457	4.987	0.007

Panel C Quintile Statistics Under Fama French 48 Industry Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	8	1191	0.064	1.298	-0.050	1205	0.590	2208	1216	10.252	0.018
2	9	756	0.096	1.416	-0.001	1240	0.569	1514	1228	12.483	0.022
3	9	509	0.148	1.345	-0.041	1396	0.552	1779	1454	15.412	0.022
4	9	357	0.230	1.423	0.063	1615	0.530	1657	1395	17.446	0.020
High	10	194	0.471	1.490	0.153	2451	0.524	2592	2246	22.130	0.016

Table 3 Summary of Firm Level Statistics By Different Industry Classifications 1963-2001

Classification	Avg. ICL	STDEV	Min	20%	40%	60%	80%	Max	Pearson Correlation of ICLs SICCD(3)	SICCD(2)	FF 48
3-digit SICCD	0.544	0.314	0.026	0.234	0.384	0.579	1.000	1.000	1	0.476	0.273
2-digit SICCD	0.291	0.283	0.015	0.079	0.137	0.234	0.458	1.000		1	0.345
FF 48 Industry	0.192	0.178	0.014	0.066	0.101	0.169	0.292	1.000			1

Section One - Industry Concentration Index Calculated by ME

Panel A Quintile Statistics Under 3-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	54	1574	0.193	1.364	-0.030	494	0.593	869	689	4.607	0.014
2	56	645	0.357	1.389	-0.077	458	0.602	610	635	4.489	0.010
3	56	356	0.540	1.406	-0.053	489	0.611	688	581	3.562	0.008
4	50	232	0.794	1.369	-0.089	772	0.596	832	921	6.665	0.009
High	61	64	0.999	1.404	-0.113	406	0.607	893	509	2.219	0.005

Panel B Quintile Statistics Under 2-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	12	1289	0.083	1.375	-0.044	493	0.595	968	577	4.116	0.014
2	13	791	0.148	1.365	-0.075	553	0.611	961	868	5.768	0.012
3	13	436	0.221	1.520	0.048	504	0.603	784	742	2.705	0.006
4	13	272	0.369	1.350	-0.124	548	0.608	842	816	1.727	0.004
High	13	79	0.780	1.364	-0.075	610	0.569	872	743	2.541	0.006

Panel C Quintile Statistics Under Fama French 48 Industry Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	8	1062	0.071	1.268	-0.127	449	0.621	1082	536	2.644	0.011
2	9	718	0.111	1.518	0.076	642	0.584	1009	770	6.503	0.019
3	9	491	0.163	1.419	-0.021	552	0.582	708	676	7.250	0.016
4	9	382	0.279	1.328	-0.088	541	0.560	618	702	9.155	0.017
High	10	223	0.541	1.491	0.073	1203	0.556	1480	1452	13.298	0.018

Section Two - Industry Concentration Index Calculated by Sale

Panel A Quintile Statistics Under 3-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	54	1572	0.179	1.502	-0.054	529	0.598	852	713	4.439	0.013
2	56	705	0.317	1.400	-0.060	475	0.602	589	590	4.549	0.011
3	56	332	0.492	1.410	-0.051	466	0.604	657	599	3.869	0.008
4	50	198	0.769	1.426	-0.041	725	0.602	885	897	6.375	0.008
High	61	64	0.999	1.387	-0.127	409	0.604	908	531	2.286	0.006

Panel B Quintile Statistics Under 2-Digit SICCD Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	12	1318	0.075	1.304	-0.022	549	0.602	944	585	4.511	0.016
2	13	856	0.131	1.313	-0.138	467	0.612	815	713	4.399	0.012
3	13	443	0.192	1.524	0.039	596	0.607	913	1044	4.128	0.006
4	13	187	0.324	1.502	0.036	519	0.601	877	685	1.396	0.003
High	13	62	0.761	1.483	0.093	577	0.564	876	718	2.416	0.006

Panel C Quintile Statistics Under Fama French 48 Industry Classification

ICL Quintile	Industries/year	Firms/year	Avg. ICL	Return	Adj. Return	ME	BM	AT	Sale	R&D	R&D/Asset
Low	8	1138	0.066	1.329	-0.081	496	0.620	1043	591	3.356	0.012
2	9	665	0.097	1.449	-0.031	540	0.602	912	626	5.233	0.016
3	9	470	0.146	1.399	-0.046	547	0.580	712	659	7.446	0.018
4	9	392	0.226	1.443	0.041	679	0.550	693	702	9.035	0.020
High	10	210	0.465	1.422	0.038	1131	0.549	1533	1557	13.847	0.016

Table 4 ICL (ME) Quintile Portfolio Average Monthly Return

Panel A 1963-2016								
3-digit SICCD			**2-digit SICCD**			**Fama French 48**		
ICL Quintile	**Return**	**Adj. Return**	**ICL Quintile**	**Return**	**Adj. Return**	**ICL Quintile**	**Return**	**Adj. Return**
Low	1.31	0.00	**Low**	1.31	0.00	**Low**	1.21	-0.11
2	1.41	0.02	**2**	1.32	-0.05	**2**	1.45	0.10
3	1.34	-0.04	**3**	1.53	0.11	**3**	1.44	0.02
4	1.34	-0.07	**4**	1.34	-0.06	**4**	1.43	0.06
High	1.42	-0.02	**High**	1.55	0.17	**High**	1.44	0.09
HML	**0.12** (2.89)	**-0.02** (-0.49)	**HML**	**0.24** (4.8)	**0.17** (3.71)	**HML**	**0.23** (4.56)	**0.19** (5.1)
Panel B 1963-2001								
3-digit SICCD			**2-digit SICCD**			**Fama French 48**		
ICL Quintile	**Return**	**Adj. Return**	**ICL Quintile**	**Return**	**Adj. Return**	**ICL Quintile**	**Return**	**Adj. Return**
Low	1.33	0.01	**Low**	1.32	0.00	**Low**	1.25	-0.09
2	1.41	0.00	**2**	1.35	-0.04	**2**	1.49	0.11
3	1.33	-0.08	**3**	1.60	0.14	**3**	1.44	0.00
4	1.31	-0.12	**4**	1.28	-0.14	**4**	1.41	0.02
High	1.38	-0.10	**High**	1.47	0.06	**High**	1.31	-0.03
HML	**0.05** (0.91)	**-0.12** (-2.96)	**HML**	**0.15** (2.91)	**0.06** (1.35)	**HML**	**0.06** (1.28)	**0.06** (1.82)
Panel C 2002-2016								
3-digit SICCD			**2-digit SICCD**			**Fama French 48**		
ICL Quintile	**Return**	**Adj. Return**	**ICL Quintile**	**Return**	**Adj. Return**	**ICL Quintile**	**Return**	**Adj. Return**
Low	1.23	-0.04	**Low**	1.27	0.01	**Low**	1.08	-0.15
2	1.41	0.09	**2**	1.24	-0.07	**2**	1.33	0.05
3	1.35	0.06	**3**	1.33	0.01	**3**	1.44	0.08
4	1.44	0.07	**4**	1.49	0.17	**4**	1.50	0.17
High	1.55	0.24	**High**	1.76	0.48	**High**	1.82	0.43
HML	**0.32** (5.73)	**0.28** (5.25)	**HML**	**0.49** (4.08)	**0.47** (4.33)	**HML**	**0.73** (5.16)	**0.58** (5.44)

Table 5 ICL (sale) Quintile Portfolio Average Monthly Return

Panel A 1963-2016								
3-digit SICCD			**2-digit SICCD**			**Fama French 48**		
ICL Quintile	Return	Adj. Return	ICL Quintile	Return	Adj. Return	ICL Quintile	Return	Adj. Return
Low	1.31	0.01	Low	1.33	-0.05	Low	1.28	0.00
2	1.34	-0.08	2	1.28	-0.01	2	1.39	0.02
3	1.38	0.10	3	1.52	0.06	3	1.42	-0.04
4	1.37	0.05	4	1.42	0.14	4	1.50	-0.07
High	1.40	0.17	High	1.51	0.07	High	1.40	-0.02
HML	**0.09** **(2.2)**	**0.15** **(3.57)**	HML	**0.19** **(4.03)**	**0.13** **(4.08)**	HML	**0.12** **(3.13)**	**-0.02** **(-0.49)**
Panel B 1963-2001								
3-digit SICCD			**2-digit SICCD**			**Fama French 48**		
ICL Quintile	Return	Adj. Return	ICL Quintile	Return	Adj. Return	ICL Quintile	Return	Adj. Return
Low	1.52	-0.01	Low	1.30	-0.02	Low	1.28	-0.07
2	1.49	-0.01	2	1.32	-0.07	2	1.45	0.01
3	1.46	-0.03	3	1.60	0.15	3	1.48	0.10
4	1.44	-0.06	4	1.49	0.08	4	1.47	0.10
High	1.41	-0.13	High	1.48	0.09	High	1.29	-0.03
HML	**-0.11** **(-2.05)**	**-0.13** **(-3.22)**	HML	**0.18** **(3.32)**	**0.11** **(2.16)**	HML	**0.01** **(0.19)**	**0.04** **(1.21)**
Panel C 2002-2016								
3-digit SICCD			**2-digit SICCD**			**Fama French 48**		
ICL Quintile	Return	Adj. Return	ICL Quintile	Return	Adj. Return	ICL Quintile	Return	Adj. Return
Low	1.28	0.00	Low	1.39	0.11	Low	1.26	0.00
2	1.25	-0.03	2	1.18	-0.12	2	1.23	-0.06
3	1.36	0.06	3	1.27	-0.03	3	1.26	-0.04
4	1.33	0.03	4	1.24	-0.06	4	1.59	0.24
High	1.55	0.24	High	1.60	0.37	High	1.72	0.37
HML	**0.27** **(4.6)**	**0.24** **(4.38)**	HML	**0.21** **(2.31)**	**0.27** **(3.38)**	HML	**0.46** **(5.57)**	**0.37** **(5.92)**

Table 6 Dependently Sorted Size & ICL 5 by 5 Portfolio Average Monthly Return 1963-2016

Panel A Size & Industry Concentration Level (ME)

3-digit SICCD

	Small	2	3	4	Big	Spread
			Size			
Low	1.84	1.37	1.12	1.05	1.02	-0.82
2	2.04	1.27	1.17	1.05	1.08	-0.96
3	1.98	1.33	1.10	1.11	1.00	-0.98
4	1.79	1.32	1.24	1.17	1.08	-0.71
High	1.79	1.29	1.14	1.10	1.04	-0.75
HML	-0.06	-0.09	0.02	0.05	0.01	
	(-0.94)	(-1.33)	(0.34)	(1.07)	(0.36)	

2-digit SICCD

	Small	2	3	4	Big	Spread
			Size			
Low	1.91	1.36	1.13	1.07	1.10	-0.81
2	1.71	1.24	1.20	1.07	1.02	-0.69
3	1.87	1.35	1.12	1.06	0.97	-0.90
4	1.94	1.28	1.11	1.08	1.02	-0.92
High	2.03	1.35	1.20	1.22	1.12	-0.91
HML	0.12	-0.01	0.07	0.14	0.02	
	(2.12)	(-0.25)	(1.27)	(3.50)	(0.43)	

Fama French 48 Industry

	Small	2	3	4	Big	Spread
			Size			
Low	1.82	1.27	1.13	1.13	0.95	-0.87
2	1.78	1.21	1.01	0.84	0.99	-0.79
3	1.95	1.48	1.29	1.23	1.09	-0.86
4	1.92	1.31	1.22	1.13	1.04	-0.88
High	1.99	1.33	1.12	1.15	1.14	-0.85
HML	0.17	0.06	-0.01	0.02	0.18	
	(3.57)	(1.58)	(-0.20)	(0.78)	(5.85)	

Panel B Size & Industry Concentration Level (Sale)

3-digit SICCD

	Small	2	3	4	Big	Spread
			Size			
Low	1.96	1.38	1.08	0.99	1.06	-0.90
2	1.94	1.33	1.19	1.11	1.03	-0.91
3	1.92	1.31	1.17	1.17	1.01	-0.91
4	1.80	1.36	1.16	1.08	1.03	-0.77
High	1.82	1.22	1.15	1.12	1.09	-0.73
HML	-0.15	-0.16	0.07	0.13	0.03	
	(-1.95)	(-2.56)	(1.27)	(2.83)	(0.69)	

2-digit SICCD

	Small	2	3	4	Big	Spread
			Size			
Low	1.86	1.32	1.04	1.00	1.13	-0.73
2	1.85	1.26	1.21	1.05	1.05	-0.80
3	1.84	1.35	1.18	1.10	1.05	-0.79
4	1.91	1.25	1.14	1.10	1.01	-0.90
High	1.97	1.36	1.19	1.19	1.07	-0.90
HML	0.11	0.04	0.15	0.19	-0.06	
	(1.61)	(0.72)	(3.24)	(4.91)	(-1.32)	

Fama French 48 Industry

	Small	2	3	4	Big	Spread
			Size			
Low	1.89	1.16	1.10	1.05	0.99	-0.90
2	1.66	1.19	1.13	0.98	1.01	-0.65
3	1.83	1.40	1.22	1.17	1.10	-0.73
4	1.98	1.31	1.17	1.14	1.01	-0.97
High	2.05	1.44	1.10	1.13	1.09	-0.96
HML	0.11	0.21	-0.04	0.10	0.09	
	(2.00)	(4.48)	(-0.96)	(2.95)	(2.99)	

Table 7 Dependently Sorted Size & ICL 5 by 5 Portfolio Average Monthly Return 1963-2001

Panel A Size & Industry Concentration Level (ME)

3-digit SICCD

	Small	2	3	4	Big	Spread
Low	2.05	1.43	1.23	1.21	1.05	-1.00
2	2.28	1.49	1.23	1.05	0.88	-1.40
3	2.08	1.38	1.32	1.26	1.08	-1.00
4	2.05	1.38	1.37	1.31	1.10	-0.95
High	1.95	1.30	1.23	1.15	1.09	-0.86
HML	-0.11	-0.13	-0.01	-0.06	0.05	
	(-1.66)	(-2.13)	(-0.10)	(-1.01)	(1.02)	

2-digit SICCD

	Small	2	3	4	Big	Spread
Low	2.07	1.35	1.21	1.20	1.07	-1.00
2	1.90	1.42	1.31	1.07	1.00	-0.90
3	1.98	1.45	1.16	1.12	0.96	-1.02
4	2.16	1.32	1.22	1.21	1.05	-1.11
High	2.25	1.39	1.42	1.37	1.21	-1.04
HML	0.18	0.02	0.21	0.12	0.16	
	(2.44)	(0.26)	(2.97)	(1.91)	(2.72)	

Fama French 48 Industry

	Small	2	3	4	Big	Spread
Low	2.05	1.38	1.29	1.23	1.11	-0.94
2	2.04	1.24	1.00	1.08	0.86	-1.18
3	2.13	1.60	1.45	1.16	1.08	-1.05
4	2.14	1.42	1.41	1.37	1.10	-1.04
High	2.11	1.31	1.23	1.18	1.17	-0.94
HML	0.05	-0.07	-0.08	-0.09	0.06	
	(0.87)	(-1.14)	(-1.01)	(-1.50)	(0.92)	

Panel B Size & Industry Concentration Level (Sale)

3-digit SICCD

	Small	2	3	4	Big	Spread
Low	2.28	1.42	1.12	1.07	0.95	-1.33
2	2.11	1.43	1.35	1.21	1.11	-1.00
3	2.10	1.40	1.23	1.21	0.94	-1.16
4	1.99	1.41	1.33	1.22	1.09	-0.90
High	1.98	1.28	1.29	1.23	1.10	-0.88
HML	-0.32	-0.15	0.17	0.18	0.15	
	(-4.27)	(-2.66)	(2.70)	(3.13)	(3.21)	

2-digit SICCD

	Small	2	3	4	Big	Spread
Low	2.19	1.41	1.14	1.16	1.09	-1.10
2	1.94	1.33	1.21	1.09	1.04	-0.90
3	2.12	1.46	1.33	1.07	1.00	-1.12
4	1.97	1.24	1.20	1.19	1.05	-0.92
High	2.21	1.53	1.44	1.42	1.13	-1.08
HML	0.01	0.10	0.31	0.22	0.07	
	(0.17)	(1.55)	(4.92)	(3.75)	(1.17)	

Fama French 48 Industry

	Small	2	3	4	Big	Spread
Low	2.20	1.39	1.24	1.21	1.14	-1.06
2	1.81	1.20	1.09	1.08	0.98	-0.83
3	1.88	1.46	1.33	1.30	1.05	-0.83
4	2.29	1.42	1.40	1.25	1.11	-1.18
High	2.20	1.45	1.23	1.18	1.10	-1.10
HML	-0.01	0.06	-0.02	-0.09	-0.03	
	(-0.10)	(0.99)	(-0.27)	(-1.75)	(-0.64)	

Table 8 Dependently Sorted BM & ICL 5 by 5 Portfolio Average Monthly Return 1963-2016

Panel A Book to Market Ratio & Industry Concentration Level (ME)

3-digit SICCD

	Low	2	3	4	High	Spread
Low	0.91	1.09	1.21	1.38	1.86	0.95
2	0.74	1.07	1.22	1.45	1.75	1.01
3	1.06	1.20	1.45	1.59	1.94	0.88
4	0.89	1.28	1.36	1.54	1.85	0.96
High	0.94	1.09	1.38	1.49	1.89	0.95
HML	0.00	0.01	0.18	0.11	0.03	
	(0.02)	(0.14)	(3.36)	(2.06)	(0.59)	

2-digit SICCD

	Low	2	3	4	High	Spread
Low	0.97	1.15	1.16	1.32	1.76	0.79
2	0.73	1.09	1.39	1.60	1.82	1.09
3	0.85	1.10	1.36	1.52	1.75	0.90
4	1.00	1.17	1.31	1.37	1.97	0.97
High	1.09	1.27	1.38	1.63	2.01	0.92
HML	0.03	0.06	0.21	0.31	0.25	
	(0.51)	(1.10)	(4.07)	(5.08)	(5.02)	

Fama French 48 Industry

	Low	2	3	4	High	Spread
Low	0.83	1.07	1.23	1.25	1.75	0.92
2	0.82	0.90	1.14	1.47	1.58	0.76
3	1.02	1.29	1.36	1.44	1.88	0.86
4	1.00	1.19	1.42	1.62	1.97	0.97
High	0.93	1.30	1.47	1.63	2.07	1.14
HML	0.04	0.15	0.25	0.38	0.32	
	(0.70)	(2.69)	(4.53)	(6.12)	(4.96)	

Panel B Book to Market Ratio & Industry Concentration Level (Sale)

3-digit SICCD

	Low	2	3	4	High	Spread
Low	1.01	1.17	1.20	1.38	1.81	0.80
2	0.72	1.03	1.40	1.68	1.93	1.21
3	0.98	1.18	1.23	1.46	1.88	0.90
4	0.92	1.19	1.36	1.49	1.81	0.89
High	0.93	1.17	1.44	1.42	1.90	0.97
HML	-0.11	0.00	0.25	0.04	0.10	
	(-1.60)	(0.00)	(4.97)	(0.90)	(1.46)	

2-digit SICCD

	Low	2	3	4	High	Spread
Low	0.97	1.23	1.25	1.34	1.88	0.91
2	0.72	0.98	1.44	1.50	1.75	1.03
3	0.89	1.15	1.29	1.63	2.00	1.11
4	0.83	1.10	1.23	1.48	1.73	0.90
High	1.13	1.31	1.41	1.54	2.00	0.87
HML	0.08	0.00	0.16	0.20	0.13	
	(0.99)	(0.09)	(3.05)	(3.84)	(2.29)	

Fama French 48 Industry

	Low	2	3	4	High	Spread
Low	0.87	1.19	1.35	1.46	1.85	0.98
2	0.86	1.01	1.19	1.35	1.69	0.83
3	0.74	0.96	1.31	1.55	1.90	1.16
4	1.01	1.39	1.33	1.54	1.86	0.85
High	0.97	1.25	1.48	1.56	2.07	1.10
HML	0.02	-0.02	0.12	0.11	0.22	
	(0.31)	(-0.33)	(2.93)	(2.39)	(4.98)	

Table 9 Dependently Sorted BM & ICL 5 by 5 Portfolio Average Monthly Return 1963-2001

Panel A Book to Market Ratio & Industry Concentration Level (ME)

	3-digit SICCD Book to Market Ratio						2-digit SICCD Book to Market Ratio						Fama French 48 Industry Book to Market Ratio					
	Low	2	3	4	High	Spread	Low	2	3	4	High	Spread	Low	2	3	4	High	Spread
Low	0.93	1.07	1.29	1.59	2.00	1.07	0.96	1.15	1.17	1.35	1.82	0.86	0.82	1.10	1.27	1.30	1.83	1.01
2	0.60	1.06	1.36	1.66	1.88	1.28	0.62	1.01	1.47	1.76	1.89	1.27	0.73	0.87	1.30	1.63	1.70	0.97
3	1.03	1.23	1.54	1.68	1.99	0.96	0.81	1.11	1.43	1.63	1.79	0.98	1.09	1.36	1.38	1.60	2.05	0.96
4	0.88	1.36	1.43	1.63	1.84	0.96	0.98	1.24	1.45	1.52	2.00	1.02	1.00	1.20	1.55	1.75	1.96	0.96
High	0.94	1.10	1.43	1.53	1.89	0.95	1.13	1.34	1.46	1.69	2.02	0.89	0.87	1.32	1.51	1.67	1.98	1.11
HML	-0.03	0.03	0.15	-0.06	-0.11		0.05	0.10	0.29	0.35	0.21		-0.03	0.12	0.24	0.38	0.16	
	(-0.31)	(0.40)	(2.20)	(-1.03)	(-2.15)		(0.65)	(1.49)	(4.35)	(4.95)	(4.04)		(-0.49)	(1.62)	(3.67)	(5.77)	(2.66)	

Panel B Book to Market Ratio & Industry Concentration Level (Sale)

	3-digit SICCD Book to Market Ratio						2-digit SICCD Book to Market Ratio						Fama French 48 Industry Book to Market Ratio					
	Low	2	3	4	High	Spread	Low	2	3	4	High	Spread	Low	2	3	4	High	Spread
Low	0.93	1.15	1.29	1.51	1.87	0.94	0.97	1.28	1.31	1.39	1.85	0.88	1.00	1.20	1.43	1.49	1.87	0.87
2	0.66	0.99	1.46	1.83	2.02	1.36	0.69	0.88	1.42	1.54	1.75	1.06	0.82	0.98	1.15	1.34	1.70	0.88
3	0.93	1.27	1.37	1.62	1.96	1.03	0.79	1.16	1.43	1.62	1.98	1.19	0.68	0.95	1.42	1.67	1.91	1.23
4	0.93	1.27	1.44	1.60	1.86	0.93	0.76	1.10	1.37	1.68	1.93	1.17	1.00	1.48	1.49	1.75	1.99	0.99
High	0.93	1.18	1.47	1.51	1.88	0.95	1.21	1.43	1.52	1.70	2.03	0.82	0.97	1.27	1.52	1.71	2.07	1.10
HML	-0.04	0.03	0.19	0.00	0.01		0.15	0.06	0.20	0.32	0.18		-0.04	-0.03	0.09	0.22	0.20	
	(-0.50)	(0.35)	(2.94)	(-0.02)	(0.26)		(1.47)	(1.03)	(2.96)	(4.90)	(3.69)		(-0.50)	(-0.49)	(1.67)	(3.81)	(4.10)	

Table 10 Dependently Sorted Momentum & ICL 5 by 5 Portfolio Average Monthly Return 1963-2016

Panel A Momentum & Industry Concentration Level (ME)

	3-digit SICCD Momentum						2-digit SICCD Momentum						Fama French 48 Industry Momentum				
	Loser	2	3	4	Winner	Spread	Loser	2	3	4	Winner	Spread	Loser	2	3	4	Winner	Spread
Low	1.25	1.19	1.28	1.34	1.41	0.16	1.31	1.30	1.23	1.24	1.38	0.07	1.29	1.34	1.23	1.25	1.35	0.06
2	1.26	1.17	1.28	1.32	1.27	0.01	1.20	1.20	1.29	1.42	1.39	0.19	1.14	1.08	1.17	1.25	1.27	0.13
3	1.47	1.32	1.40	1.45	1.42	-0.05	1.30	1.26	1.34	1.39	1.33	0.03	1.38	1.33	1.33	1.45	1.48	0.10
4	1.39	1.32	1.31	1.44	1.55	0.16	1.42	1.28	1.34	1.36	1.37	-0.05	1.44	1.33	1.44	1.45	1.49	0.05
High	1.37	1.27	1.34	1.40	1.39	0.02	1.54	1.32	1.38	1.50	1.60	0.06	1.51	1.33	1.39	1.48	1.47	-0.04
HML	0.10	0.09	0.05	0.06	-0.02		0.18	0.02	0.11	0.25	0.23		0.18	-0.02	0.12	0.23	0.12	
	(1.48)	(1.77)	(1.04)	(1.20)	(-0.25)		(2.84)	(0.47)	(2.72)	(4.80)	(3.54)		(2.83)	(-0.51)	(2.62)	(4.60)	(1.95)	

Panel B Momentum & Industry Concentration Level (Sale)

	3-digit SICCD Momentum						2-digit SICCD Momentum						Fama French 48 Industry Momentum				
	Loser	2	3	4	Winner	Spread	Loser	2	3	4	Winner	Spread	Loser	2	3	4	Winner	Spread
Low	1.41	1.21	1.29	1.26	1.32	-0.09	1.30	1.32	1.29	1.25	1.31	0.01	1.35	1.35	1.32	1.29	1.42	0.07
2	1.31	1.29	1.35	1.49	1.43	0.12	1.30	1.21	1.26	1.34	1.41	0.11	1.27	1.19	1.24	1.32	1.32	0.05
3	1.33	1.19	1.27	1.40	1.50	0.17	1.45	1.31	1.33	1.42	1.48	0.03	1.05	1.26	1.41	1.52	1.42	0.37
4	1.34	1.31	1.32	1.35	1.37	0.03	1.18	1.18	1.30	1.42	1.30	0.12	1.49	1.31	1.31	1.42	1.44	-0.05
High	1.39	1.29	1.38	1.44	1.40	0.01	1.55	1.39	1.42	1.47	1.48	-0.07	1.50	1.32	1.38	1.42	1.48	-0.02
HML	-0.05	0.09	0.09	0.19	0.09		0.19	0.07	0.10	0.21	0.18		0.02	-0.05	0.02	0.12	0.08	
	(-0.70)	(1.81)	(1.84)	(3.76)	(1.63)		(3.08)	(1.44)	(2.33)	(4.36)	(2.79)		(0.39)	(-1.11)	(0.58)	(3.03)	(1.40)	

Table 11 Dependently Sorted Momentum & ICL 5 by 5 Portfolio Average Monthly Return 1963-2001

Panel A Momentum & Industry Concentration Level (ME)

3-digit SICCD Momentum	Loser	2	3	4	Winner	Spread
Low	1.20	1.21	1.38	1.46	1.60	0.40
2	1.18	1.23	1.34	1.45	1.45	0.27
3	1.30	1.35	1.48	1.59	1.60	0.30
4	1.24	1.37	1.37	1.53	1.71	0.47
High	1.24	1.27	1.39	1.48	1.50	0.26
HML	-0.01	0.06	0.01	0.03	-0.10	
	(-0.08)	(1.01)	(0.13)	(0.47)	(-1.16)	

2-digit SICCD Momentum	Loser	2	3	4	Winner	Spread
Low	1.16	1.28	1.25	1.28	1.46	0.30
2	1.07	1.17	1.32	1.54	1.60	0.53
3	1.22	1.31	1.43	1.49	1.49	0.27
4	1.33	1.35	1.44	1.50	1.55	0.22
High	1.39	1.34	1.45	1.60	1.76	0.37
HML	0.16	0.05	0.16	0.31	0.32	
	(2.25)	(0.78)	(2.89)	(4.62)	(3.77)	

Fama French 48 Industry Momentum	Loser	2	3	4	Winner	Spread
Low	1.28	1.35	1.26	1.29	1.48	0.20
2	1.04	1.12	1.29	1.40	1.49	0.45
3	1.26	1.37	1.40	1.58	1.68	0.42
4	1.37	1.37	1.55	1.62	1.64	0.27
High	1.29	1.31	1.41	1.54	1.59	0.30
HML	-0.04	-0.06	0.09	0.25	0.13	
	(-0.75)	(-0.98)	(1.63)	(4.18)	(1.58)	

Panel B Momentum & Industry Concentration Level (Sale)

3-digit SICCD Momentum	Loser	2	3	4	Winner	Spread
Low	1.33	1.24	1.33	1.33	1.46	0.13
2	1.11	1.27	1.43	1.64	1.60	0.49
3	1.27	1.28	1.36	1.51	1.68	0.41
4	1.19	1.33	1.40	1.46	1.56	0.37
High	1.27	1.30	1.44	1.53	1.51	0.24
HML	-0.10	0.07	0.10	0.21	0.06	
	(-1.31)	(1.11)	(1.58)	(3.30)	(0.81)	

2-digit SICCD Momentum	Loser	2	3	4	Winner	Spread
Low	1.22	1.37	1.33	1.31	1.40	0.18
2	1.09	1.16	1.27	1.41	1.59	0.50
3	1.33	1.26	1.36	1.51	1.61	0.28
4	1.07	1.23	1.38	1.59	1.52	0.45
High	1.51	1.46	1.53	1.61	1.67	0.16
HML	0.25	0.10	0.17	0.29	0.28	
	(3.44)	(1.65)	(3.04)	(4.57)	(3.61)	

Fama French 48 Industry Momentum	Loser	2	3	4	Winner	Spread
Low	1.30	1.40	1.39	1.38	1.52	0.22
2	1.08	1.13	1.24	1.35	1.45	0.37
3	0.99	1.26	1.53	1.67	1.56	0.57
4	1.42	1.40	1.38	1.57	1.69	0.27
High	1.36	1.33	1.42	1.49	1.62	0.26
HML	0.02	-0.10	-0.01	0.12	0.12	
	(0.29)	(-1.79)	(-0.28)	(2.21)	(1.68)	

Table 12 Fama MacBeth Regression of Average Monthly Returns Under Different Industry Classification With ICL (ME)

	1963-2016		
	3-digit SICCD	**2-digit SICCD**	**FF 48**
ICL(ME)	0.069		
	(0.67)		
ICL(ME)		0.279**	
		(2.02)	
ICL(ME)			0.474***
			(3.42)
logME	-0.168***	-0.169***	-0.163***
	(-5.10)	(-5.20)	(-5.28)
logBM	0.715***	0.788***	0.741***
	(6.52)	(7.12)	(6.71)
Leverage	0.008	0.010	0.013
	(1.35)	(1.24)	(1.63)
Momentum	0.151*	0.133*	0.145*
	(1.93)	(1.73)	(1.93)
Postbeta	0.084	0.044	0.089
	(0.52)	(0.25)	(0.57)
Adjusted R Square	0.056	0.058	0.055

*** means statistical significance at 1% level
** means statistical significance at 5% level
* means statistical significance at 10% level

Table 13 Fama MaBeth Regression of Average Monthly Returns Under Different Industry Classification Subsample Period Analysis With ICL (ME)

	Panel A 1963-2001			Panel B 2002-2016		
	3-digit SICCD	2-digit SICCD	FF 48	3-digit SICCD	2-digit SICCD	FF 48
ICL(ME)	-0.298***			0.224*		
	(-2.93)			(1.81)		
ICL(ME)		-0.024			0.510**	
		(-0.13)			(2.10)	
ICL(ME)			0.019			1.115***
			(0.13)			(3.44)
logME	-0.129***	-0.132***	-0.131***	-0.069**	-0.069**	-0.069**
	(-5.40)	(-5.48)	(-5.43)	(-2.11)	(-2.11)	(-2.10)
logBM	0.831***	0.824***	0.834***	0.759***	0.755***	0.775***
	(5.25)	(5.14)	(5.23)	(3.92)	(3.95)	(3.96)
Leverage	0.003	0.003	0.003	0.008***	0.008***	0.009***
	(0.58)	(0.49)	(0.58)	(3.08)	(3.10)	(3.17)
Momentum	0.265***	0.259***	0.267***	-0.464***	-0.459***	-0.463***
	(3.77)	(3.73)	(3.81)	(-3.06)	(-3.04)	(-3.05)
Postbeta	0.010	-0.001	-0.005	0.856**	0.859**	0.822**
	(0.07)	(-0.01)	(-0.03)	(2.59)	(2.58)	(2.55)
Adjusted R Square	0.047	0.047	0.047	0.043	0.042	0.043

*** means statistical significance at 1% level
** means statistical significance at 5% level
* means statistical significance at 10% level

Table 14 Fama MaBeth Regression of Average Monthly Returns Under Different Industry Classifications With ICL (sale)

	1963-2016		
	3-digit SICCD	**2-digit SICCD**	**FF 48**
ICL(sale)	0.121		
	(0.89)		
ICL(sale)		0.259*	
		(1.85)	
ICL(sale)			0.649***
			(4.14)
logME	-0.168***	-0.168***	-0.163***
	(-5.13)	(-5.22)	(-5.31)
logBM	0.721***	0.781***	0.748***
	(6.58)	(7.25)	(6.81)
Leverage	0.007	0.012	0.013
	(1.29)	(1.44)	(1.64)
Momentum	0.150*	0.141*	0.141*
	(1.92)	(1.80)	(1.88)
Postbeta	0.080	0.046	0.090
	(0.50)	(0.26)	(0.57)
Adjusted R Square	0.056	0.056	0.055

*** means statistical significance at 1% level

** means statistical significance at 5% level

* means statistical significance at 10% level

Table 15 Fama MaBeth Regression of Average Monthly Returns Under Different Industry Classifications Subsample Period Analysis With ICL (sale)

	Panel A 1963-2001			Panel B 2002-2016		
	3-digit SICCD	2-digit SICCD	FF 48	3-digit SICCD	2-digit SICCD	FF 48
ICL(sale)	-0.294***			0.149		
	(-2.78)			(1.16)		
ICL(sale)		0.388**			-0.122	
		(2.22)			(-0.65)	
ICL(sale)			0.641***			0.674***
			(3.23)			(3.37)
logME	-0.201***		-0.196***	-0.068**	-0.067**	-0.068**
	(-4.82)		(-4.99)	(-2.07)	(-2.04)	(-2.06)
logBM	0.706***		0.744***	0.763***	0.766***	0.763***
	(5.38)		(5.65)	(3.94)	(3.99)	(3.93)
Leverage	0.007		0.014	0.008***	0.009***	0.009***
	(0.92)		(1.38)	(3.08)	(3.20)	(3.14)
Momentum	0.357***		0.345***	-0.463***	-0.463***	-0.462***
	(4.33)		(4.41)	(-3.05)	(-3.05)	(-3.04)
Postbeta	-0.183		-0.168	0.857**	0.861**	0.852**
	(-1.02)		(-0.98)	(2.60)	(2.58)	(2.57)
Adjusted R Square	0.060		0.059	0.043	0.042	0.042

*** means statistical significance at 1% level
** means statistical significance at 5% level
* means statistical significance at 10% level

Table 16 Value Weighted Industry Momentum Returns under 3-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Winner	42	1.50	1.19	1.14	1.14	1.13
Mom (t-1)	Loser	43	0.77	1.07	1.20	1.29	1.35
	WML	N/A	**-0.73** **(-4.36)**	**-0.11** **(-1.16)**	**0.06** **(0.78)**	**0.15** **(2.50)**	**0.22** **(4.04)**
	Winner	42	1.48	1.10	1.07	1.07	1.06
Mom (t-1,t-3)	Loser	43	1.11	1.28	1.33	1.39	1.45
	WML	N/A	**-0.37** **(-1.88)**	**0.18** **(1.70)**	**0.25** **(3.02)**	**0.31** **(4.50)**	**0.39** **(6.22)**
	Winner	42	1.23	0.94	0.95	0.93	1.01
Mom (t-1,t-6)	Loser	43	1.28	1.36	1.46	1.50	1.50
	WML	N/A	**0.05** **(0.24)**	**0.42** **(3.73)**	**0.52** **(5.78)**	**0.58** **(7.76)**	**0.49** **(7.27)**
	Winner	42	1.21	0.92	0.87	0.95	1.05
Mom (t-1,t-9)	Loser	43	1.33	1.44	1.52	1.50	1.49
	WML	N/A	**0.12** **(0.54)**	**0.53** **(4.35)**	**0.65** **(6.99)**	**0.55** **(7.13)**	**0.44** **(6.29)**
	Winner	42	0.96	0.85	0.94	1.04	1.11
Mom (t-1,t-12)	Loser	43	1.40	1.49	1.47	1.46	1.45
	WML	N/A	**0.44** **(2.11)**	**0.64** **(5.16)**	**0.53** **(5.40)**	**0.42** **(5.08)**	**0.34** **(4.60)**

Table 17 Value Weighted Industry Momentum Returns under 3-digit SICCD Classification Subsample Analysis

| | | | Panel A 1963-1997 | | | | | | | | Panel B 1998-2016 | | | | |
| | | Number of | Holding Period Average Monthly Return | | | | | | | Number of | Holding Period Average Monthly Return | | | | |
Momentum	Rank	Industries	1 month	3 months	6 months	9 months	12 months	Momentum	Rank	Industries	1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	39	1.55	1.26	1.20	1.18	1.16	Mom (t-1)	Winner	46	1.40	1.05	1.03	1.07	1.07
	Loser	40	0.84	1.17	1.29	1.40	1.47		Loser	47	0.62	0.88	1.01	1.08	1.12
	WML	N/A	-0.70	-0.08	0.10	0.23	0.31		WML	N/A	-0.78	-0.17	-0.02	0.01	0.05
			(-3.62)	(-0.71)	(1.14)	(3.07)	(4.60)				(-2.46)	(-0.99)	(-0.13)	(0.06)	(0.53)
Mom (t-1,t-3)	Winner	39	1.56	1.15	1.10	1.08	1.05	Mom (t-1,t-3)	Winner	46	1.34	1.01	1.02	1.06	1.07
	Loser	40	1.13	1.32	1.39	1.47	1.56		Loser	47	1.07	1.19	1.21	1.22	1.22
	WML	N/A	-0.43	0.18	0.29	0.39	0.51		WML	N/A	-0.26	0.19	0.19	0.17	0.15
			(-1.80)	(1.39)	(3.05)	(4.87)	(7.03)				(-0.75)	(0.98)	(1.14)	(1.27)	(1.29)
Mom (t-1,t-6)	Winner	39	1.16	0.95	0.94	0.89	0.98	Mom (t-1,t-6)	Winner	46	1.36	0.92	0.95	1.00	1.05
	Loser	40	1.24	1.39	1.54	1.61	1.62		Loser	47	1.35	1.29	1.33	1.31	1.27
	WML	N/A	0.08	0.44	0.59	0.72	0.63		WML	N/A	-0.01	0.38	0.37	0.31	0.21
			(0.35)	(3.35)	(6.32)	(8.81)	(8.35)				(-0.03)	(1.80)	(1.97)	(2.06)	(1.64)
Mom (t-1,t-9)	Winner	39	1.22	0.95	0.84	0.91	1.02	Mom (t-1,t-9)	Winner	46	1.18	0.86	0.92	1.04	1.10
	Loser	40	1.32	1.49	1.65	1.64	1.64		Loser	47	1.35	1.35	1.27	1.22	1.21
	WML	N/A	0.09	0.55	0.81	0.74	0.61		WML	N/A	0.17	0.49	0.34	0.19	0.11
			(0.35)	(3.86)	(8.20)	(8.62)	(7.70)				(0.44)	(2.16)	(1.78)	(1.25)	(0.81)
Mom (t-1,t-12)	Winner	39	0.90	0.84	0.90	1.01	1.09	Mom (t-1,t-12)	Winner	46	1.08	0.87	1.01	1.11	1.16
	Loser	40	1.46	1.63	1.63	1.62	1.59		Loser	47	1.30	1.22	1.17	1.17	1.18
	WML	N/A	0.56	0.79	0.73	0.61	0.50		WML	N/A	0.21	0.35	0.15	0.06	0.02
			(2.29)	(5.56)	(6.96)	(6.68)	(6.25)				(0.54)	(1.47)	(0.75)	(0.37)	(0.13)

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Table 18 Value Weighted Industry Momentum Returns under 2-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Winner	9	0.98	0.99	0.94	0.93	0.94
Mom (t-1)	Loser	10	1.05	1.14	1.16	1.22	1.29
	WML	N/A	**0.07**	**0.15**	**0.22**	**0.29**	**0.35**
			(0.36)	**(1.22)**	**(2.74)**	**(4.20)**	**(5.51)**
	Winner	9	0.93	0.91	0.90	0.87	0.85
Mom (t-1,t-3)	Loser	10	1.13	1.21	1.20	1.28	1.37
	WML	N/A	**0.21**	**0.30**	**0.30**	**0.41**	**0.51**
			(0.96)	**(2.43)**	**(3.34)**	**(5.60)**	**(7.46)**
	Winner	9	0.95	0.84	0.82	0.76	0.84
Mom (t-1,t-6)	Loser	10	1.28	1.26	1.37	1.45	1.45
	WML	N/A	**0.33**	**0.42**	**0.56**	**0.70**	**0.61**
			(1.47)	**(3.22)**	**(5.78)**	**(8.93)**	**(8.43)**
	Winner	9	0.84	0.80	0.71	0.74	0.81
Mom (t-1,t-9)	Loser	10	1.28	1.35	1.43	1.46	1.46
	WML	N/A	**0.45**	**0.54**	**0.72**	**0.73**	**0.65**
			(1.93)	**(3.86)**	**(7.24)**	**(9.16)**	**(8.87)**
	Winner	9	0.62	0.63	0.74	0.78	0.85
Mom (t-1,t-12)	Loser	10	1.44	1.47	1.47	1.48	1.48
	WML	N/A	**0.82**	**0.84**	**0.73**	**0.70**	**0.63**
			(3.53)	**(5.77)**	**(6.77)**	**(8.23)**	**(8.26)**

Table 19 Value Weighted Industry Momentum Returns under 2-digit SICCD Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return 1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	9	1.09	1.13	1.08	1.03	1.03
	Loser	10	1.19	1.32	1.31	1.41	1.49
	WML	N/A	0.10 (0.40)	0.19 (1.29)	0.23 (2.38)	0.38 (4.40)	0.46 (6.04)
Mom (t-1,t-3)	Winner	9	0.94	1.01	0.99	0.94	0.91
	Loser	10	1.20	1.33	1.33	1.44	1.55
	WML	N/A	0.27 (0.99)	0.32 (2.10)	0.34 (3.35)	0.50 (5.85)	0.65 (7.84)
Mom (t-1,t-6)	Winner	9	0.94	0.97	0.92	0.81	0.88
	Loser	10	1.30	1.35	1.53	1.63	1.63
	WML	N/A	0.36 (1.28)	0.38 (2.33)	0.61 (5.59)	0.82 (9.04)	0.75 (8.73)
Mom (t-1,t-9)	Winner	9	0.89	0.92	0.76	0.77	0.88
	Loser	10	1.37	1.48	1.65	1.69	1.63
	WML	N/A	0.48 (1.67)	0.56 (3.32)	0.89 (8.15)	0.92 (10.00)	0.75 (8.67)
Mom (t-1,t-12)	Winner	9	0.63	0.66	0.80	0.88	0.96
	Loser	10	1.59	1.69	1.71	1.67	1.63
	WML	N/A	0.96 (3.35)	1.03 (5.91)	0.91 (7.35)	0.79 (7.62)	0.67 (7.32)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return 1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	10	0.76	0.74	0.67	0.72	0.77
	Loser	11	0.78	0.81	0.87	0.85	0.90
	WML	N/A	0.02 (0.07)	0.07 (0.32)	0.20 (1.39)	0.13 (1.07)	0.12 (1.12)
Mom (t-1,t-3)	Winner	10	0.91	0.73	0.73	0.74	0.75
	Loser	11	1.00	0.99	0.94	0.97	1.01
	WML	N/A	0.09 (0.26)	0.26 (1.23)	0.21 (1.24)	0.23 (1.71)	0.25 (2.09)
Mom (t-1,t-6)	Winner	10	0.96	0.59	0.62	0.65	0.75
	Loser	11	1.23	1.07	1.08	1.10	1.10
	WML	N/A	0.27 (0.73)	0.48 (2.29)	0.46 (2.44)	0.46 (3.15)	0.36 (2.68)
Mom (t-1,t-9)	Winner	10	0.73	0.59	0.64	0.67	0.68
	Loser	11	1.11	1.09	1.01	1.04	1.13
	WML	N/A	0.38 (0.97)	0.50 (2.02)	0.38 (1.93)	0.36 (2.45)	0.45 (3.38)
Mom (t-1,t-12)	Winner	10	0.58	0.55	0.63	0.60	0.63
	Loser	11	1.14	1.04	1.02	1.12	1.19
	WML	N/A	0.56 (1.40)	0.49 (1.84)	0.39 (1.88)	0.53 (3.57)	0.56 (4.05)

Table 20 Value Weighted Industry Momentum Returns under Fama French 48 Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Winner	6	0.57	0.83	0.89	0.92	0.92
Mom (t-1)	Loser	7	1.22	1.17	1.19	1.26	1.30
	WML	N/A	**0.65**	**0.34**	**0.30**	**0.34**	**0.37**
			(3.70)	**(3.19)**	**(3.83)**	**(5.15)**	**(6.35)**
	Winner	6	0.78	0.84	0.90	0.89	0.90
Mom (t-1,t-3)	Loser	7	1.23	1.26	1.26	1.33	1.37
	WML	N/A	**0.44**	**0.43**	**0.36**	**0.44**	**0.46**
			(2.26)	**(3.90)**	**(4.42)**	**(6.78)**	**(7.59)**
	Winner	6	0.72	0.78	0.78	0.76	0.85
Mom (t-1,t-6)	Loser	7	1.25	1.28	1.34	1.40	1.40
	WML	N/A	**0.53**	**0.51**	**0.56**	**0.65**	**0.56**
			(2.69)	**(4.44)**	**(6.68)**	**(8.83)**	**(8.39)**
	Winner	6	0.69	0.66	0.68	0.74	0.86
Mom (t-1,t-9)	Loser	7	1.29	1.39	1.43	1.44	1.41
	WML	N/A	**0.60**	**0.72**	**0.75**	**0.69**	**0.54**
			(2.81)	**(5.85)**	**(8.27)**	**(9.10)**	**(7.86)**
	Winner	6	0.59	0.65	0.76	0.86	0.96
Mom (t-1,t-12)	Loser	7	1.38	1.42	1.41	1.40	1.37
	WML	N/A	**0.79**	**0.76**	**0.66**	**0.54**	**0.41**
			(3.71)	**(5.87)**	**(6.74)**	**(6.66)**	**(5.84)**

Table 21 Value Weighted Industry Momentum Returns under Fama French 48 Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	6	0.62	0.98	1.05	1.04	1.03
	Loser	7	1.49	1.36	1.33	1.40	1.45
	WML	N/A	0.88 (4.70)	0.38 (3.16)	0.28 (3.14)	0.36 (4.80)	0.42 (6.24)
Mom (t-1,t-3)	Winner	6	0.88	1.00	1.04	1.01	1.00
	Loser	7	1.38	1.40	1.36	1.46	1.50
	WML	N/A	0.50 (2.16)	0.41 (3.14)	0.32 (3.43)	0.45 (6.34)	0.50 (7.67)
Mom (t-1,t-6)	Winner	6	0.76	0.90	0.89	0.83	0.94
	Loser	7	1.26	1.33	1.42	1.50	1.53
	WML	N/A	0.50 (2.29)	0.43 (3.24)	0.53 (5.80)	0.68 (9.18)	0.59 (8.88)
Mom (t-1,t-9)	Winner	6	0.76	0.82	0.78	0.82	0.97
	Loser	7	1.35	1.48	1.57	1.58	1.57
	WML	N/A	0.59 (2.41)	0.66 (4.65)	0.78 (8.56)	0.76 (10.58)	0.60 (8.81)
Mom (t-1,t-12)	Winner	6	0.66	0.78	0.86	0.95	1.07
	Loser	7	1.46	1.54	1.57	1.55	1.52
	WML	N/A	0.81 (3.54)	0.76 (5.49)	0.71 (7.05)	0.60 (7.34)	0.45 (6.19)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	6	0.47	0.55	0.59	0.69	0.71
	Loser	7	0.68	0.80	0.91	1.00	1.01
	WML	N/A	0.21 (0.58)	0.25 (1.24)	0.32 (2.21)	0.30 (2.35)	0.29 (2.55)
Mom (t-1,t-3)	Winner	6	0.60	0.53	0.62	0.67	0.71
	Loser	7	0.94	0.99	1.05	1.08	1.11
	WML	N/A	0.34 (0.93)	0.46 (2.32)	0.43 (2.79)	0.41 (3.15)	0.40 (3.10)
Mom (t-1,t-6)	Winner	6	0.63	0.53	0.57	0.62	0.68
	Loser	7	1.23	1.19	1.19	1.21	1.17
	WML	N/A	0.60 (1.49)	0.66 (3.05)	0.61 (3.61)	0.59 (3.67)	0.49 (3.35)
Mom (t-1,t-9)	Winner	6	0.57	0.37	0.48	0.59	0.67
	Loser	7	1.20	1.20	1.16	1.16	1.10
	WML	N/A	0.63 (1.50)	0.84 (3.56)	0.67 (3.43)	0.57 (3.25)	0.43 (2.82)
Mom (t-1,t-12)	Winner	6	0.45	0.41	0.55	0.67	0.74
	Loser	7	1.21	1.18	1.12	1.09	1.08
	WML	N/A	0.76 (1.72)	0.77 (2.83)	0.57 (2.69)	0.42 (2.40)	0.34 (2.25)

Table 22 Equal Weighted Industry Momentum Returns under 3-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Winner	42	1.75	1.34	1.26	1.26	1.26
Mom (t-1)	Loser	43	1.02	1.28	1.36	1.44	1.49
	WML	N/A	**-0.73**	**-0.06**	**0.10**	**0.18**	**0.23**
			(-4.47)	**(-0.66)**	**(1.36)**	**(3.10)**	**(4.46)**
	Winner	42	1.56	1.23	1.22	1.20	1.19
Mom (t-1,t-3)	Loser	43	1.35	1.50	1.50	1.54	1.59
	WML	N/A	**-0.21**	**0.27**	**0.28**	**0.35**	**0.39**
			(-1.02)	**(2.56)**	**(3.43)**	**(5.18)**	**(6.53)**
	Winner	42	1.40	1.10	1.08	1.06	1.16
Mom (t-1,t-6)	Loser	43	1.42	1.51	1.55	1.59	1.57
	WML	N/A	**0.02**	**0.41**	**0.47**	**0.53**	**0.41**
			(0.10)	**(3.63)**	**(5.42)**	**(7.36)**	**(6.12)**
	Winner	42	1.39	1.08	1.01	1.10	1.21
Mom (t-1,t-9)	Loser	43	1.48	1.57	1.61	1.57	1.53
	WML	N/A	**0.09**	**0.49**	**0.60**	**0.47**	**0.32**
			(0.43)	**(4.05)**	**(6.45)**	**(6.11)**	**(4.49)**
	Winner	42	1.22	1.04	1.13	1.24	1.30
Mom (t-1,t-12)	Loser	43	1.56	1.61	1.56	1.52	1.49
	WML	N/A	**0.35**	**0.57**	**0.42**	**0.28**	**0.19**
			(1.75)	**(4.74)**	**(4.36)**	**(3.42)**	**(2.59)**

Table 23 Equal Weighted Industry Momentum Returns under 3-digit SICCD Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	39	1.81	1.42	1.30	1.28	1.28
	Loser	40	1.02	1.31	1.43	1.54	1.60
	WML	N/A	-0.79	-0.10	0.12	0.26	0.31
			(-4.12)	(-0.90)	(1.56)	(3.67)	(4.98)
Mom (t-1,t-3)	Winner	39	1.61	1.25	1.23	1.20	1.18
	Loser	40	1.29	1.51	1.57	1.64	1.71
	WML	N/A	-0.33	0.26	0.33	0.44	0.53
			(-1.33)	(2.06)	(3.75)	(5.71)	(7.70)
Mom (t-1,t-6)	Winner	39	1.37	1.13	1.08	1.04	1.13
	Loser	40	1.40	1.53	1.66	1.72	1.71
	WML	N/A	0.04	0.40	0.58	0.68	0.58
			(0.17)	(3.07)	(6.44)	(8.88)	(8.34)
Mom (t-1,t-9)	Winner	39	1.44	1.12	0.97	1.04	1.16
	Loser	40	1.49	1.65	1.77	1.73	1.72
	WML	N/A	0.06	0.53	0.80	0.70	0.56
			(0.24)	(3.85)	(8.68)	(8.69)	(7.48)
Mom (t-1,t-12)	Winner	39	1.16	1.02	1.07	1.18	1.24
	Loser	40	1.61	1.74	1.71	1.68	1.66
	WML	N/A	0.46	0.72	0.64	0.51	0.42
			(2.01)	(5.31)	(6.51)	(5.86)	(5.59)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	46	1.63	1.20	1.18	1.20	1.20
	Loser	47	1.00	1.21	1.23	1.25	1.29
	WML	N/A	-0.63	0.01	0.05	0.04	0.09
			(-2.05)	(0.06)	(0.33)	(0.41)	(0.91)
Mom (t-1,t-3)	Winner	46	1.44	1.18	1.19	1.19	1.21
	Loser	47	1.47	1.48	1.37	1.36	1.35
	WML	N/A	0.02	0.30	0.19	0.17	0.14
			(0.06)	(1.52)	(1.10)	(1.34)	(1.21)
Mom (t-1,t-6)	Winner	46	1.46	1.04	1.07	1.11	1.23
	Loser	47	1.44	1.46	1.35	1.36	1.29
	WML	N/A	-0.02	0.43	0.28	0.25	0.07
			(-0.05)	(1.99)	(1.48)	(1.65)	(0.49)
Mom (t-1,t-9)	Winner	46	1.30	1.00	1.10	1.22	1.32
	Loser	47	1.45	1.43	1.32	1.27	1.19
	WML	N/A	0.15	0.43	0.22	0.05	-0.14
			(0.39)	(1.78)	(1.08)	(0.29)	(-0.92)
Mom (t-1,t-12)	Winner	46	1.34	1.08	1.25	1.36	1.42
	Loser	47	1.47	1.37	1.25	1.20	1.16
	WML	N/A	0.13	0.29	0.01	-0.16	-0.26
			(0.35)	(1.21)	(0.04)	(-0.93)	(-1.75)

Table 24 Equal Weighted Industry Momentum Returns under 2-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Winner	9	1.10	1.11	1.05	1.05	1.07
Mom (t-1)	Loser	10	1.45	1.48	1.46	1.48	1.52
	WML	N/A	**0.34** **(1.67)**	**0.37** **(2.89)**	**0.41** **(4.87)**	**0.44** **(6.37)**	**0.44** **(7.07)**
	Winner	9	1.16	0.92	0.97	0.95	0.98
Mom (t-1,t-3)	Loser	10	1.53	1.57	1.49	1.52	1.56
	WML	N/A	**0.37** **(1.71)**	**0.65** **(5.11)**	**0.52** **(5.94)**	**0.57** **(8.11)**	**0.58** **(9.02)**
	Winner	9	1.03	0.87	0.89	0.87	0.98
Mom (t-1,t-6)	Loser	10	1.61	1.52	1.59	1.63	1.57
	WML	N/A	**0.58** **(2.67)**	**0.65** **(5.10)**	**0.69** **(7.34)**	**0.76** **(10.00)**	**0.59** **(8.58)**
	Winner	9	1.00	0.91	0.89	0.94	1.04
Mom (t-1,t-9)	Loser	10	1.55	1.58	1.60	1.61	1.56
	WML	N/A	**0.55** **(2.52)**	**0.67** **(4.89)**	**0.71** **(7.17)**	**0.67** **(8.22)**	**0.52** **(7.03)**
	Winner	9	0.85	0.86	0.98	1.04	1.13
Mom (t-1,t-12)	Loser	10	1.65	1.66	1.59	1.58	1.55
	WML	N/A	**0.80** **(3.71)**	**0.80** **(5.70)**	**0.61** **(5.72)**	**0.53** **(6.31)**	**0.43** **(5.69)**

Table 25 Equal Weighted Industry Momentum Returns under 2-digit SICCD Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	1 month	3 months	6 months	9 months	12 months
				Holding Period Average Monthly Return			
Mom (t-1)	Winner	9	1.32	1.25	1.15	1.11	1.11
	Loser	10	1.45	1.54	1.53	1.61	1.64
	WML	N/A	0.13	0.29	0.38	0.50	0.53
			(0.51)	(1.92)	(3.88)	(6.10)	(7.36)
Mom (t-1,t-3)	Winner	9	1.26	1.01	1.03	0.99	1.00
	Loser	10	1.49	1.59	1.55	1.62	1.69
	WML	N/A	0.23	0.58	0.52	0.63	0.68
			(0.85)	(3.82)	(5.29)	(7.44)	(8.92)
Mom (t-1,t-6)	Winner	9	1.11	0.97	0.96	0.90	0.99
	Loser	10	1.57	1.57	1.68	1.77	1.71
	WML	N/A	0.46	0.60	0.72	0.88	0.72
			(1.70)	(3.88)	(6.56)	(9.80)	(9.05)
Mom (t-1,t-9)	Winner	9	1.10	1.02	0.89	0.93	1.06
	Loser	10	1.58	1.67	1.79	1.79	1.72
	WML	N/A	0.47	0.66	0.90	0.86	0.66
			(1.78)	(4.00)	(8.32)	(9.23)	(7.56)
Mom (t-1,t-12)	Winner	9	0.82	0.85	0.96	1.07	1.16
	Loser	10	1.73	1.85	1.81	1.74	1.71
	WML	N/A	0.91	1.00	0.85	0.67	0.55
			(3.45)	(6.06)	(6.96)	(6.46)	(6.04)

Panel B 1998-2016

Momentum	Rank	Number of Industries	1 month	3 months	6 months	9 months	12 months
				Holding Period Average Monthly Return			
Mom (t-1)	Winner	10	0.67	0.84	0.84	0.92	0.99
	Loser	11	1.43	1.37	1.32	1.24	1.28
	WML	N/A	0.76	0.53	0.48	0.32	0.29
			(2.08)	(2.20)	(2.95)	(2.58)	(2.37)
Mom (t-1,t-3)	Winner	10	0.97	0.73	0.84	0.88	0.94
	Loser	11	1.61	1.53	1.36	1.34	1.32
	WML	N/A	0.64	0.80	0.52	0.46	0.38
			(1.76)	(3.40)	(3.01)	(3.64)	(3.29)
Mom (t-1,t-6)	Winner	10	0.87	0.68	0.77	0.83	0.96
	Loser	11	1.70	1.44	1.40	1.36	1.31
	WML	N/A	0.83	0.76	0.64	0.53	0.35
			(2.21)	(3.33)	(3.59)	(3.84)	(2.69)
Mom (t-1,t-9)	Winner	10	0.81	0.71	0.89	0.96	1.01
	Loser	11	1.51	1.41	1.24	1.25	1.26
	WML	N/A	0.70	0.70	0.34	0.29	0.25
			(1.83)	(2.81)	(1.73)	(1.91)	(1.87)
Mom (t-1,t-12)	Winner	10	0.89	0.88	1.01	0.99	1.06
	Loser	11	1.49	1.29	1.15	1.26	1.26
	WML	N/A	0.59	0.41	0.15	0.26	0.19
			(1.58)	(1.59)	(0.73)	(1.85)	(1.47)

Table 26 Equal Weighted Industry Momentum Returns under Fama French 48 Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Winner	6	0.94	1.03	1.09	1.13	1.19
Mom (t-1)	Loser	7	1.77	1.64	1.56	1.59	1.65
	WML	N/A	**0.83** **(4.64)**	**0.61** **(5.48)**	**0.48** **(6.22)**	**0.47** **(6.83)**	**0.46** **(7.06)**
	Winner	6	0.96	0.91	1.01	1.07	1.12
Mom (t-1,t-3)	Loser	7	1.85	1.78	1.67	1.70	1.72
	WML	N/A	**0.88** **(4.40)**	**0.87** **(7.48)**	**0.66** **(8.19)**	**0.62** **(9.03)**	**0.60** **(8.72)**
	Winner	6	0.89	0.85	0.94	0.98	1.10
Mom (t-1,t-6)	Loser	7	1.87	1.75	1.70	1.73	1.68
	WML	N/A	**0.98** **(5.10)**	**0.90** **(7.55)**	**0.76** **(8.91)**	**0.75** **(9.55)**	**0.58** **(8.02)**
	Winner	6	0.89	0.84	0.88	0.99	1.15
Mom (t-1,t-9)	Loser	7	1.72	1.68	1.67	1.65	1.60
	WML	N/A	**0.83** **(3.98)**	**0.84** **(6.71)**	**0.78** **(8.83)**	**0.65** **(8.24)**	**0.46** **(6.04)**
	Winner	6	0.83	0.85	0.98	1.11	1.23
Mom (t-1,t-12)	Loser	7	1.76	1.71	1.63	1.58	1.55
	WML	N/A	**0.94** **(4.76)**	**0.87** **(6.89)**	**0.66** **(6.86)**	**0.47** **(5.73)**	**0.31** **(4.14)**

Table 27 Equal Weighted Industry Momentum Returns under Fama French 48 Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	6	1.04	1.18	1.20	1.17	1.19
	Loser	7	1.85	1.71	1.65	1.69	1.75
	WML	N/A	0.80	0.53	0.45	0.53	0.56
			(4.44)	(4.49)	(5.26)	(7.09)	(7.97)
Mom (t-1,t-3)	Winner	6	1.03	1.02	1.10	1.08	1.09
	Loser	7	1.83	1.79	1.70	1.76	1.78
	WML	N/A	0.80	0.77	0.60	0.68	0.69
			(3.62)	(6.29)	(7.05)	(9.19)	(9.86)
Mom (t-1,t-6)	Winner	6	0.99	0.97	1.01	0.97	1.08
	Loser	7	1.86	1.78	1.79	1.84	1.80
	WML	N/A	0.87	0.81	0.79	0.87	0.72
			(4.37)	(6.40)	(8.60)	(10.86)	(9.74)
Mom (t-1,t-9)	Winner	6	1.02	0.96	0.92	0.96	1.09
	Loser	7	1.78	1.78	1.84	1.81	1.79
	WML	N/A	0.76	0.82	0.92	0.85	0.70
			(3.32)	(5.80)	(9.71)	(10.88)	(9.15)
Mom (t-1,t-12)	Winner	6	0.86	0.89	0.99	1.07	1.19
	Loser	7	1.88	1.84	1.82	1.78	1.75
	WML	N/A	1.02	0.95	0.83	0.71	0.56
			(4.82)	(7.21)	(8.32)	(8.13)	(7.08)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Winner	6	0.76	0.75	0.88	1.05	1.19
	Loser	7	1.63	1.52	1.41	1.40	1.45
	WML	N/A	0.87	0.77	0.53	0.35	0.26
			(2.25)	(3.29)	(3.47)	(2.50)	(1.96)
Mom (t-1,t-3)	Winner	6	0.84	0.70	0.85	1.06	1.17
	Loser	7	1.87	1.75	1.61	1.57	1.59
	WML	N/A	1.03	1.04	0.76	0.50	0.42
			(2.57)	(4.31)	(4.56)	(3.55)	(2.86)
Mom (t-1,t-6)	Winner	6	0.69	0.63	0.81	0.99	1.13
	Loser	7	1.88	1.69	1.50	1.51	1.45
	WML	N/A	1.19	1.06	0.70	0.52	0.32
			(2.90)	(4.29)	(3.99)	(3.06)	(2.02)
Mom (t-1,t-9)	Winner	6	0.65	0.63	0.82	1.06	1.25
	Loser	7	1.60	1.50	1.34	1.33	1.24
	WML	N/A	0.95	0.87	0.52	0.27	-0.01
			(2.28)	(3.57)	(2.83)	(1.56)	(-0.06)
Mom (t-1,t-12)	Winner	6	0.76	0.76	0.94	1.17	1.32
	Loser	7	1.54	1.46	1.27	1.20	1.15
	WML	N/A	0.78	0.70	0.33	0.03	-0.16
			(1.91)	(2.64)	(1.63)	(0.18)	(-1.07)

Table 28 Value Weighted Industry Momentum Strategy Adjusted* Returns under 3-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Loser	42	0.31	-0.03	-0.09	-0.11	-0.15
Mom (t-1)	Winner	43	-0.47	-0.15	-0.02	0.04	0.04
	WML	N/A	**-0.78**	**-0.11**	**0.06**	**0.15**	**0.19**
			(-5.58)	**(-1.38)**	**(1.03)**	**(2.83)**	**(4.05)**
	Loser	42	0.22	-0.12	-0.16	-0.18	-0.21
Mom (t-1,t-3)	Winner	43	-0.12	0.05	0.11	0.14	0.15
	WML	N/A	**-0.34**	**0.17**	**0.26**	**0.32**	**0.36**
			(-2.22)	**(1.88)**	**(3.72)**	**(5.53)**	**(6.76)**
	Loser	42	0.04	-0.25	-0.25	-0.28	-0.25
Mom (t-1,t-6)	Winner	43	0.06	0.14	0.24	0.24	0.19
	WML	N/A	**0.02**	**0.39**	**0.50**	**0.52**	**0.44**
			(0.12)	**(4.10)**	**(6.59)**	**(8.38)**	**(7.78)**
	Loser	42	-0.09	-0.30	-0.31	-0.27	-0.23
Mom (t-1,t-9)	Winner	43	0.18	0.27	0.31	0.26	0.21
	WML	N/A	**0.27**	**0.58**	**0.63**	**0.53**	**0.44**
			(1.57)	**(5.67)**	**(8.02)**	**(8.30)**	**(7.65)**
	Loser	42	-0.22	-0.32	-0.28	-0.21	-0.19
Mom (t-1,t-12)	Winner	43	0.24	0.30	0.27	0.23	0.18
	WML	N/A	**0.46**	**0.62**	**0.54**	**0.45**	**0.37**
			(2.60)	**(5.95)**	**(6.77)**	**(6.69)**	**(6.14)**

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 29 Value Weighted Industry Momentum Strategy Adjusted* Returns under 3-digit SICCD Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	39	0.32	-0.06	-0.15	-0.17	-0.20
	Winner	40	-0.52	-0.17	-0.06	0.03	0.04
	WML	N/A	-0.84	-0.11	0.09	0.20	0.24
			(-5.49)	(-1.20)	(1.29)	(3.24)	(4.23)
Mom (t-1,t-3)	Loser	39	0.22	-0.16	-0.24	-0.26	-0.29
	Winner	40	-0.21	-0.03	0.05	0.12	0.15
	WML	N/A	-0.44	0.14	0.29	0.38	0.45
			(-2.54)	(1.35)	(3.87)	(5.93)	(7.40)
Mom (t-1,t-6)	Loser	39	-0.05	-0.32	-0.36	-0.38	-0.34
	Winner	40	-0.05	0.08	0.20	0.23	0.19
	WML	N/A	0.00	0.40	0.55	0.62	0.53
			(0.01)	(3.74)	(7.32)	(9.53)	(8.71)
Mom (t-1,t-9)	Loser	39	-0.16	-0.36	-0.43	-0.38	-0.33
	Winner	40	0.12	0.23	0.33	0.30	0.25
	WML	N/A	0.28	0.59	0.75	0.67	0.57
			(1.43)	(5.31)	(9.43)	(9.96)	(9.21)
Mom (t-1,t-12)	Loser	39	-0.31	-0.40	-0.41	-0.32	-0.29
	Winner	40	0.22	0.34	0.31	0.28	0.22
	WML	N/A	0.53	0.73	0.71	0.60	0.51
			(2.73)	(6.36)	(8.70)	(8.47)	(7.82)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	46	0.29	0.01	0.02	0.00	-0.05
	Winner	47	-0.38	-0.10	0.04	0.05	0.05
	WML	N/A	-0.67	-0.12	0.02	0.04	0.10
			(-2.34)	(-0.73)	(0.14)	(0.46)	(1.14)
Mom (t-1,t-3)	Loser	46	0.22	-0.04	0.01	-0.03	-0.05
	Winner	47	0.06	0.20	0.22	0.19	0.15
	WML	N/A	-0.17	0.23	0.21	0.22	0.19
			(-0.53)	(1.32)	(1.41)	(1.83)	(1.88)
Mom (t-1,t-6)	Loser	46	0.22	-0.11	-0.06	-0.07	-0.07
	Winner	47	0.28	0.26	0.33	0.26	0.19
	WML	N/A	0.06	0.37	0.39	0.33	0.26
			(0.16)	(1.99)	(2.34)	(2.55)	(2.24)
Mom (t-1,t-9)	Loser	46	0.03	-0.19	-0.10	-0.05	-0.04
	Winner	47	0.29	0.36	0.28	0.19	0.13
	WML	N/A	0.26	0.55	0.38	0.25	0.17
			(0.76)	(2.67)	(2.28)	(1.90)	(1.52)
Mom (t-1,t-12)	Loser	46	-0.05	-0.17	-0.03	-0.00	0.01
	Winner	47	0.26	0.23	0.19	0.15	0.11
	WML	N/A	0.31	0.41	0.22	0.16	0.10
			(0.88)	(1.95)	(1.27)	(1.12)	(0.83)

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 30 Value Weighted Industry Momentum Strategy Adjusted* Returns under 2-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Loser	9	-0.06	-0.05	-0.12	-0.17	-0.19
Mom (t-1)	Winner	10	-0.05	0.02	0.03	0.07	0.10
	WML	N/A	**0.01**	**0.07**	**0.15**	**0.24**	**0.29**
			(0.06)	**(0.66)**	**(2.07)**	**(3.75)**	**(4.97)**
	Loser	9	-0.06	-0.11	-0.16	-0.22	-0.27
Mom (t-1,t-3)	Winner	10	0.03	0.08	0.08	0.14	0.18
	WML	N/A	**0.09**	**0.19**	**0.24**	**0.36**	**0.45**
			(0.45)	**(1.70)**	**(2.99)**	**(5.46)**	**(7.32)**
	Loser	9	-0.05	-0.20	-0.25	-0.33	-0.30
Mom (t-1,t-6)	Winner	10	0.14	0.12	0.23	0.28	0.26
	WML	N/A	**0.19**	**0.32**	**0.49**	**0.61**	**0.56**
			(0.95)	**(2.84)**	**(5.55)**	**(8.62)**	**(8.53)**
	Loser	9	-0.18	-0.25	-0.32	-0.35	-0.33
Mom (t-1,t-9)	Winner	10	0.23	0.27	0.32	0.32	0.29
	WML	N/A	**0.41**	**0.51**	**0.64**	**0.67**	**0.62**
			(1.98)	**(4.06)**	**(6.96)**	**(9.44)**	**(9.77)**
	Loser	9	-0.36	-0.39	-0.34	-0.36	-0.33
Mom (t-1,t-12)	Winner	10	0.40	0.38	0.37	0.35	0.32
	WML	N/A	**0.77**	**0.77**	**0.71**	**0.71**	**0.65**
			(3.63)	**(6.03)**	**(7.66)**	**(9.98)**	**(10.01)**

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 31 Value Weighted Industry Momentum Strategy Adjusted* Returns under 2-digit SICCD Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	1 month	3 months	6 months	9 months	12 months
				Holding Period Average Monthly Return			
Mom (t-1)	Loser	9	-0.00	-0.02	-0.11	-0.18	-0.21
	Winner	10	-0.04	0.06	0.04	0.13	0.18
	WML	N/A	-0.04 (-0.17)	0.09 (0.69)	0.15 (1.79)	0.31 (4.15)	0.39 (5.64)
Mom (t-1,t-3)	Loser	9	-0.10	-0.12	-0.22	-0.27	-0.33
	Winner	10	-0.00	0.06	0.08	0.18	0.25
	WML	N/A	0.10 (0.40)	0.19 (1.34)	0.31 (3.40)	0.45 (6.20)	0.58 (8.09)
Mom (t-1,t-6)	Loser	9	-0.12	-0.20	-0.30	-0.38	-0.37
	Winner	10	0.07	0.11	0.26	0.35	0.32
	WML	N/A	0.19 (0.76)	0.31 (2.24)	0.56 (6.13)	0.73 (9.40)	0.69 (9.40)
Mom (t-1,t-9)	Loser	9	-0.20	-0.25	-0.40	-0.42	-0.38
	Winner	10	0.27	0.31	0.42	0.44	0.36
	WML	N/A	0.46 (1.86)	0.56 (3.93)	0.83 (8.56)	0.86 (11.16)	0.74 (10.28)
Mom (t-1,t-12)	Loser	9	-0.40	-0.46	-0.43	-0.38	-0.35
	Winner	10	0.50	0.51	0.49	0.43	0.37
	WML	N/A	0.89 (3.53)	0.97 (6.72)	0.91 (9.46)	0.82 (10.37)	0.72 (9.83)

Panel B 1998-2016

Momentum	Rank	Number of Industries	1 month	3 months	6 months	9 months	12 months
				Holding Period Average Monthly Return			
Mom (t-1)	Loser	10	-0.16	-0.09	-0.14	-0.15	-0.15
	Winner	11	-0.06	-0.05	0.01	-0.06	-0.04
	WML	N/A	0.10 (0.32)	0.04 (0.20)	0.15 (1.08)	0.10 (0.84)	0.11 (0.99)
Mom (t-1,t-3)	Loser	10	0.01	-0.08	-0.05	-0.12	-0.16
	Winner	11	0.08	0.12	0.08	0.06	0.06
	WML	N/A	0.07 (0.22)	0.21 (1.04)	0.12 (0.76)	0.18 (1.39)	0.22 (1.87)
Mom (t-1,t-6)	Loser	10	0.09	-0.20	-0.17	-0.22	-0.17
	Winner	11	0.29	0.14	0.18	0.16	0.13
	WML	N/A	0.20 (0.57)	0.34 (1.74)	0.35 (1.86)	0.39 (2.70)	0.31 (2.40)
Mom (t-1,t-9)	Loser	10	-0.16	-0.23	-0.16	-0.20	-0.24
	Winner	11	0.16	0.18	0.12	0.11	0.16
	WML	N/A	0.31 (0.84)	0.42 (1.69)	0.28 (1.46)	0.31 (2.18)	0.40 (3.25)
Mom (t-1,t-12)	Loser	10	-0.29	-0.25	-0.18	-0.30	-0.30
	Winner	11	0.22	0.14	0.14	0.20	0.23
	WML	N/A	0.52 (1.36)	0.40 (1.59)	0.32 (1.63)	0.50 (3.57)	0.53 (4.10)

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

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Table 32 Value Weighted Industry Momentum Strategy Adjusted* Returns under Fama French 48 Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	6	-0.31	-0.13	-0.11	-0.13	-0.15
	Winner	7	0.15	0.10	0.12	0.16	0.16
	WML	N/A	**0.46** **(3.01)**	**0.24** **(2.61)**	**0.23** **(3.51)**	**0.29** **(4.99)**	**0.31** **(5.97)**
Mom (t-1,t-3)	Loser	6	-0.15	-0.13	-0.12	-0.17	-0.17
	Winner	7	0.16	0.17	0.18	0.23	0.23
	WML	N/A	**0.31** **(1.90)**	**0.31** **(3.35)**	**0.30** **(4.28)**	**0.39** **(6.71)**	**0.40** **(7.40)**
Mom (t-1,t-6)	Loser	6	-0.18	-0.19	-0.23	-0.28	-0.23
	Winner	7	0.19	0.20	0.25	0.28	0.26
	WML	N/A	**0.37** **(2.17)**	**0.40** **(3.96)**	**0.48** **(6.30)**	**0.56** **(8.22)**	**0.49** **(8.25)**
Mom (t-1,t-9)	Loser	6	-0.30	-0.34	-0.32	-0.29	-0.22
	Winner	7	0.28	0.33	0.35	0.33	0.27
	WML	N/A	**0.58** **(3.30)**	**0.67** **(6.26)**	**0.66** **(8.21)**	**0.62** **(9.11)**	**0.50** **(8.28)**
Mom (t-1,t-12)	Loser	6	-0.35	-0.32	-0.27	-0.22	-0.15
	Winner	7	0.35	0.36	0.34	0.30	0.25
	WML	N/A	**0.70** **(3.84)**	**0.68** **(6.05)**	**0.62** **(7.44)**	**0.52** **(7.56)**	**0.40** **(6.79)**

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 33 Value Weighted Industry Momentum Strategy Adjusted* Returns under Fama French 48 Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	1 month	3 months	6 months	9 months	12 months
				Holding Period Average Monthly Return			
Mom (t-1)	Loser	6	-0.31	-0.11	-0.09	-0.13	-0.15
	Winner	7	0.30	0.16	0.13	0.18	0.19
	WML	N/A	0.61 (3.97)	0.28 (2.83)	0.22 (2.99)	0.31 (4.85)	0.34 (6.01)
Mom (t-1,t-3)	Loser	6	-0.14	-0.11	-0.12	-0.17	-0.18
	Winner	7	0.20	0.18	0.15	0.24	0.25
	WML	N/A	0.34 (1.96)	0.29 (2.79)	0.27 (3.45)	0.41 (6.62)	0.44 (7.74)
Mom (t-1,t-6)	Loser	6	-0.19	-0.19	-0.25	-0.31	-0.26
	Winner	7	0.12	0.14	0.20	0.27	0.27
	WML	N/A	0.31 (1.71)	0.33 (2.94)	0.46 (5.73)	0.57 (8.91)	0.53 (9.08)
Mom (t-1,t-9)	Loser	6	-0.35	-0.32	-0.34	-0.32	-0.24
	Winner	7	0.27	0.31	0.36	0.37	0.33
	WML	N/A	0.62 (3.31)	0.64 (5.46)	0.71 (8.90)	0.69 (11.12)	0.57 (10.16)
Mom (t-1,t-12)	Loser	6	-0.36	-0.32	-0.32	-0.26	-0.18
	Winner	7	0.36	0.36	0.36	0.34	0.29
	WML	N/A	0.73 (3.85)	0.67 (5.91)	0.68 (8.55)	0.59 (9.52)	0.47 (8.48)

Panel B 1998-2016

Momentum	Rank	Number of Industries	1 month	3 months	6 months	9 months	12 months
				Holding Period Average Monthly Return			
Mom (t-1)	Loser	6	-0.30	-0.17	-0.15	-0.13	-0.15
	Winner	7	-0.15	-0.01	0.09	0.13	0.10
	WML	N/A	0.16 (0.47)	0.16 (0.85)	0.25 (1.92)	0.26 (2.17)	0.25 (2.36)
Mom (t-1,t-3)	Loser	6	-0.18	-0.18	-0.13	-0.15	-0.15
	Winner	7	0.06	0.16	0.23	0.21	0.19
	WML	N/A	0.24 (0.72)	0.34 (1.90)	0.36 (2.57)	0.36 (2.91)	0.34 (2.91)
Mom (t-1,t-6)	Loser	6	-0.17	-0.21	-0.19	-0.21	-0.18
	Winner	7	0.32	0.33	0.33	0.31	0.23
	WML	N/A	0.50 (1.37)	0.53 (2.65)	0.52 (3.24)	0.52 (3.38)	0.41 (3.13)
Mom (t-1,t-9)	Loser	6	-0.22	-0.36	-0.26	-0.22	-0.18
	Winner	7	0.30	0.36	0.31	0.26	0.17
	WML	N/A	0.52 (1.40)	0.72 (3.35)	0.58 (3.21)	0.49 (3.07)	0.35 (2.53)
Mom (t-1,t-12)	Loser	6	-0.33	-0.31	-0.19	-0.14	-0.10
	Winner	7	0.33	0.37	0.31	0.22	0.17
	WML	N/A	0.66 (1.67)	0.68 (2.81)	0.50 (2.67)	0.37 (2.31)	0.27 (1.98)

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 34 Equal Weighted Industry Momentum Strategy Adjusted* Returns under 3-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Loser	42	0.40	-0.02	-0.10	-0.13	-0.16
Mom (t-1)	Winner	43	-0.38	-0.08	0.01	0.06	0.05
	WML	N/A	**-0.77** **(-5.49)**	**-0.06** **(-0.76)**	**0.11** **(1.79)**	**0.19** **(3.62)**	**0.22** **(4.62)**
	Loser	42	0.14	-0.13	-0.16	-0.20	-0.22
Mom (t-1,t-3)	Winner	43	-0.03	0.14	0.16	0.17	0.16
	WML	N/A	**-0.17** **(-1.08)**	**0.27** **(2.96)**	**0.31** **(4.40)**	**0.37** **(6.42)**	**0.38** **(7.32)**
	Loser	42	0.04	-0.23	-0.26	-0.29	-0.24
Mom (t-1,t-6)	Winner	43	0.07	0.18	0.22	0.21	0.14
	WML	N/A	**0.03** **(0.16)**	**0.41** **(4.24)**	**0.48** **(6.36)**	**0.50** **(8.15)**	**0.38** **(6.69)**
	Loser	42	-0.07	-0.28	-0.31	-0.26	-0.22
Mom (t-1,t-9)	Winner	43	0.19	0.28	0.29	0.21	0.13
	WML	N/A	**0.26** **(1.53)**	**0.56** **(5.35)**	**0.60** **(7.53)**	**0.48** **(7.27)**	**0.34** **(5.76)**
	Loser	42	-0.16	-0.29	-0.24	-0.18	-0.16
Mom (t-1,t-12)	Winner	43	0.26	0.30	0.24	0.17	0.10
	WML	N/A	**0.42** **(2.53)**	**0.59** **(5.82)**	**0.47** **(5.93)**	**0.35** **(5.23)**	**0.26** **(4.38)**

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 35 Equal Weighted Industry Momentum Strategy Adjusted* Returns under 3-digit SICCD Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	39	0.43	-0.02	-0.16	-0.19	-0.21
	Winner	40	-0.49	-0.16	-0.03	0.06	0.06
	WML	N/A	-0.91 (-5.88)	-0.13 (-1.44)	0.12 (1.87)	0.24 (4.08)	0.27 (4.87)
Mom (t-1,t-3)	Loser	39	0.13	-0.19	-0.24	-0.28	-0.31
	Winner	40	-0.18	0.04	0.11	0.17	0.18
	WML	N/A	-0.32 (-1.83)	0.23 (2.28)	0.36 (4.89)	0.45 (6.95)	0.49 (8.38)
Mom (t-1,t-6)	Loser	39	-0.02	-0.28	-0.35	-0.38	-0.34
	Winner	40	-0.02	0.12	0.22	0.24	0.18
	WML	N/A	0.00 (0.03)	0.40 (3.66)	0.57 (7.62)	0.62 (9.83)	0.52 (8.99)
Mom (t-1,t-9)	Loser	39	-0.10	-0.32	-0.44	-0.39	-0.34
	Winner	40	0.16	0.27	0.34	0.28	0.22
	WML	N/A	0.26 (1.37)	0.59 (5.40)	0.78 (10.16)	0.67 (10.34)	0.56 (9.50)
Mom (t-1,t-12)	Loser	39	-0.25	-0.37	-0.39	-0.32	-0.31
	Winner	40	0.25	0.34	0.29	0.24	0.18
	WML	N/A	0.51 (2.78)	0.71 (6.51)	0.68 (8.84)	0.56 (8.31)	0.49 (8.09)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	46	0.34	-0.00	0.00	-0.03	-0.08
	Winner	47	-0.17	0.07	0.10	0.06	0.05
	WML	N/A	-0.50 (-1.79)	0.07 (0.40)	0.10 (0.71)	0.09 (0.89)	0.13 (1.44)
Mom (t-1,t-3)	Loser	46	0.16	-0.02	0.01	-0.05	-0.06
	Winner	47	0.28	0.32	0.24	0.17	0.11
	WML	N/A	0.12 (0.41)	0.34 (1.89)	0.22 (1.47)	0.22 (1.94)	0.18 (1.72)
Mom (t-1,t-6)	Loser	46	0.16	-0.15	-0.09	-0.11	-0.05
	Winner	47	0.23	0.29	0.22	0.16	0.05
	WML	N/A	0.07 (0.20)	0.44 (2.27)	0.31 (1.85)	0.27 (2.06)	0.10 (0.84)
Mom (t-1,t-9)	Loser	46	-0.00	-0.20	-0.07	-0.02	0.03
	Winner	47	0.25	0.29	0.19	0.08	-0.04
	WML	N/A	0.26 (0.77)	0.49 (2.23)	0.27 (1.48)	0.10 (0.70)	-0.07 (-0.55)
Mom (t-1,t-12)	Loser	46	0.02	-0.13	0.05	0.08	0.11
	Winner	47	0.28	0.23	0.13	0.03	-0.05
	WML	N/A	0.25 (0.76)	0.36 (1.72)	0.09 (0.48)	-0.05 (-0.35)	-0.16 (-1.29)

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Table 36 Equal Weighted Industry Momentum Strategy Adjusted* Returns under 2-digit SICCD Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Loser	9	-0.15	-0.13	-0.22	-0.26	-0.27
Mom (t-1)	Winner	10	0.08	0.15	0.13	0.13	0.12
	WML	N/A	**0.22**	**0.28**	**0.34**	**0.39**	**0.39**
			(1.22)	**(2.35)**	**(4.44)**	**(6.21)**	**(6.76)**
	Loser	9	-0.04	-0.30	-0.31	-0.35	-0.36
Mom (t-1,t-3)	Winner	10	0.19	0.23	0.18	0.18	0.18
	WML	N/A	**0.23**	**0.53**	**0.48**	**0.54**	**0.54**
			(1.22)	**(4.55)**	**(6.01)**	**(8.48)**	**(9.46)**
	Loser	9	-0.20	-0.38	-0.39	-0.41	-0.37
Mom (t-1,t-6)	Winner	10	0.25	0.21	0.27	0.28	0.19
	WML	N/A	**0.45**	**0.59**	**0.66**	**0.69**	**0.56**
			(2.35)	**(5.37)**	**(8.04)**	**(10.28)**	**(9.16)**
	Loser	9	-0.29	-0.36	-0.37	-0.37	-0.34
Mom (t-1,t-9)	Winner	10	0.28	0.33	0.31	0.28	0.20
	WML	N/A	**0.57**	**0.69**	**0.68**	**0.65**	**0.54**
			(3.04)	**(5.68)**	**(7.56)**	**(9.14)**	**(8.64)**
	Loser	9	-0.37	-0.37	-0.33	-0.32	-0.29
Mom (t-1,t-12)	Winner	10	0.40	0.39	0.30	0.26	0.21
	WML	N/A	**0.78**	**0.76**	**0.63**	**0.58**	**0.49**
			(4.06)	**(6.31)**	**(7.15)**	**(8.57)**	**(7.91)**

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 37 Equal Weighted Industry Momentum Strategy Adjusted* Returns under 2-digit SICCD Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	9	0.02	-0.07	-0.21	-0.28	-0.31
	Winner	10	-0.01	0.10	0.08	0.15	0.14
	WML	N/A	-0.02 (-0.10)	0.18 (1.32)	0.29 (3.39)	0.44 (6.11)	0.45 (7.10)
Mom (t-1,t-3)	Loser	9	0.02	-0.28	-0.35	-0.41	-0.43
	Winner	10	0.07	0.14	0.14	0.18	0.21
	WML	N/A	0.05 (0.19)	0.42 (3.13)	0.48 (5.53)	0.59 (8.02)	0.63 (9.60)
Mom (t-1,t-6)	Loser	9	-0.17	-0.38	-0.44	-0.47	-0.44
	Winner	10	0.13	0.18	0.27	0.32	0.23
	WML	N/A	0.30 (1.28)	0.56 (4.36)	0.71 (7.66)	0.79 (10.15)	0.68 (9.87)
Mom (t-1,t-9)	Loser	9	-0.26	-0.36	-0.46	-0.46	-0.41
	Winner	10	0.27	0.35	0.40	0.37	0.27
	WML	N/A	0.52 (2.31)	0.71 (5.06)	0.86 (8.80)	0.83 (10.44)	0.67 (9.56)
Mom (t-1,t-12)	Loser	9	-0.42	-0.45	-0.44	-0.39	-0.35
	Winner	10	0.42	0.49	0.42	0.33	0.27
	WML	N/A	0.84 (3.65)	0.94 (6.88)	0.86 (9.16)	0.72 (9.20)	0.62 (8.64)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	10	-0.46	-0.23	-0.24	-0.22	-0.19
	Winner	11	0.23	0.23	0.22	0.08	0.08
	WML	N/A	0.69 (2.05)	0.47 (2.05)	0.46 (2.89)	0.30 (2.46)	0.27 (2.35)
Mom (t-1,t-3)	Loser	10	-0.16	-0.33	-0.22	-0.26	-0.25
	Winner	11	0.43	0.40	0.26	0.18	0.12
	WML	N/A	0.59 (1.80)	0.73 (3.35)	0.49 (2.94)	0.43 (3.65)	0.36 (3.37)
Mom (t-1,t-6)	Loser	10	-0.26	-0.38	-0.31	-0.31	-0.23
	Winner	11	0.48	0.26	0.28	0.19	0.11
	WML	N/A	0.74 (2.20)	0.64 (3.15)	0.58 (3.56)	0.50 (3.95)	0.34 (2.85)
Mom (t-1,t-9)	Loser	10	-0.36	-0.37	-0.19	-0.20	-0.20
	Winner	11	0.32	0.28	0.15	0.10	0.09
	WML	N/A	0.68 (1.97)	0.65 (2.82)	0.34 (1.85)	0.30 (2.19)	0.29 (2.36)
Mom (t-1,t-12)	Loser	10	-0.29	-0.22	-0.10	-0.19	-0.16
	Winner	11	0.37	0.20	0.08	0.13	0.09
	WML	N/A	0.66 (1.92)	0.42 (1.79)	0.18 (1.02)	0.32 (2.50)	0.24 (2.10)

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 38 Equal Weighted Industry Momentum Strategy Adjusted Returns under Fama French 48 Classification 1963-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Loser	6	-0.21	-0.17	-0.15	-0.15	-0.13
Mom (t-1)	Winner	7	0.42	0.35	0.28	0.28	0.28
	WML	N/A	**0.62**	**0.52**	**0.43**	**0.43**	**0.41**
			(4.14)	**(5.60)**	**(6.74)**	**(7.34)**	**(7.24)**
	Loser	6	-0.23	-0.30	-0.25	-0.22	-0.21
Mom (t-1,t-3)	Winner	7	0.52	0.47	0.39	0.39	0.36
	WML	N/A	**0.75**	**0.78**	**0.64**	**0.61**	**0.57**
			(4.71)	**(8.05)**	**(9.51)**	**(10.23)**	**(9.61)**
	Loser	6	-0.30	-0.37	-0.31	-0.30	-0.23
Mom (t-1,t-6)	Winner	7	0.58	0.49	0.44	0.42	0.34
	WML	N/A	**0.88**	**0.86**	**0.75**	**0.72**	**0.57**
			(5.50)	**(8.64)**	**(10.34)**	**(10.60)**	**(9.07)**
	Loser	6	-0.41	-0.41	-0.35	-0.28	-0.19
Mom (t-1,t-9)	Winner	7	0.50	0.46	0.42	0.36	0.28
	WML	N/A	**0.90**	**0.86**	**0.77**	**0.65**	**0.47**
			(5.43)	**(8.19)**	**(10.04)**	**(9.42)**	**(7.28)**
	Loser	6	-0.41	-0.38	-0.30	-0.22	-0.15
Mom (t-1,t-12)	Winner	7	0.51	0.47	0.39	0.30	0.23
	WML	N/A	**0.92**	**0.85**	**0.69**	**0.53**	**0.37**
			(5.51)	**(8.01)**	**(8.85)**	**(7.67)**	**(5.89)**

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 39 Equal Weighted Industry Momentum Strategy Adjusted Returns under Fama French 48 Classification Subsample Analysis

Panel A 1963-1997

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	6	-0.15	-0.13	-0.15	-0.21	-0.21
	Winner	7	0.38	0.31	0.25	0.28	0.29
	WML	N/A	0.53 (3.64)	0.44 (4.78)	0.41 (6.12)	0.49 (8.17)	0.50 (8.60)
Mom (t-1,t-3)	Loser	6	-0.23	-0.30	-0.28	-0.31	-0.32
	Winner	7	0.42	0.39	0.32	0.37	0.34
	WML	N/A	0.65 (4.13)	0.69 (7.09)	0.60 (8.92)	0.68 (11.20)	0.66 (11.49)
Mom (t-1,t-6)	Loser	6	-0.22	-0.34	-0.35	-0.38	-0.33
	Winner	7	0.51	0.45	0.45	0.46	0.38
	WML	N/A	0.73 (4.69)	0.79 (7.86)	0.80 (10.65)	0.84 (12.79)	0.71 (11.73)
Mom (t-1,t-9)	Loser	6	-0.36	-0.39	-0.42	-0.39	-0.33
	Winner	7	0.52	0.48	0.48	0.44	0.38
	WML	N/A	0.89 (5.28)	0.87 (7.77)	0.90 (11.24)	0.83 (12.80)	0.71 (11.58)
Mom (t-1,t-12)	Loser	6	-0.42	-0.42	-0.39	-0.35	-0.29
	Winner	7	0.56	0.50	0.46	0.40	0.34
	WML	N/A	0.98 (5.69)	0.92 (8.57)	0.86 (11.10)	0.76 (11.63)	0.63 (10.34)

Panel B 1998-2016

Momentum	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
Mom (t-1)	Loser	6	-0.31	-0.25	-0.15	-0.06	0.03
	Winner	7	0.49	0.42	0.33	0.26	0.26
	WML	N/A	0.79 (2.35)	0.67 (3.28)	0.48 (3.51)	0.32 (2.51)	0.23 (1.93)
Mom (t-1,t-3)	Loser	6	-0.24	-0.31	-0.19	-0.05	0.00
	Winner	7	0.69	0.63	0.52	0.42	0.40
	WML	N/A	0.93 (2.66)	0.94 (4.48)	0.71 (4.82)	0.47 (3.68)	0.39 (2.98)
Mom (t-1,t-6)	Loser	6	-0.44	-0.42	-0.24	-0.13	-0.04
	Winner	7	0.72	0.57	0.42	0.35	0.25
	WML	N/A	1.15 (3.24)	0.99 (4.57)	0.66 (4.24)	0.49 (3.21)	0.30 (2.13)
Mom (t-1,t-9)	Loser	6	-0.49	-0.43	-0.22	-0.08	0.07
	Winner	7	0.44	0.42	0.29	0.21	0.09
	WML	N/A	0.93 (2.56)	0.85 (3.85)	0.52 (3.21)	0.29 (1.89)	0.02 (0.12)
Mom (t-1,t-12)	Loser	6	-0.38	-0.30	-0.13	0.02	0.13
	Winner	7	0.43	0.42	0.24	0.11	0.01
	WML	N/A	0.81 (2.26)	0.72 (3.11)	0.38 (2.19)	0.09 (0.56)	-0.12 (-0.86)

*All individual stock returns are adjusted for 25 Size & BM benchmark portfolio returns

Table 40 Seasonality Analysis of Value Weighted Industry Momentum Returns under 3-digit SICCD Classification

Momentum (t-1,t-12)	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Loser	42	1.20	1.72	0.82	0.56	0.96
January	Winner	43	1.89	2.13	1.35	1.01	1.45
	WML	N/A	**0.69** **(1.26)**	**0.41** **(1.13)**	**0.53** **(1.74)**	**0.45** **(1.47)**	**0.49** **(1.91)**
	Loser	42	1.94	1.47	0.77	0.55	1.07
February	Winner	43	2.66	1.93	1.15	1.06	1.49
	WML	N/A	**0.72** **(1.19)**	**0.46** **(0.77)**	**0.39** **(0.87)**	**0.51** **(1.43)**	**0.42** **(1.36)**
	Loser	42	2.38	0.63	0.52	0.48	1.11
March	Winner	43	2.06	1.34	0.83	1.12	1.44
	WML		**-0.32** **(-0.34)**	**0.72** **(1.52)**	**0.31** **(0.68)**	**0.64** **(1.89)**	**0.33** **(1.12)**
	Loser	42	0.35	-0.20	-0.21	0.60	1.01
April	Winner	43	0.81	0.73	0.54	1.17	1.35
	WML		**0.46** **(0.64)**	**0.93** **(2.67)**	**0.75** **(2.51)**	**0.57** **(2.24)**	**0.34** **(1.57)**
	Loser	42	-0.67	-0.33	-0.33	0.70	0.94
May	Winner	43	0.75	0.52	0.76	1.35	1.56
	WML		**1.42** **(2.38)**	**0.84** **(2.71)**	**1.09** **(4.31)**	**0.65** **(2.96)**	**0.62** **(3.20)**
	Loser	42	-0.33	0.07	0.08	0.99	0.95
June	Winner	43	0.02	0.38	1.02	1.49	1.49
	WML		**0.34** **(0.69)**	**0.31** **(0.62)**	**0.93** **(2.74)**	**0.49** **(2.09)**	**0.54** **(2.95)**

Table 40 Panel B 3-digit SICCD July - December 1963-2016							
July	**Loser**	**42**	0.42	-0.35	0.82	1.38	1.25
	Winner	**43**	-0.26	0.07	1.30	1.52	1.22
	WML		**-0.68** **(-0.92)**	**0.42** **(0.96)**	**0.49** **(1.37)**	**0.15** **(0.47)**	**-0.03** **(-0.11)**
August	**Loser**	**42**	-0.17	-0.51	0.96	1.26	0.98
	Winner	**42**	0.84	1.11	1.85	1.90	1.52
	WML		**1.01** **(1.53)**	**1.62** **(4.95)**	**0.89** **(3.62)**	**0.64** **(3.10)**	**0.54** **(2.98)**
September	**Loser**	**42**	-0.94	0.14	1.46	1.36	1.10
	Winner	**43**	-0.11	1.56	2.06	1.88	1.49
	WML		**0.82** **(1.26)**	**1.41** **(3.51)**	**0.60** **(2.11)**	**0.52** **(2.14)**	**0.39** **(1.79)**
October	**Loser**	**42**	0.49	1.92	2.08	1.53	1.27
	Winner	**43**	2.05	2.75	2.51	1.98	1.50
	WML		**1.56** **(2.29)**	**0.84** **(2.08)**	**0.43** **(1.53)**	**0.45** **(1.78)**	**0.23** **(0.89)**
November	**Loser**	**42**	1.11	2.42	2.15	1.46	1.26
	Winner	**43**	2.97	2.72	2.34	1.72	1.47
	WML		**1.85** **(2.91)**	**0.30** **(0.70)**	**0.19** **(0.56)**	**0.26** **(0.85)**	**0.21** **(0.78)**
December	**Loser**	**42**	5.72	3.18	2.11	1.62	1.45
	Winner	**43**	3.15	2.62	1.88	1.33	1.41
	WML		**-2.57** **(-2.34)**	**-0.56** **(-1.18)**	**-0.23** **(-0.57)**	**-0.28** **(-0.82)**	**-0.04** **(-0.13)**

Table 41 Seasonality Analysis of Value Weighted Industry Momentum Returns under 2-digit SICCD Classification

Momentum (t-1,t-12)	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
			Panel A January to June 1963-2016				
January	Loser	9	0.11	0.88	0.49	0.37	0.87
	Winner	10	2.05	2.12	1.39	1.03	1.53
	WML	N/A	**1.94** **(2.40)**	**1.24** **(3.35)**	**0.90** **(3.02)**	**0.66** **(2.40)**	**0.67** **(2.33)**
February	Loser	9	1.48	1.03	0.57	0.55	0.94
	Winner	10	1.71	1.61	1.01	1.05	1.48
	WML	N/A	**0.23** **(0.37)**	**0.58** **(1.07)**	**0.44** **(1.00)**	**0.50** **(1.48)**	**0.54** **(1.70)**
March	Loser	9	1.75	0.45	0.47	0.63	0.88
	Winner	10	2.37	1.44	0.84	1.24	1.42
	WML		**0.62** **(0.72)**	**0.99** **(1.98)**	**0.37** **(0.84)**	**0.61** **(1.63)**	**0.54** **(1.85)**
April	Loser	9	0.10	-0.23	-0.07	0.61	0.76
	Winner	10	0.74	0.50	0.40	1.24	1.38
	WML		**0.64** **(0.89)**	**0.73** **(1.78)**	**0.47** **(1.37)**	**0.63** **(1.95)**	**0.62** **(2.45)**
May	Loser	9	-0.69	-0.12	0.04	0.62	0.73
	Winner	10	1.19	0.62	1.01	1.49	1.65
	WML		**1.88** **(2.52)**	**0.74** **(1.78)**	**0.97** **(2.54)**	**0.87** **(2.82)**	**0.93** **(3.68)**
June	Loser	9	0.21	0.37	0.92	1.00	0.95
	Winner	10	-0.43	0.06	0.99	1.36	1.44
	WML		**-0.63** **(-0.90)**	**-0.31** **(-0.46)**	**0.06** **(0.11)**	**0.36** **(1.11)**	**0.49** **(1.84)**

			Table 41 Panel B 2-digit SICCD July - December 1963-2016				
	Loser	9	-0.06	-0.23	0.81	1.05	0.85
July	Winner	10	-0.15	0.30	1.46	1.57	1.40
	WML		**-0.09** **(-0.13)**	**0.52** **(1.12)**	**0.65** **(1.53)**	**0.53** **(1.74)**	**0.55** **(2.05)**
	Loser	9	-0.23	-0.16	0.65	0.92	0.66
August	Winner	10	0.98	1.57	2.04	1.95	1.61
	WML		**1.21** **(1.73)**	**1.72** **(3.88)**	**1.39** **(4.26)**	**1.03** **(4.05)**	**0.94** **(4.13)**
	Loser	9	-0.78	0.63	1.02	0.96	0.78
September	Winner	10	0.24	1.89	2.04	1.93	1.47
	WML		**1.02** **(1.11)**	**1.26** **(1.80)**	**1.03** **(3.12)**	**0.97** **(3.51)**	**0.70** **(2.96)**
	Loser	9	0.61	1.46	1.33	0.94	0.88
October	Winner	10	2.30	2.70	2.39	1.87	1.35
	WML		**1.69** **(2.02)**	**1.24** **(3.06)**	**1.06** **(3.25)**	**0.93** **(3.83)**	**0.47** **(2.08)**
	Loser	9	1.20	1.67	1.47	0.93	0.94
November	Winner	10	3.67	2.71	2.24	1.68	1.43
	WML		**2.46** **(3.09)**	**1.04** **(2.21)**	**0.77** **(3.09)**	**0.75** **(3.15)**	**0.49** **(2.08)**
	Loser	9	3.67	1.73	1.14	0.79	0.93
December	Winner	10	2.55	2.05	1.80	1.33	1.54
	WML		**-1.11** **(-1.04)**	**0.32** **(0.59)**	**0.66** **(2.41)**	**0.54** **(2.11)**	**0.61** **(1.99)**

Table 42 Seasonality Analysis of Value Weighted Industry Momentum Returns under Fama French 48 Classification

Panel A January to June 1963-2016							
Momentum (t-1,t-12)	Rank	Number of Industries	Holding Period Average Monthly Return				
			1 month	3 months	6 months	9 months	12 months
	Loser	6	0.18	1.12	0.49	0.46	0.93
January	Winner	7	1.88	1.86	1.36	0.98	1.38
	WML	N/A	**1.69** (2.23)	**0.74** (1.73)	**0.87** (3.01)	**0.51** (2.04)	**0.45** (1.88)
	Loser	6	0.98	1.09	0.58	0.58	0.94
February	Winner	7	1.83	1.63	1.10	1.00	1.33
	WML	N/A	**0.85** (1.49)	**0.54** (1.07)	**0.52** (1.55)	**0.42** (1.30)	**0.38** (1.21)
	Loser	6	1.81	0.45	0.36	0.64	0.95
March	Winner	7	1.82	1.31	0.85	1.14	1.30
	WML		**0.01** (0.01)	**0.87** (1.89)	**0.49** (1.36)	**0.50** (1.50)	**0.35** (1.22)
	Loser	6	0.66	-0.04	0.05	0.68	0.95
April	Winner	7	1.06	0.82	0.46	1.15	1.29
	WML		**0.40** (0.59)	**0.86** (2.30)	**0.41** (1.21)	**0.47** (1.47)	**0.34** (1.37)
	Loser	6	-1.16	-0.28	0.05	0.65	0.93
May	Winner	7	0.96	0.60	0.77	1.32	1.46
	WML		**2.11** (3.20)	**0.88** (2.65)	**0.73** (2.37)	**0.68** (2.21)	**0.54** (2.40)
	Loser	6	-0.15	0.15	0.57	0.92	0.89
June	Winner	7	0.34	0.35	1.10	1.35	1.33
	WML		**0.50** (0.62)	**0.19** (0.36)	**0.52** (1.28)	**0.43** (1.36)	**0.45** (1.92)

	Table 42 Panel B Fama French 48 July - December 1963-2016						
	Loser	**6**	0.86	0.05	0.79	1.14	1.07
July	**Winner**	**7**	0.26	0.19	1.40	1.58	1.42
	WML		**-0.60** **(-1.07)**	**0.14** **(0.39)**	**0.60** **(1.91)**	**0.44** **(1.81)**	**0.35** **(1.66)**
	Loser	**6**	-0.61	0.11	0.87	1.14	0.91
August	**Winner**	**7**	0.62	1.23	1.92	1.76	1.49
	WML		**1.22** **(1.86)**	**1.12** **(2.56)**	**1.06** **(2.79)**	**0.62** **(2.56)**	**0.58** **(2.52)**
	Loser	**6**	0.04	0.85	1.25	1.14	0.98
September	**Winner**	**7**	0.22	1.82	1.99	1.76	1.40
	WML		**0.18** **(0.22)**	**0.97** **(1.84)**	**0.74** **(1.87)**	**0.62** **(2.24)**	**0.42** **(1.75)**
	Loser	**6**	1.09	1.48	1.52	1.09	1.00
October	**Winner**	**7**	1.99	2.58	2.26	1.84	1.41
	WML		**0.90** **(1.25)**	**1.10** **(2.44)**	**0.74** **(2.01)**	**0.75** **(2.72)**	**0.40** **(1.62)**
	Loser	**6**	1.26	1.29	1.42	0.95	0.93
November	**Winner**	**7**	3.31	2.64	2.09	1.66	1.40
	WML		**2.05** **(2.90)**	**1.36** **(2.69)**	**0.67** **(2.49)**	**0.71** **(3.14)**	**0.48** **(2.19)**
	Loser	**6**	2.05	1.56	1.07	0.87	1.05
December	**Winner**	**7**	2.22	1.94	1.61	1.18	1.26
	WML		**0.18** **(0.20)**	**0.38** **(0.84)**	**0.54** **(1.88)**	**0.31** **(1.24)**	**0.21** **(0.86)**

Appendix

3-digit SICCD Classification[3] Sample (From 10 to 299 due to space limit)

10
AGRICULTURAL PRODUCTION-CROPS
20
AGRICULTURAL PROD-LIVESTOCK & ANIMAL SPECIALTIES
70
AGRICULTURAL SERVICE
80
FORESTRY
90
FISHING, HUNTING AND TRAPPING
100
METAL MINING
104
GOLD AND SILVER ORES
109
MISCELLANEOUS METAL ORES
122
BITUMINOUS COAL & LIGNITE MINING
BITUMINOUS COAL & LIGNITE SURFACE MINING
131
CRUDE PETROLEUM & NATURAL GAS
138
DRILLING OIL & GAS WELLS
OIL & GAS FIELD EXPLORATION SERVICES
OIL & GAS FIELD SERVICES, NEC
140
MINING & QUARRYING OF NONMETALLIC MINERALS (NO FUELS)
152
GENERAL BLDG CONTRACTORS - RESIDENTIAL BLDGS
153
OPERATIVE BUILDERS
154
GENERAL BLDG CONTRACTORS - NONRESIDENTIAL BLDGS
160
HEAVY CONSTRUCTION OTHER THAN BLDG CONST - CONTRACTORS
162
WATER, SEWER, PIPELINE, COMM & POWER LINE CONSTRUCTION
170
CONSTRUCTION - SPECIAL TRADE CONTRACTORS

173

ELECTRICAL WORK

200

FOOD AND KINDRED PRODUCTS

201

MEAT PACKING PLANTS

POULTRY SLAUGHTERING AND PROCESSING

SAUSAGES & OTHER PREPARED MEAT PRODUCTS

202

DAIRY PRODUCTS

ICE CREAM & FROZEN DESSERTS

203

CANNED, FROZEN & PRESERVD FRUIT, VEG & FOOD SPECIALTIES

CANNED, FRUITS, VEG, PRESERVES, JAMS & JELLIES

204

GRAIN MILL PRODUCTS

205

BAKERY PRODUCTS

COOKIES & CRACKERS

206

SUGAR & CONFECTIONERY PRODUCTS

207

FATS & OILS

208

BEVERAGES

BOTTLED & CANNED SOFT DRINKS & CARBONATED WATERS

MALT BEVERAGES

209

MISCELLANEOUS FOOD PREPARATIONS & KINDRED PRODUCTS

PREPARED FRESH OR FROZEN FISH & SEAFOODS

210

TOBACCO PRODUCTS

211

CIGARETTES

220

TEXTILE MILL PRODUCTS

221

BROADWOVEN FABRIC MILLS, COTTON

222

BROADWOVEN FABRIC MILLS, MAN MADE FIBER & SILK

225

KNIT OUTERWEAR MILLS

KNITTING MILLS

227

CARPETS & RUGS

230

APPAREL & OTHER FINISHD PRODS OF FABRICS & SIMILAR MATL

232

MEN'S & BOYS' FURNISHGS, WORK CLOTHG, & ALLIED GARMENTS

233

WOMEN'S, MISSES', AND JUNIORS OUTERWEAR

234

WOMEN'S, MISSES', CHILDREN'S & INFANTS' UNDERGARMENTS

239

MISCELLANEOUS FABRICATED TEXTILE PRODUCTS

240

LUMBER & WOOD PRODUCTS (NO FURNITURE)

242

SAWMILLS & PLANTING MILLS, GENERAL

243

MILLWOOD, VENEER, PLYWOOD, & STRUCTURAL WOOD MEMBERS

245

MOBILE HOMES

PREFABRICATED WOOD BLDGS & COMPONENTS

251

HOUSEHOLD FURNITURE

WOOD HOUSEHOLD FURNITURE, (NO UPHOLSTERED)

252

OFFICE FURNITURE

OFFICE FURNITURE (NO WOOD)

253

PUBLIC BLDG & RELATED FURNITURE

254

PARTITIONS, SHELVG, LOCKERS, & OFFICE & STORE FIXTURES

259

MISCELLANEOUS FURNITURE & FIXTURES

260

PAPERS & ALLIED PRODUCTS

261

PULP MILLS

262

PAPER MILLS

263

PAPERBOARD MILLS

265

PAPERBOARD CONTAINERS & BOXES

267

CONVERTED PAPER & PAPERBOARD PRODS (NO CONTANERS/BOXES)

PLASTICS, FOIL & COATED PAPER BAGS

271

NEWSPAPERS: PUBLISHING OR PUBLISHING & PRINTING

272

PERIODICALS: PUBLISHING OR PUBLISHING & PRINTING
273
BOOK PRINTING
BOOKS: PUBLISHING OR PUBLISHING & PRINTING
274
MISCELLANEOUS PUBLISHING
275
COMMERCIAL PRINTING
276
MANIFOLD BUSINESS FORMS
277
GREETING CARDS
278
BLANKBOOKS, LOOSELEAF BINDERS & BOOKBINDG & RELATD WORK
279
SERVICE INDUSTRIES FOR THE PRINTING TRADE
280
CHEMICALS & ALLIED PRODUCTS
281
INDUSTRIAL INORGANIC CHEMICALS
282
PLASTIC MATERIAL, SYNTH RESIN/RUBBER, CELLULOS (NO GLASS)
PLASTIC MATERIALS, SYNTH RESINS & NONVULCAN ELASTOMERS
283
BIOLOGICAL PRODUCTS, (NO DISGNOSTIC SUBSTANCES)
IN VITRO & IN VIVO DIAGNOSTIC SUBSTANCES
MEDICINAL CHEMICALS & BOTANICAL PRODUCTS
PHARMACEUTICAL PREPARATIONS
284
PERFUMES, COSMETICS & OTHER TOILET PREPARATIONS
SOAP, DETERGENTS, CLEANG PREPARATIONS, PERFUMES, COSMETICS
SPECIALTY CLEANING, POLISHING AND SANITATION PREPARATIONS
285
PAINTS, VARNISHES, LACQUERS, ENAMELS & ALLIED PRODS
286
INDUSTRIAL ORGANIC CHEMICALS
287
AGRICULTURAL CHEMICALS
289
ADHESIVES & SEALANTS
MISCELLANEOUS CHEMICAL PRODUCTS
291
PETROLEUM REFINING
295
ASPHALT PAVING & ROOFING MATERIALS
299

MISCELLANEOUS PRODUCTS OF PETROLEUM & COAL

2-digit SICCD Classification Description[4]

A. Division A: Agriculture, Forestry, And Fishing
Major Group 01: Agricultural Production Crops
Major Group 02: Agriculture production livestock and animal specialties
Major Group 07: Agricultural Services
Major Group 08: Forestry
Major Group 09: Fishing, hunting, and trapping

B. Division B: Mining
Major Group 10: Metal Mining
Major Group 12: Coal Mining
Major Group 13: Oil And Gas Extraction
Major Group 14: Mining And Quarrying Of Nonmetallic Minerals, Except Fuels

C. Division C: Construction
Major Group 15: Building Construction General Contractors And Operative Builders
Major Group 16: Heavy Construction Other Than Building Construction Contractors
Major Group 17: Construction Special Trade Contractors

D. Division D: Manufacturing
Major Group 20: Food And Kindred Products
Major Group 21: Tobacco Products
Major Group 22: Textile Mill Products
Major Group 23: Apparel And Other Finished Products Made From Fabrics And Similar Materials
Major Group 24: Lumber And Wood Products, Except Furniture
Major Group 25: Furniture And Fixtures
Major Group 26: Paper And Allied Products
Major Group 27: Printing, Publishing, And Allied Industries
Major Group 28: Chemicals And Allied Products
Major Group 29: Petroleum Refining And Related Industries
Major Group 30: Rubber And Miscellaneous Plastics Products
Major Group 31: Leather And Leather Products
Major Group 32: Stone, Clay, Glass, And Concrete Products
Major Group 33: Primary Metal Industries
Major Group 34: Fabricated Metal Products, Except Machinery And Transportation Equipment
Major Group 35: Industrial And Commercial Machinery And Computer Equipment
Major Group 36: Electronic And Other Electrical Equipment And Components, Except Computer Equipment
Major Group 37: Transportation Equipment

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[4] Source: US Department of Labor https://www.osha.gov/pls/imis/sic_manual.html

Major Group 38: Measuring, Analyzing, And Controlling Instruments; Photographic, Medical And Optical Goods; Watches And Clocks
Major Group 39: Miscellaneous Manufacturing Industries

E. Division E: Transportation, Communications, Electric, Gas, And Sanitary Services
Major Group 40: Railroad Transportation
Major Group 41: Local And Suburban Transit And Interurban Highway Passenger Transportation
Major Group 42: Motor Freight Transportation And Warehousing
Major Group 43: United States Postal Service
Major Group 44: Water Transportation
Major Group 45: Transportation By Air
Major Group 46: Pipelines, Except Natural Gas
Major Group 47: Transportation Services
Major Group 48: Communications
Major Group 49: Electric, Gas, And Sanitary Services

F. Division F: Wholesale Trade
Major Group 50: Wholesale Trade-durable Goods
Major Group 51: Wholesale Trade-non-durable Goods

G. Division G: Retail Trade
Major Group 52: Building Materials, Hardware, Garden Supply, And Mobile Home Dealers
Major Group 53: General Merchandise Stores
Major Group 54: Food Stores
Major Group 55: Automotive Dealers And Gasoline Service Stations
Major Group 56: Apparel And Accessory Stores
Major Group 57: Home Furniture, Furnishings, And Equipment Stores
Major Group 58: Eating And Drinking Places
Major Group 59: Miscellaneous Retail

H. Division H: Finance, Insurance, And Real Estate
Major Group 60: Depository Institutions
Major Group 61: Non-depository Credit Institutions
Major Group 62: Security And Commodity Brokers, Dealers, Exchanges, And Services
Major Group 63: Insurance Carriers
Major Group 64: Insurance Agents, Brokers, And Service
Major Group 65: Real Estate
Major Group 67: Holding And Other Investment Offices

I. Division I: Services
Major Group 70: Hotels, Rooming Houses, Camps, And Other Lodging Places
Major Group 72: Personal Services
Major Group 73: Business Services
Major Group 75: Automotive Repair, Services, And Parking
Major Group 76: Miscellaneous Repair Services

Major Group 78: Motion Pictures
Major Group 79: Amusement And Recreation Services
Major Group 80: Health Services
Major Group 81: Legal Services
Major Group 82: Educational Services
Major Group 83: Social Services
Major Group 84: Museums, Art Galleries, And Botanical And Zoological Gardens
Major Group 86: Membership Organizations
Major Group 87: Engineering, Accounting, Research, Management, And Related Services
Major Group 88: Private Households
Major Group 89: Miscellaneous Services

J. Division J: Public Administration
Major Group 91: Executive, Legislative, And General Government, Except Finance
Major Group 92: Justice, Public Order, And Safety
Major Group 93: Public Finance, Taxation, And Monetary Policy
Major Group 94: Administration Of Human Resource Programs
Major Group 95: Administration Of Environmental Quality And Housing Programs
Major Group 96: Administration Of Economic Programs
Major Group 97: National Security And International Affairs
Major Group 99: Non-classifiable Establishments

Fama French 48 Industries Description[5]

1 Agric   Agriculture

2 Food   Food Products

3 Soda   Candy & Soda

4 Beer   Beer & Liquor

5 Smoke Tobacco Products

6 Toys   Recreation

7 Fun   Entertainment

8 Books   Printing and Publishing

9 Hshld   Consumer Goods

10 Clths   Apparel

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[5] Source: Kenneth French's website
http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_48_ind_port.html

11 Hlth   Healthcare

12 MedEq   Medical Equipment

13 Drugs   Pharmaceutical Products

14 Chems   Chemicals

15 Rubbr   Rubber and Plastic Products

16 Txtls   Textiles

17 BldMt   Construction Materials

18 Cnstr   Construction

19 Steel   Steel Works Etc

20 FabPr   Fabricated Products

21 Mach   Machinery

22 ElcEq   Electrical Equipment

23 Autos   Automobiles and Trucks

24 Aero   Aircraft

25 Ships   Shipbuilding, Railroad Equipment

26 Guns   Defense

27 Gold   Precious Metals

28 Mines   Non-Metallic and Industrial Metal Mining

29 Coal   Coal

30 Oil   Petroleum and Natural Gas

31 Util   Utilities

32 Telcm   Communication

33 PerSv   Personal Services

34 BusSv   Business Services

35 Comps   Computers

36 Chips   Electronic Equipment

37 LabEq   Measuring and Control Equipment

38 Paper   Business Supplies

39 Boxes   Shipping Containers

40 Trans   Transportation

41 Whlsl   Wholesale

42 Rtail   Retail

43 Meals   Restaraunts, Hotels, Motels

44 Banks   Banking

45 Insur   Insurance

46 RlEst   Real Estate

47 Fin   Trading

48 Other   Almost Nothing

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