

Value versus Growth: Movements in Economic Fundamentals

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Abstract

We study the cyclical behavior of economic fundamentals for value and growth firms. Our goal is to evaluate the empirical relevance of recent rational theories of the value premium. We find that the fundamentals of value firms are more adversely affected by negative business cycle shocks than those of growth firms. And the differential response is mostly significant. We also examine the potential sources of the cyclical movements.

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1 Introduction

We study the cyclical behavior of economic fundamentals for value and growth firms, and their differential response to negative business cycle shocks. Our goal is to evaluate the empirical relevance of recent theories linking the value premium to economic fundamentals.

The issue is important. It is well known that value stocks earn higher average returns than growth stocks (e.g., Rosenberg, Reid, and Lanstein (1985); Fama and French (1992, 1993); Lakonishok, Shleifer, and Vishny (1994)). But the economic interpretation of the value premium has been a source of heated debate. DeBondt and Thaler (1985) and Lakonishok, Shleifer, and Vishny (1994) argue that the value premium is driven by overreaction-related mispricing. In contrast, Fama and French (1993, 1996) interpret size and book-to-market factor returns as sources of risk in the ICAPM- or APT-framework. But this interpretation has met with some skepticism because of the empirical nature of these factors.

Several theoretical papers have recently responded by linking risk and expected returns to firm characteristics, and resurrected the view that fundamentals are important determinants of the cross-section of average returns.¹ Although the underlying models are diverse, a central prediction is that differences in cyclical behavior in fundamentals should emerge across firms, depending on their respective book-to-market ratios. To date, there has been little direct empirical evidence. But we believe a more balanced interaction between theory and evidence can produce richer models and more powerful tests to distinguish alternative hypotheses.

Consistent with rational asset pricing, we document that value firms are more adversely affected by negative business cycle shocks than growth firms. The fundamentals of value firms respond negatively and rapidly to negative shocks, while the fundamentals of growth

¹Examples include Berk, Green, and Naik (1999), Gomes, Kogan, and Zhang (2003), Carlson, Fisher, and Giammarino (2004), Cooper (2004), Kogan (2004), and Zhang (2004). See Section 2 for a brief review.

firms respond more mildly. And the differential response between value and growth is largely significant. This result holds both for the post-1963 sample and for the long sample starting from 1928; it also holds for many fundamental measures including earnings growth, dividend growth, sales growth, investment growth, profitability, and investment rate.

Our work is built on the empirical foundation of Fama and French (1995), who are among the first to study whether the behavior of value and growth portfolio returns reflects the behavior of their economic fundamentals. Fama and French find that high book-to-market signals persistent poor earnings and low book-to-market signals persistent strong earnings, and that there are market, size, and book-to-market factors in earnings, similar to the factors in stock returns. We complement their analysis in several ways. We study the behavior of many other fundamentals besides earnings and changes in book value studied by Fama and French. And we empirically relate firm-level fundamentals to business cycle fluctuations, a linkage motivated by recent theoretical developments (see footnote 1).

Several other papers have also extended the analysis in Fama and French (1995). Using a present-value model, Cohen, Polk, and Vuolteenaho (2003a) find that expected returns cause only 20–25% of the cross-sectional variance of book-to-market equity; the rest is attributed to expected profitability and persistence of valuation levels. Anderson and Garcia-Feijóo (2004) and Xing (2004) find that growth in capital expenditures correlates negatively with future stock returns, and that this correlation helps explain the value premium.

Our evidence fits naturally with recent contributions in consumption-based asset pricing. These papers focus on refining and testing models of stochastic discount factor (e.g., Lettau and Ludvigson (2001), Piazzesi, Schneider, and Tuzel (2003), and Lustig and Nieuwerburgh (2004)).² Their various degrees of empirical success hinge on the common theme that value

²These papers formulate and test single- or two-factor models of the conditional consumption CAPM.

firms are more adversely affected by negative aggregate shocks and are therefore riskier than growth firms in bad times when the price of risk is high. We contribute by providing direct evidence from economic fundamentals.

Our evidence also complements several recent papers suggesting that value stocks have higher cash flow betas than growth stocks (e.g, Cohen, Polk, and Vuolteenaho (2003b), Bansal, Dittmar, and Lundblad (2004), and Campbell and Vuolteenaho (2004)). These papers do not directly model firm dynamics, however. And the question is largely open as to why value stocks have higher cash flow betas than growth stocks. Guided by recent theories, we shed some light on this issue by linking firm-level fundamentals to business cycles.

Finally, our empirical methods are reminiscent of those in Gertler and Gilchrist (1994). But we differ in both economic question and its theoretical motivation. Gertler and Gilchrist ask whether there exists a differential response to negative monetary policy shocks between small and large firms, motivated by the imperfect capital markets theories. In contrast, we ask whether there exists a differential response to negative business cycle shocks between value and growth firms, an inquiry motivated by recent theories of the value premium.

The remainder of the text is organized as follows. Section 2 briefly reviews the theoretical background. We describe our data in Section 3, and present our main findings in Section 4. Section 5 summarizes and interprets our results. And finally, Section 6 concludes.

2 Background

Aiming to understand the economic foundation of the value anomaly, several theoretical papers have recently linked risk and expected return to firm-level economic fundamentals.

But Lewellen and Nagel (2004) argue that the conditional CAPM cannot explain the value anomaly because the covariance between value-minus-growth betas and the expected market risk premium is too small.

Berk, Green, and Naik (1999) develop implications of the exercise of real options for risk and expected returns. In their model, book-to-market equity summarizes risk related to assets in place. Further, changes in asset portfolio over the firm's life cycle lead to an explanatory role for market value because these changes alter the relative importance of growth options vis-à-vis assets in place.

Gomes, Kogan, and Zhang (2003) construct a dynamic general equilibrium production economy to link risk and expected return to firm characteristics. They find that firm characteristics can explain the cross-section of returns because they are correlated with true conditional betas, which are estimated with error in empirical studies.

Our empirical analysis is directly motivated by Zhang (2004). His model allows optimal investment at the firm level. As a result, assets in place are riskier than growth options in bad times when the price of risk is high. Specifically, because of costly reversibility and time-varying price of risk, value firms have less flexibility in scaling down, and are therefore more adversely affected by negative aggregate shocks and riskier than growth firms.³

Costly reversibility implies that firms face higher costs in scraping than in expanding productive assets. Because value firms are burdened with more unproductive assets (e.g., Fama and French (1995)), value firms want to disinvest more than growth firms in recessions. But scaling down is limited by costly reversibility; this causes the operating performance of value firms to be more adversely affected by negative shocks than that of growth firms.

Time-varying price of risk reinforces the effects of costly reversibility. When the price of risk is time-varying (e.g., Fama and French (1988, 1989)), firms' discount rates are higher in bad times than in good times. This implies that in bad times firms' expected net present

³Petkova and Zhang (2004) test the risk implication using data on stock returns, and find some evidence that value is riskier than growth in bad times when the expected market risk premium is high. We instead test the implication on economic fundamentals.

values are even lower than they are with constant price of risk, causing value firms to disinvest even more. Because scaling down is difficult, the fundamentals of value firms respond even more strongly to negative aggregate shocks than they do with constant price of risk.

Cooper (2004) and Kogan (2004) present two models related to Zhang (2004). Cooper studies the effects of fixed costs of investment on risk and expected returns. He finds that book-to-market is informative of the deviation of a firm's actual capital stock from its target level, and this deviation measures the sensitivity of stock returns to aggregate economic conditions. Kogan assumes that the rate of investment must be between zero and an upper limit. The lower constraint is due to irreversibility, and the upper constraint is due to adjustment costs. Kogan finds that when the lower constraint is binding, the relation between expected return and book-to-market is positive, and that when the upper constraint is binding, the relation becomes negative.

Carlson, Fisher, and Giammarino (2004) use a real options model to study the dynamic behavior of monopolistic firms. In their model, operating leverage is an important driving force of the value anomaly. Intuitively, when demand for value firms' products decrease, equity values fall relative to book values. If the fixed costs are proportional to book value, the risk of value firms increases because of their higher operating leverage. Although Carlson et al. do not model business cycles directly, the operating-leverage mechanism is likely to cause value firms to be more affected by negative aggregate shocks than growth firms.

We test whether value firms are indeed more affected by negative aggregate shocks than growth firms in the data. We also study the potential driving forces of this cyclical variation.

3 Data

Our basic sample comes from the merged CRSP and Compustat database from 1963 to 2002. CRSP contains monthly prices, shares outstanding, dividends, and returns for firms listed on NYSE, AMEX, and NASDAQ. Compustat annual research files provide the relevant accounting information for publicly traded U.S. firms. All variables are of annual frequency.

Our data include all manufacturing firms in Compustat (SIC code between 2000 and 3999). Our focus on manufacturing firms is natural because the theories we aim to test all derive asset pricing implications from real investment decisions. The number of manufacturing firms as a percentage of the total number of publicly traded firms is on average 21% (the 25th percentile is 18% and the 75th percentile is 23%). The market capitalization of manufacturing firms as a percentage of the total market value of publicly traded firms is on average 37% (the 25th percentile is 33% and the 75th percentile is 42%). We require all firms to have a December fiscal-year end to align accounting variables across firms. Our total number of firm-year observations is 71,420.

We use the following data definitions. We use Compustat item 60 (common equity) as book equity. If item 60 is not available, we use item 235 (liquidation value of common equity). Negative or zero book values are treated as missing. If deferred tax and investment tax credit (item 35) is available, it is added back to the book equity. Market equity (combined value of all common stocks outstanding) is taken from CRSP as of the end of June. Book-to-market is the ratio of the six-month-lagged book value divided by market value at the end of June.

We measure earnings as net income (item 172, earnings available for common). We have also used the product of earnings per share (item 58) and shares outstanding (item 25), and obtained very similar results (not reported). We use item 21 for dividends, item 12 for sales,

item 128 for capital investment, and item 8 (property, plant and equipment) for net fixed assets. All variables are in real terms after adjusted for inflation. We use the GDP deflator obtained from the DRI database to adjust for inflation in all the variables. The business cycle dates are from NBER.⁴

For robustness, we also conduct our tests on an alternative, longer sample that goes from 1928 to 2002. The sample is a merged data set of Compustat and Moody's book equity data collected by Davis, Fama and French (2000) and obtained from Kenneth French's website.

We again include only manufacturing firms. The number of manufacturing firms as a percentage of the total number of publicly traded firms from 1928 to 2002 is on average 41% (the 25th percentile is 22% and the 75th percentile is 61%). The market capitalization of manufacturing firms as a percentage of the total market value of publicly traded firms is on average 54% (the 25th percentile is 44% and the 75th percentile is 61%). The total number of firm-year observations in this sample is 143,102.

Since earnings data are not available from Compustat prior to 1963, we follow Cohen, Polk, and Vuolteenaho (2003b) and use the clean surplus relation to compute earnings, i.e., $\text{earnings}(t) = \text{book value}(t) - \text{book value}(t-1) + \text{dividends}(t)$. Dividends are extracted from the difference between value-weighted returns with and without dividends from CRSP. To keep the data construction consistent, throughout the long sample we use the same methods to compute earnings and dividends as in the pre-1963 sample.

⁴Source: NBER document titled "US Business Cycle Expansions and Contractions" available online at: <http://www.nber.org/cycles.html/>.

4 Empirical Results

Our empirical analysis proceeds in three main stages. First, we present a set of informal tests designed to illustrate the basic properties of the data (Section 4.1). Second, we quantify the relative response of value and growth manufacturing firms to negative business cycle shocks using a variety of methods (Section 4.2). The first two stages use the post-1963 sample. Finally, we examine the robustness of our results using the long sample (Section 4.3).

4.1 Descriptive Tests

We sort all the firms into five quintiles on book-to-market equity in June of each year. Value portfolio contains all the firms in the highest book-to-market quintile, while growth portfolio contains all the firms in the lowest book-to-market quintile.

For each portfolio, we first aggregate firm-level earnings, book equity, dividends, sales, capital expenditure, net fixed assets into portfolio-level variables. We then calculate gross portfolio growth rates for earnings, for dividends, for sales, and for capital investment. Profitability is measured as earnings over one-period-lagged book equity, and investment rate is measured as investment over one-period-lagged net fixed assets.

Descriptive Statistics

Table 1 reports summary statistics for value and growth firms as well as their differences.

The value premium clearly exists in our sample of manufacturing firms. The first row shows that value stocks earn an average value-weighted return of 1.38% per month, higher than the average value-weighted return of growth stocks, 0.83%. And the difference between the two average returns is 0.55% per month, significant with a t -statistic of 2.57. All the t -statistics are adjusted for heteroscedasticity and autocorrelations of up to 12 lags. The

difference in average equal-weighted returns is 1.11%, highly significant with a t -statistic of 5.58. Although not reported in the table, the unconditional alpha of the value-weighted value-minus-growth portfolio from the market regression is 0.47% per month with a t -statistic of 1.99. And the unconditional alpha for the equally-weighted value-minus-growth portfolio is 1.20% per month with a t -statistic of 5.99.

The remaining rows of Table 1 show that growth firms have on average higher growth rates of earnings, net income, dividends, sales, and investment than value firms. Except for dividend growth, the differences in growth rates between value and growth are all highly significant. For example, value firms have negative net growth rates of earnings, -8%, and real investment, -1% per annum. Consistent with Fama and French (1995), we also find that the profitability of growth firms is on average 24%, much higher than that of value firms, 8%. Further, growth firms invest with an average annual rate of 28%, faster than value firms with an average rate of 17%.

Finally, Table 1 also shows that the volatilities of growth rates for growth firms are generally lower than those of value firms, with the exception of investment growth rate.

Time Series Evidence

Figure 1 plots the time series of fundamentals for value firms (solid line) and growth firms (dotted line) from 1963 to 2002. The NBER recession periods are shown in the shaded area.

In general, we find that the fundamentals of value firms decline sharply in recessions. Growth firms also experience some decline in fundamentals in recessions, but the decline is not as deep as that of value firms.

For example, Panel A of Figure 1 shows that the earnings growth of value firms declines rapidly, but the earnings growth of growth firms actually rises somewhat in the recessionary

early 1980s. From Panel B, the dividend growth of value firms declines in recessions, generally more rapidly than that of growth firms. In fact, the dividend growth of growth firms actually increases in the recession of the early 1990s, while that of value firms declines. Further, from Panels C and D, value firms have sales and investment growth rates that are more adversely affected by recessions than growth firms. From Panel E, the profitability levels of both value and growth firms decrease during most recessions. Finally, Panel F shows that the investment rates of value and growth firms have both upside and downside movements during recessions.

Event Time Evidence

We now examine the behavior of fundamentals for value and growth firms in event time. Specifically, we study the average log deviations of earnings growth, dividend growth, sales growth, investment growth, profitability, and investment rate for seven years around the beginning of a NBER recession. The log deviation is calculated as $\log(x_t) - \log(x_0)$, where x_t denotes the variable of interest, $t = -3, \dots, +3$, and $t=0$ is the beginning of a recession.

The NBER defines a recession to be the periods from a business cycle peak to the following trough. There are six recessionary periods in the 1963–2001 sample: 1969(IV)–1970(IV), 1973(IV)–1975(I), 1980(I)–1980(III), 1981(III)–1982(IV), 1990(III)–1991(I), and 2001(I)–2001(IV), where quarterly dates are in parentheses. We define 1969, 1973, 1980, 1981, 1990, and 2001 to be the beginning years of recessions, time zero in the event window. Our event definition as the beginning of a recession is very natural because we want to trace the response of firm-level fundamentals to negative aggregate shocks.

Panels A to F of Figure 2 report the average log deviations across the six recessions. Our main finding here is that the fundamentals of value firms are more affected by negative aggregate shocks than those of growth firms. And this applies to all the fundamentals.

For example, from Panel A of Figure 2, the earnings growth rates for value (the solid line) and growth firms (the dotted line) both decline in response to negative aggregate shocks. The earnings growth of value firms declines more than that of growth firms in the first two years after the recession date, but it also bounces back more in the third year. Panel B reports a similar pattern for dividend growth. In fact, the dividend growth for growth firms even increases slightly during the first year of a recession. From Panel C, value firms are again more adversely affected by recessions in terms of sales growth, although the difference in log deviations between value and growth firms is relatively small in this case. Panels D to F show that value firms' investment growth, profitability, and investment rates all decline more rapidly than their counterparts in growth firms in response to negative aggregate shocks.

There are substantial variations in the responses of fundamentals to negative aggregate shocks across the six recessions. This can be seen from Panels G to R in Figure 2. Panels G to L report the log deviations around each one of the recessions for value firms, and Panels M to R do the same for growth firms. The thickest curves in these panels are the average log deviations across the six recessions, as in Panels A to F. On average, however, value firms are more affected by negative aggregate shocks than growth firms.

4.2 Formal Tests

We now supplement the descriptive analysis with some formal tests on the differential response between value and growth manufacturing firms to negative business cycle shocks. The idea is to ascertain, in the simplest fashion possible, the statistical significance of negative aggregate shocks for the fundamental dynamics of value and growth firms.

VAR estimation

We begin by estimating a bivariate VAR that includes one dummy variable for the NBER recessions and one fundamental variable from either value or growth firms. The dummy is set to be one at the beginning of a recession and zero otherwise.

The lag of the VAR is three.⁵ We report for each variable the sum of coefficients associated with the three dummy regressors and the t -statistic testing whether the sum equals zero. To test whether a negative business cycle shock has a differential impact on the fundamentals of value and growth firms, we estimate a second bivariate VAR. The second VAR includes the recession dummy and the difference in one variable between value and growth firms (the variable of value firms minus that of growth firms). We then report the sum of coefficients for the difference and its associated t -statistic.

Table 2 reports the results. We find that the differential response between value and growth is largely significant. From Panel A of Table 2, the sum of coefficients on the recession dummy for the value firms is mostly negative. For dividend growth, sales growth, investment growth, and profitability, the sum of coefficients is significant at the five percent level. From Panel B, recessions do not have much impact on growth firms; all their coefficients are relatively small and insignificant. More important, Panel C of Table 2 shows that the differences in the sums of coefficients between value and growth firms are all negative. Although insignificant for investment growth, profitability, and investment rate, the differences are significant for earning growth, dividend growth, and sales growth.

⁵The optimal lag for the VAR from Akaike information criterion or Schwarz criterion ranges from two to seven depending on which fundamental variable is included in the VAR. Our results are basically unchanged if we use the optimal lag for each individual variable (not reported).

Impulse Response Function

To evaluate the overall quantitative impact of a recession on the fundamentals of value and growth manufacturing firms, we report a set of impulse response functions from the bivariate VARs estimated above.

The first and the third columns of the panels in Figures 3 represent the bivariate VARs that include the recession dummy and a fundamental variable for either value or growth firms. The second and the fourth columns of the panels represent the bivariate VARs that include the recession dummy and the difference in one fundamental variable between value and growth firms. All panels report the cumulative response of the variable other than the recession dummy to a one standard-deviation positive shock to the recession dummy. This shock represents a negative business cycle shock because the dummy takes the value of one in recessions and zero otherwise. In all panels, two standard-error bands are also plotted.

In general, the impulse responses in Figure 3 confirm our early results that value firms are more affected by negative aggregate shocks than growth firms, and that the differential response is mostly significant.

From Panel A of Figure 3, the earnings growth of growth firms decreases only slightly in the first two years after a negative shock, and then starts to increase in the third year. In contrast, the earnings growth of value firms decreases drastically in the first two years. From Panel B, the differential response of the earnings growth between value and growth is negative and significant. Panel C of Figure 3 shows that the sales growth declines for both growth and value firms in the first two years after the initial shock. The sales growth of growth firms bounces back in the next few years, but that of value firms remains low. The differential response is again negative and significant, as shown in Panel D. The remaining

panels report similar patterns for dividend growth (Panels E and F), investment growth (Panels G and H), profitability (Panels I and J), and investment rate (Panels K and L).

4.3 Evidence from the Long Sample

There are only six recessions in the post-Compustat sample. The small number of recessions calls into question the robustness of our results. This is especially true given that there are substantial variations in fundamental responses to negative shocks across the six recessions (Figure 2). To address this issue, we replicate our tests on a merged data set of Compustat and Moody's book equity data. The long sample goes from 1928 to 2002.

We again sort all the firms independently into five quintiles on book-to-market in June of each year, and aggregate firm-level earnings, book values, dividends into portfolio level variables. Earnings from the clean surplus relation are volatile and can be negative even at the portfolio level. This makes the usual definition of growth rate meaningless. We instead compute the change of earnings divided by the lagged book equity, and refer to this measure as the rate of earnings change. We can also examine the behavior of profitability and dividend growth in the long sample, but not sales growth, investment rate, or investment growth because of data restrictions.

Time Series Evidence

Figure 4 plots the time series of fundamentals for value and growth firms from 1928 to 2002 along with NBER recessions. From Panels A and B, the earnings from the clean-surplus relation in the long sample give results similar to those from Compustat in the post-1963 sample. The rate of earnings change and profitability decline sharply in recessions for both value and growth firms. Although the two variables decline more rapidly for value firms in most recessions, there are several exceptions. For example, the speed of decline in the rate

of earnings change is roughly the same for value and growth (Panel A). And the speed of decline in profitability is faster for growth firms than for value firms (Panel B).

From Panel C of Figure 4, the dividend growth of value firms has a big spike of about 600% in 1934; another less conspicuous spike of about 270% occurs in 1936. The reason is that only a few value firms pay dividends in the Great Depression. As a result, changes in a few firm-level observations have a big impact on portfolio-level dividend growth. Given this feature of the data, we conduct two versions of the tests involving dividend growth, with and without the two outliers.

Descriptive Statistics

Table 3 reports the descriptive statistics of stock returns and fundamentals for value and growth firms in the long sample.

Similar to that in the post-1963 sample, the value premium remains strong in the long sample. From the first two rows of Table 3, the value-weighted value-minus-growth strategy has an average return of 0.56% per month with a significant t -statistic of 2.85. The average equal-weighted value-minus-growth return is almost twice as large, 0.98%, with a highly significant t -statistic of 4.44. Although not reported in the table, the unconditional alpha of the value-weighted value-minus-growth portfolio is 0.34%, significant with a t -statistic of 2.05. The unconditional alpha for the equal-weighted value-minus-growth portfolio is 0.80%, highly significant with a t -statistic of 4.61.

In contrast to the the post-1963 sample, the first two rows of Table 3 show that the returns of value stocks and the value-minus-growth returns exhibit strong, positive skewness in the long sample. The skewness of equal-weighted value-minus-growth returns is 4.88 and that of value-weighted value-minus-growth returns is 2.37 in the long sample. Their counterparts

from the post-1963 sample are only 0.27 and 0.44, respectively.

From the third row of Table 3, value firms have a lower average rate of earnings change than growth firms. And the difference, 8%, is highly significant with a t -statistic of 7.57. The average profitability of value firms is only 4% per annum, much lower than that of growth firms, 25%. The difference is again highly significantly with a t -statistic of 15.99.

The last two rows of Table 3 report the statistics for dividend growth for value and growth firms. We report results with and without the two outliers in the sample. With the two outliers, the average dividend growth of value firms is only slightly lower than that of growth firms, and the difference is close to zero and insignificant. The volatility of dividend growth for value firms, 0.69 per annum, is much higher than that for growth firms, which is only 0.17. And the dividend growth for value firms is highly skewed with the skewness coefficient being 5.16. All these patterns are not present in the post-1963 sample.

However, these new patterns of dividend growth are largely driven by the two outliers in the long sample. The last row of Table 3 shows that, once the outliers are excluded, the difference in average annual dividend growth increases to 0.12% and is significant with a t -statistic of 2.28. The volatility of dividend growth for value firms reduces to 31%, albeit still higher than that for growth firms, 17%. And the skewness of dividend growth for value firms reduces to -1.38.

Event Time Evidence

Figure 5 plots the average simple deviation of each variable for seven years around the recession dates. We use simple deviations because portfolio-level earnings observations can be negative, rendering log deviations undefined. Simple deviations are calculated as $x_t - x_0$ where x_t is the variable of interest and $t = -3, \dots, +3$.

Besides the recessions in the post-1963 sample, there are seven more recessions from 1928 to 1962 dated by NBER: 1929(III)–1933(I), 1937(II)–1938(II), 1945(I)–1945(IV), 1948(IV)–1949(IV), 1953(II)–1954(II), 1957(III)–1958(II), and 1960(II)–1961(I), where quarterly dates are in parentheses. We therefore define 1929, 1937, 1945, 1948, 1953, 1957, and 1960 as the beginning years of recessions or time zero in the event window.

Figure 5 reports the results. Consistent with previous results from the post-1963 sample, negative business cycle shocks in general have more severe effects on value firms than on growth firms in the long sample.

For example, from Panel A, the rate of earnings change of value firms remains negative for two years after the initial shock, while that of growth firms is largely unaffected. Panel B shows that value firms also experience a more rapid decline in profitability than growth firms. From Panel C, which includes the two outliers in 1934 and 1936, the dividend growth of value firms declines slightly in the first year after the recession, while the dividend growth of growth firms increases in the first year but declines thereafter. It seems that after observing a negative shock, growth firms reduce investment rates and pay out more dividends. From Panel D, which excludes the two outliers, the dividend growth of value firms is affected only slightly in the first two years after a negative aggregate shock.

Finally, from Panels E to L in Figure 5, there are again substantial variations in the fundamental responses to negative aggregate shocks across different recessions. On average, however, value firms are more affected by negative shocks than growth firms.

Formal Tests

We now report the VAR estimation results on whether the differential response between value and growth to negative aggregate shocks is statistically significant. The answer is largely

affirmative in the long sample, consistent with that in the post-1963 results. However, the evidence from the long sample is somewhat weaker than that from the post-1963 sample.

Table 4 reports the long-sample results of the bivariate VARs similar to those reported in Table 2 using the post-1963 sample. From Panel A, recessions have negative effects on value firms. For example, the sum of coefficients is -0.09 for the rate of earnings change and is -0.11 for profitability. And both are significant at the five percent level. The sum of coefficients on dividend growth is -0.78 and is marginally significant with a t -statistic of -1.85. From Panel B, recessions do not have much effects on the fundamentals of growth firms. None of the sums of the coefficients is significantly different from zero.

Panel C of Table 4 shows that the sums of coefficients associated with the differences in profitability and dividend growth between value and growth firms are significant at the five percent level. But the sum of coefficients for the difference in the rate of earnings change is not significant. Further, once the two outliers in dividend growth are excluded from the sample, the last row of the table shows that the difference in dividend growth fails to remain significant, although it is still negative.

Figure 6 reports the impulse response functions from the bivariate VARs estimated in Table 4. The results from the post-1963 sample are fairly robust to the inclusion of the early sample. From Panel A, the rate of earnings change responds negatively to the recessions for both value and growth firms. The rate of decline is faster for value firms than for growth firms. From Panel B, profitability drops in the first year after the shock for growth firms but recovers thereafter. In contrast, the profitability of value firms declines more rapidly after the initial shock. Both the differential response in the rate of earnings change and that in profitability are negative and significant (Panels D and F).

From Panel C of Figure 6, the initial impact of a recession shock on the dividend growth

of growth firms is weakly positive, and then dies out after about five years. This suggests that growth firms cut capital investment and pay back more earnings as dividends in response to negative shocks. In contrast, the dividend growth of value firms declines rapidly. And from Panel G, the differential response between value and growth is significant. These results are robust to the exclusion of the two outliers, as shown in Panels D and H.

5 Summary and Interpretation

We have shown that value firms are more affected by negative business cycle shocks than growth firms. And the differential response between value and growth is mostly significant. These results are generally consistent with the predictions from the investment-based theories discussed in Section 2. This section digs deeper into the potential sources of the cyclical variations in economic fundamentals for value and growth manufacturing firms.

5.1 Real Flexibility

We first evaluate the empirical relevance of the flexibility mechanism proposed by Zhang (2004) (see also Cooper (2004) and Kogan (2004) for two related models). We take a direct approach by studying a list of firm characteristics that are known to be related to real flexibility. Consistent with the theory, we find that value firms generally have less flexibility and should be more susceptible to costly reversibility than growth firms.

Our set of flexibility proxies includes the ratio of fixed assets to total assets, the ratio of research and development expense (R&D) to sales, the ratio of R&D to total assets, and the ratio of capital expenditure to total assets.

The ratio of fixed-to-total assets measures asset specificity or tangibility (e.g., Rajan and Zingales (1995)). Because costly reversibility applies primarily to real investment on

property, plant, and equipment, a higher ratio of fixed-to-total assets implies less flexibility. The other three proxies measure the firms' growth attributes (e.g., Titman and Wessels (1988)). Unlike assets in place, growth options can be freely disposed of — an option is a right, not an obligation from the firms' perspective. Higher values of growth attributes therefore imply more flexibility.

Importantly, none of our proxies involve the market value of equity. Perhaps because of lacking direct proxies for mispricing, behavioral studies often use the market value to measure mispricing (e.g., Daniel, Hirshleifer, and Subrahmanyam (2001)). We avoid the market value so that our proxies can measure the fundamental forces in the real economy. Another reason is that using the market value has the disadvantage of being mechanically related to expected returns (e.g., Berk (1995, 2000)).

Table 5 reports the results. All proxies indicate that value firms have less real flexibility than growth firms. Value firms have higher proportions of tangible assets. The average ratio of fixed-to-total assets for value firms is 0.427, higher than that for growth firms, 0.340. Value firms also have lower values of growth attributes than growth firms. For example, the average ratio of R&D to sales for value firms is 0.016, lower than that for growth firms, 0.041. Using the ratio of R&D to total assets yields similar results. And the average investment-to-total assets is 0.071 for value firms, lower than that of growth firms, 0.085. In all cases, the differences between value and growth are statistically significant.

We have also examined the frequencies of investment and disinvestment for value and growth firms. We measure investment as capital expenditure (item 128) and disinvestment as the sales of property, plant, and equipment (item 107). Consistent with theory, we find that value firms on average disinvest more frequently than growth firms. The frequency of disinvestment of value firms is 2.88%, higher than that of growth firms, 0.96%. This evidence

implies that value firms should be more susceptible to costly reversibility than growth firms.

Finally, we caution the readers that our evidence in this subsection is only suggestive. More powerful tests can perhaps be designed using more elaborate methods of measuring real flexibility (e.g., MacKay (2003)), but these methods are arguably more model-dependent.

5.2 Operating Leverage

We now test the operating-leverage hypothesis of Carlson, Fisher, and Giamarino (2004). They argue that when demand for value firms' products decrease, equity values fall relative to book values. If the fixed costs are proportional to book value, value firms will have higher operating leverage than growth firms. In general, we fail to find much supporting evidence.

While operating leverage is usually defined as the ratio of fixed operating costs divided by operating profits, measuring fixed costs can be problematic. The reason is that, although depreciation and amortization components of fixed costs can be found in cash flow statement, other fixed costs such as administrative expenses, rent, and fixed wage expenditure are aggregated with variable costs in items on the income statement.

Instead, we follow Mandelker and Rhee (1984) and Penman (2001) and measure operating leverage indirectly as the elasticity of operating profits with respect to sales. In other words,

$$l_1 = \frac{\partial e_t / e_t}{\partial s_t / s_t} = \frac{\partial \log(e_t)}{\partial \log(s_t)} \quad (1)$$

where l_1 is the operating leverage, e_t is operating profits, and s_t is sales.

The economic idea underlying equation (1) is that total production costs of a firm without fixed costs should vary proportionally with sales. The share of operating profits in sales is constant, implying that operating profits vary proportionally with sales. Fixed costs will cause operating profits to vary more than proportionally with sales over the business cycles.

As in Mandelker and Rhee (1984), we estimate the operating leverage, l_1 , as the slope coefficient from regressing the logarithm of operating profits (item 178, operating income after depreciation) onto the logarithm of sales (item 12):

$$\log(e_t) = l_0 + l_1 \log(s_t) + u_t \quad (2)$$

We run this regression separately for each of the five book-to-market quintiles, and test the null hypothesis that $l_1 = 1$. We also run the regressions simultaneously for value and growth portfolios and test whether their slopes are equal.

Table 6 reports the results. From the first column, the operating leverage of value firms is 0.969, lower than that of growth firms, 1.025, although the difference is not significant. And the relation between book-to-market and operating leverage is not monotonic. Further, the second column shows that none of the estimated slopes from equation (2) is statistically different from one, suggesting that the operating profits vary roughly proportionally with sales for all the book-to-market quintiles.

Finally, Table 6 also casts some doubt on the assumption that fixed costs are proportional to capital. The fourth column shows that value firms have higher capital, as measured by fixed assets, than growth firms. Using book equity or total assets to measure capital yields similar results (not reported). Note that this evidence does not contradict the negative correlation between book-to-market and market value of equity (e.g., Fama and French (1992)). This negative correlation is replicated in the last column of Table 6. More important, despite higher assets of value firms relative to those of growth firms, the first column shows that value firms have slightly lower operating leverage than growth firms.

6 Conclusion

Our long term goal is to provide an economic foundation for the cross-section of returns. Our work so far has been guided by Fama (1991, p. 1610): “I think we can hope for a coherent story that (1) relates the cross-section properties of expected returns to the variation of expected returns through time, and (2) relates the behavior of expected returns to the real economy in a rather detailed way”. Most empirical studies relate the cross-section of returns to the time-varying price of risk. Our approach is relatively fresh because it relates expected returns to “the real economy in a rather detailed way”.

Consistent with recent theories linking expected returns to economic fundamentals, we document that value firms are more affected by negative business cycle shocks than growth firms. The fundamentals of value firms respond negatively and rapidly to negative shocks, but those of growth firms respond more mildly. And the differential response between value and growth firms is mostly significant. These results hold for different samples and for different fundamental measures. We also find some evidence that value firms have less real flexibility than growth firms in smoothing negative aggregate shocks. In all, our results suggest that economic fundamentals are important determinants of the cross section of returns.

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Table 1 : Descriptive Statistics for Value and Growth Manufacturing Firms (1963–2002)

This table reports descriptive statistics of stock returns and economic fundamentals for value and growth manufacturing firms. The sample is from 1963 to 2002. The set of descriptive statistics includes the mean, standard deviation (std), skewness (skew), and the first-order autocorrelation (ρ_1). The means and standard deviations of returns are in percentage per month. Panel A reports the results for value firms, Panel B reports the results for growth firms, and Panel C report their differences, defined as the variables of value firms minus their counterparts of growth firms. Significant average differences and their t -statistics are highlighted in Panel C. For each portfolio, we aggregate firm-level variables into portfolio-level variables. Growth rates are defined by dividing current-period variables by their one-period-lagged counterparts. Profitability is earnings over one-period-lagged book equity. Investment rate is investment over one-period-lagged fixed assets.

Variables	Panel A: Value Firms				Panel B: Growth Firms				Panel C: Differences				
	mean	std	skew	ρ_1	mean	std	skew	ρ_1	mean	t_{mean}	std	skew	ρ_1
value-weighted return	1.38	5.31	0.06	0.04	0.83	5.02	-0.15	0.04	0.55	2.57	4.38	0.44	0.09
equal-weighted return	1.91	6.22	0.31	0.21	0.80	7.17	-0.15	0.22	1.11	5.58	3.80	0.27	0.19
earnings growth	0.92	0.35	0.52	0.14	1.26	0.27	1.35	0.31	-0.34	-3.97	0.41	-0.05	0.35
dividend growth	1.02	0.18	1.54	-0.17	1.05	0.12	-1.32	0.27	-0.03	-0.76	0.19	0.75	0.20
sales growth	1.00	0.09	0.04	0.07	1.09	0.05	0.44	0.14	-0.09	-5.89	0.08	-0.64	0.14
investment growth	0.99	0.11	-0.18	0.17	1.16	0.16	0.95	0.01	-0.16	-6.13	0.19	-1.20	0.08
profitability	0.08	0.03	0.67	0.35	0.24	0.08	1.00	0.87	-0.17	-7.21	0.08	-0.79	0.85
investment rate	0.17	0.03	0.27	0.72	0.28	0.06	0.88	0.45	-0.11	-9.71	0.06	-0.96	0.31

Table 2 : The Effect of Recession Dates on Value and Growth Manufacturing Firms (1963–2002)

Panels A and B report results from a bivariate VAR that includes one fundamental variable of value or growth portfolios, respectively, and one NBER recession dummy. The dummy is set to be one at the beginning of a recession and zero otherwise. The order of the VAR is three. The sample period is from 1963 to 2002. We report the sum of three coefficients for the fundamental-variable equation, and the t -statistic testing whether the sum of coefficients is zero. Significant sums of coefficients and their t -statistics are highlighted. For each portfolio, we aggregate firm-level variables into portfolio-level variables. Growth rates are defined by dividing current-period variables by their one-period-lagged counterparts. Profitability is earnings over one-period-lagged book equity. And investment rate is investment over one-period-lagged net fixed assets.

Variables	Panel A: Value Firms		Panel B: Growth Firms		Panel C: Differences	
	sum of coefs	t -statistic	sum of coefs	t -statistic	sum of coefs	t -statistic
earnings growth	-0.47	-1.60	0.26	1.33	-0.77	-2.23
dividend growth	-0.57	-4.05	0.07	0.81	-0.52	-3.53
sales growth	-0.16	-2.34	-0.03	-0.60	-0.13	-2.05
investment growth	-0.23	-3.01	-0.13	-0.97	-0.11	-0.77
profitability	-0.04	-1.97	0.00	0.13	-0.04	-1.18
investment rate	-0.02	-1.53	0.02	0.44	-0.06	-1.18

Table 3 : Descriptive Statistics for Value and Growth Manufacturing Firms (1928–2002)

This table reports summary statistics of returns and fundamentals for value and growth manufacturing firms in the sample from 1928 to 2002. The set of descriptive statistics includes the mean, standard deviation (std), skewness (skew), and the first-order autocorrelation (ρ_1). The means and standard deviations of returns are in percentage per month. Panel A reports the results for value firms, Panel B reports the results for growth firms, and Panel C report their differences (value-minus-growth). Significant average differences and their t -statistics are highlighted in Panel C. The rate of earnings change is calculated as the current-period change in earnings divided by one-period-lagged book equity. Profitability is earnings over one-period-lagged book equity. The next-to-last row reports the results with the two outliers of dividend growth in 1934 and 1936. The last row, denoted dividend growth*, reports the results without the two outliers.

Variables	Panel A: Value Firms				Panel B: Growth Firms				Panel C: Differences				
	mean	std	skew	ρ_1	mean	std	skew	ρ_1	mean	t_{mean}	std	skew	ρ_1
value-weighted return	1.46	8.45	2.30	0.18	0.90	5.89	0.10	0.10	0.56	2.85	5.32	2.37	0.18
equal-weighted return	1.92	9.56	3.09	0.23	0.94	6.92	-0.06	0.15	0.98	4.44	5.79	4.88	0.20
the rate of earnings change	-0.02	0.07	-0.36	0.09	0.05	0.08	0.77	0.10	-0.08	-7.57	0.08	-0.62	-0.03
profitability	0.04	0.07	-0.50	0.58	0.25	0.08	0.46	0.46	-0.21	-15.99	0.09	-0.60	0.41
dividend growth	1.07	0.69	5.16	-0.11	1.10	0.17	0.49	-0.01	-0.03	-0.47	0.68	5.76	-0.18
dividend growth*	0.97	0.31	-1.38	0.65	1.09	0.17	0.39	-0.05	-0.12	-2.28	0.29	-1.22	0.60

Table 4 : The Effect of Recession Dates on Value and Growth Manufacturing Firms (1928–2002)

Panels A and B report results from a bivariate VAR that includes one fundamental variable for value and growth portfolios, respectively, and one NBER recession dummy. The dummy is set to be one at a business cycle peak (i.e., the beginning of a recession) and is set to be zero otherwise. The order of the VAR is three. The sample is from 1928 to 2002. We report the sum of three coefficients for the fundamental-variable equation, and the t -statistics testing the sum of coefficients is zero. Significant average differences and their t -statistics are highlighted. The rate of earnings change is calculated as the current-period change in earnings divided by one-period-lagged book equity. Profitability is earnings over one-period-lagged book equity. The next-to-last row reports the results with the two outliers of dividend growth in 1934 and 1936. The last row, denoted dividend growth*, reports the results without the two outliers.

Variable	Panel A: Value Firms		Panel B: Growth Firms		Panel C: Differences	
	sum of coefs	t -statistic	sum of coefs	t -statistic	sum of coefs	t -statistic
the rate of earnings change	-0.09	-2.00	-0.03	-0.67	-0.06	-1.19
profitability	-0.11	-3.02	0.02	0.33	-0.10	-2.16
dividend growth	-0.78	-1.85	0.08	0.71	-0.91	-2.16
dividend growth*	-0.13	-0.95	0.09	0.86	-0.18	-1.45

Table 5 : Flexibility Proxies for Value and Growth Manufacturing Firms (1963–2002)

This table reports for the book-to-market quintiles the average values of flexibility proxies including the ratio of fixed assets (item 8) to total assets (item 6), the ratio of R&D expense (item 46) to sales (item 12), the ratio of R&D expense to total assets, and the ratio of capital expenditure (item 128) to total assets. We also report the average differences in the proxies between value and growth firms and the t -statistics that test zero differences and are adjusted for heteroscedasticity and autocorrelations of up to 12 lags. Significant differences and their t -statistics are highlighted.

	Asset Specificity	Growth Attributes		
	Fixed Assets/ Total Assets	R&D/ Sales	R&D/ Total Assets	Investment/ Total Assets
Growth	0.340	0.041	0.044	0.085
2	0.386	0.027	0.029	0.083
3	0.435	0.029	0.020	0.080
4	0.454	0.015	0.016	0.082
Value	0.427	0.016	0.014	0.071
Value-minus-Growth	0.087 (4.44)	-0.025 7.95	-0.030 (-9.41)	-0.014 (-2.95)

Table 6 : Operating Leverage, Assets, and Market Values for Value and Growth Manufacturing Firms (1963–2002)

This table reports the estimated operating leverage for five book-to-market quintiles. Operating leverage (l_1) is estimated as the slope coefficient from regressing the logarithm of operating profits (item 178, operating income after depreciation) onto the logarithm of sales (item 12). t -statistics testing $l_1 = 1$ are reported in the column adjacent to operating leverage. We also report the medium value of fixed assets (item 8) and the medium market value of equity (in millions of dollars) for five book-to-market quintiles. Each year we take the medium value of assets and medium market value of equity across firms within each book-to-market quintiles. We then report the time-series averages of these cross-sectional mediums. We also report the average differences in these variables between value and growth firms and their t -statistics that test zero differences and are adjusted for heteroscedasticity and autocorrelations of up to 12 lags. Significant differences and their corresponding t -statistics are highlighted.

	Operating	$t(l_1 = 1)$	Medium Value of	Medium Market
	Leverage (l_1)		Fixed Assets (millions)	Value (millions)
Growth	1.025	0.215	16.629	169.787
2	1.013	0.185	31.627	162.402
3	0.908	-1.716	37.644	118.690
4	0.919	-1.365	33.660	69.500
Value	0.969	-0.586	39.289	31.713
Value-minus-Growth	-0.055 (-1.07)		22.660 (3.59)	-138.075 (-3.77)

Figure 1 : Times Series of Fundamentals for Value and Growth Manufacturing Firms (1963–2002)

This figure plots the time series of economic fundamentals for value and growth manufacturing firms. The fundamentals include earnings growth (Panel A), dividend growth (Panel B), sales growth (Panel C), investment growth (Panel D), profitability (Panel E), and investment rate (Panel F). Solid lines represent value firms and the dotted line represent growth firms. The sample is from 1963 to 2002. For each portfolio, we aggregate firm-level variables into portfolio-level variables. Growth rates are defined by dividing current-period variables by their one-period-lagged counterparts. Profitability is earnings over one-period-lagged book equity, and the investment rate is investment over one-period-lagged fixed assets.

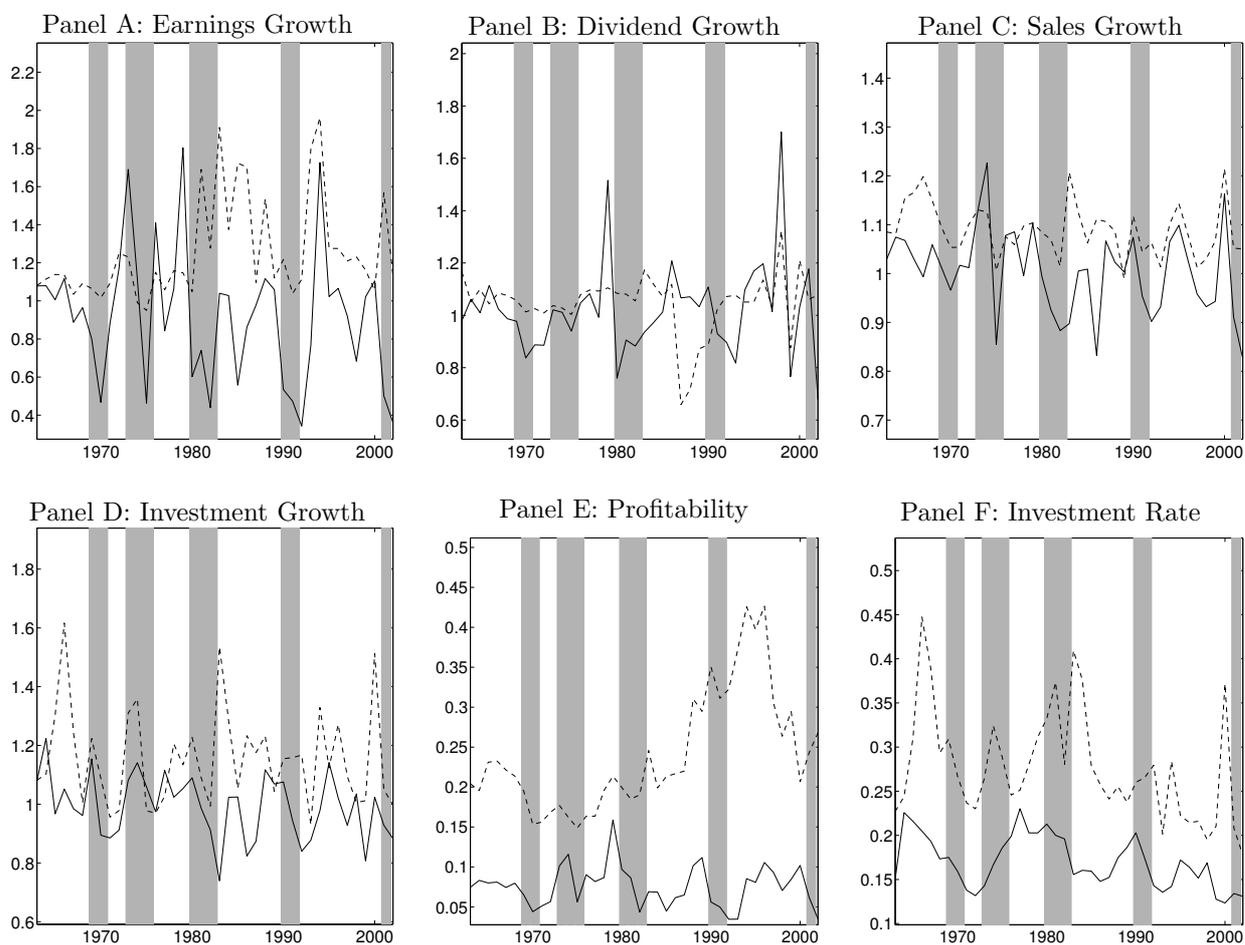


Figure 2 : Responses of Value and Growth Manufacturing Firms' Fundamentals to Negative Business Cycle Shocks (1963–2002)

All series are shown as log deviation from their values at the NBER Recession date. The sample is from 1963 to 2002. Denote the variable of interest around one particular recession date by x_t , where $t = -3, \dots, +3$ and event time 0 is the beginning of a recession. The figure plots log deviations, i.e., $\log(x_t) - \log(x_0)$, for three years before and three years after the recession date. g_e denotes earnings growth, g_d denotes dividend growth, g_s denotes sales growth, g_i denotes investment growth, roe is profitability, and i/k denotes the investment rate. In Panels A to F, the solid line represents the average log deviations of value firms and the dotted line represents the average log deviations of growth firms, both of which are averaged across the six recession events. There are in total seven curves in each panel from Panels G to R. The thickest solid curve is the average log deviation across the six recession events. Each one of the other six curves corresponds to the log deviation in one recession event.

32

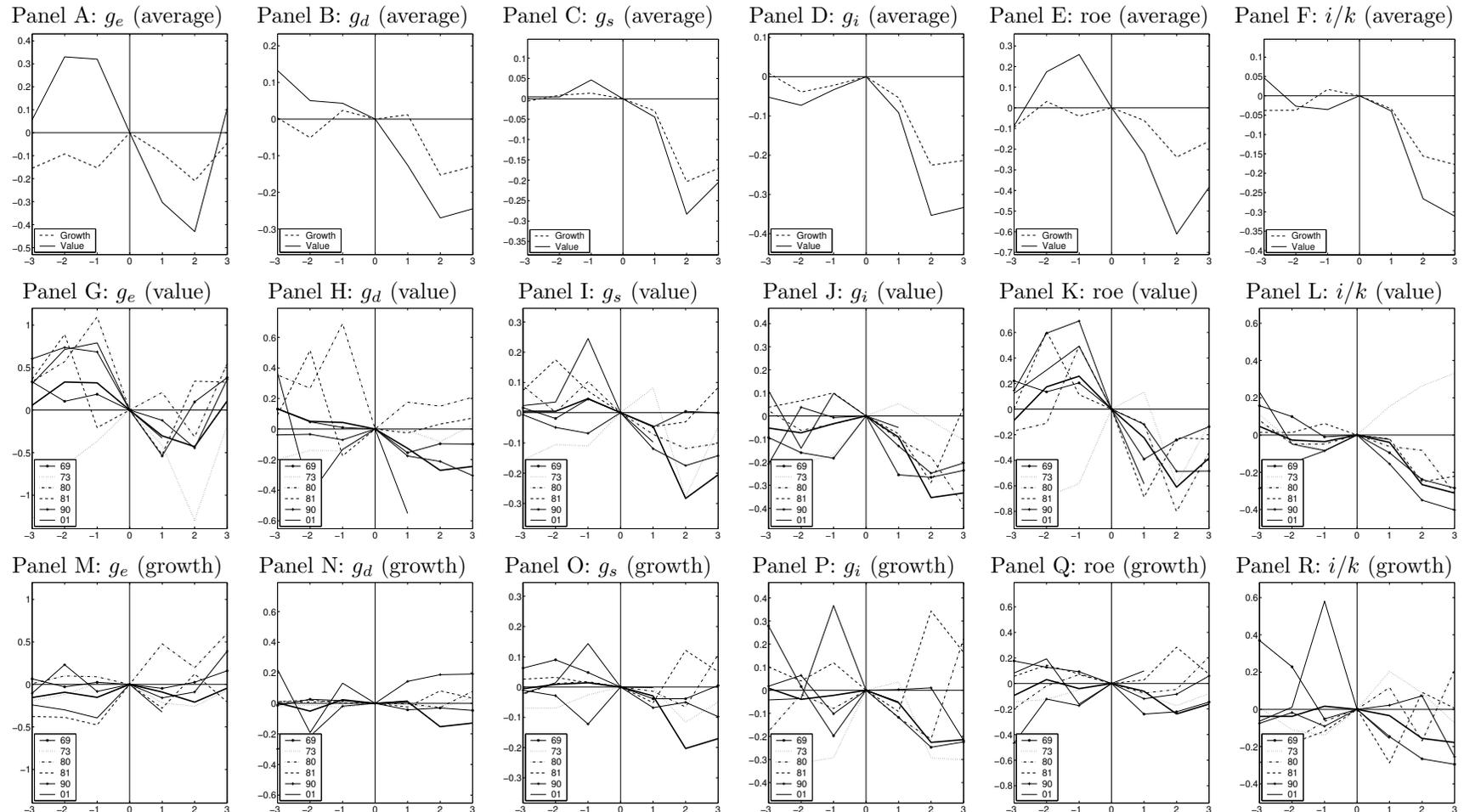


Figure 3 : Cumulative Responses to a One Standard-Deviation Negative Business Cycle Shock (1963–2002)

The first and the third columns of the panels represent the bivariate VARs that include a fundamental variable for either value or growth firms and the recession dummy. All panels in these two columns report the cumulative response of the variable to a one-standard deviation, positive shock to the recession dummy. This shock is a negative business cycle shock because the dummy takes the value of one in recessions. The second and the fourth columns of panels (denoted “diff”) represent the bivariate VARs that include the recession dummy and the difference in one fundamental variable between value and growth firms (value-minus-growth). All panels in these two columns report the cumulative response of the difference in the variable to a one-standard deviation positive shock to the recession dummy. In all panels, two standard-error bands are also plotted. g_e denotes earnings growth; g_s denotes sales growth; roe is profitability; i/k is the investment rate (investment over one-period-lagged fixed assets); g_d is the dividend growth; and g_i is the investment growth. The sample is from 1963 to 2002.

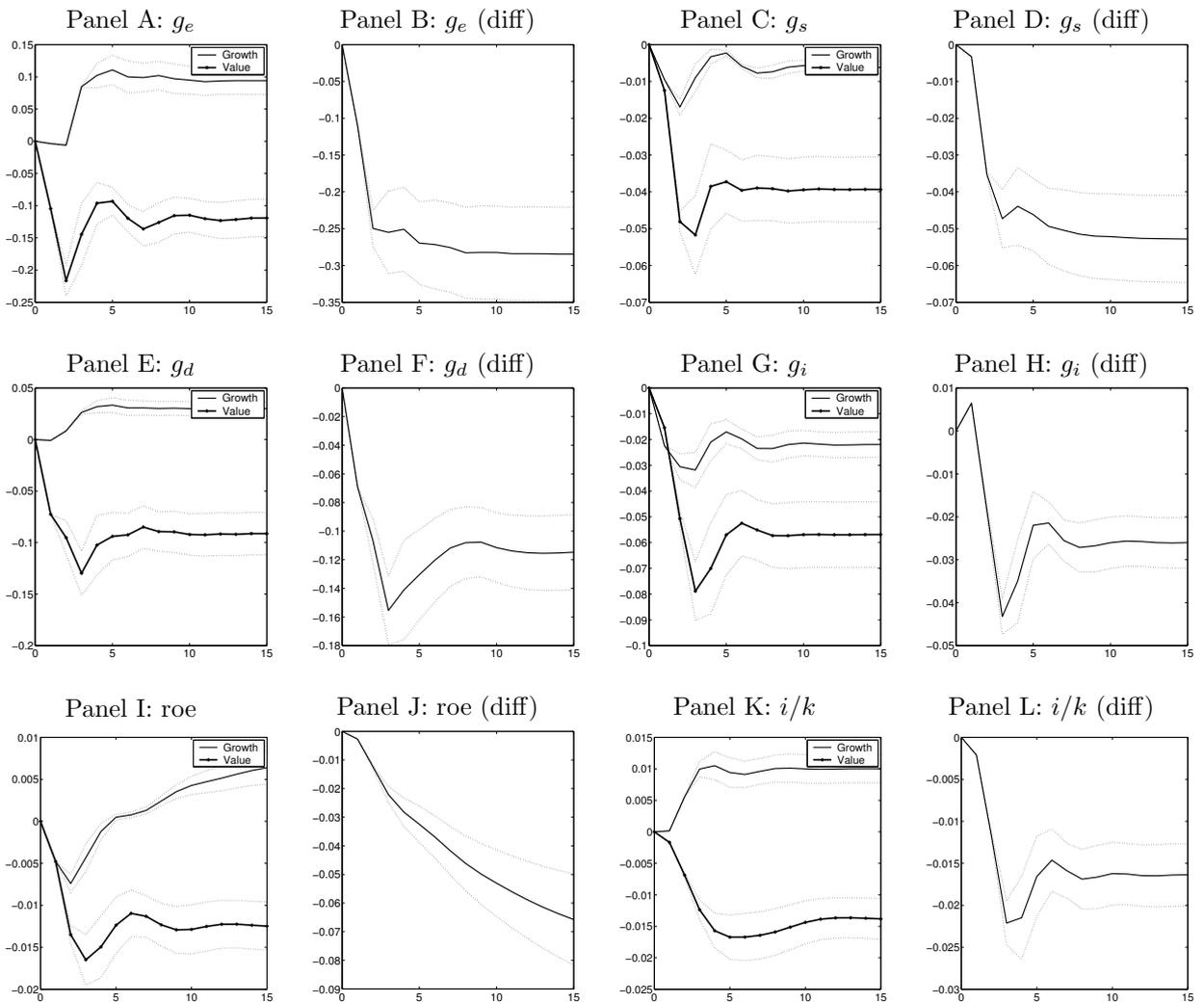


Figure 4 : Times Series of Fundamentals for Value and Growth Manufacturing Firms (1928–2002)

This figure plots the time series of the rate of earnings change (Panel A), profitability (Panel B), and dividend growth (Panel C) for value and growth manufacturing firms. Solid lines represent value firms and the dotted lines represent growth firms. The sample is from 1928 to 2002. We measure earnings using the clean-surplus relation, i.e., $\text{earnings}(t) = \text{book equity}(t) - \text{book equity}(t-1) + \text{dividends}(t)$. Dividends are extracted from the differences between value-weighted returns with and without dividends from CRSP. For each portfolio, we aggregate firm-level variables into portfolio-level variables. The rate of earnings change is calculated as the current-period change in earnings divided by one-period-lagged book equity. Profitability is earnings over one-period-lagged book equity.

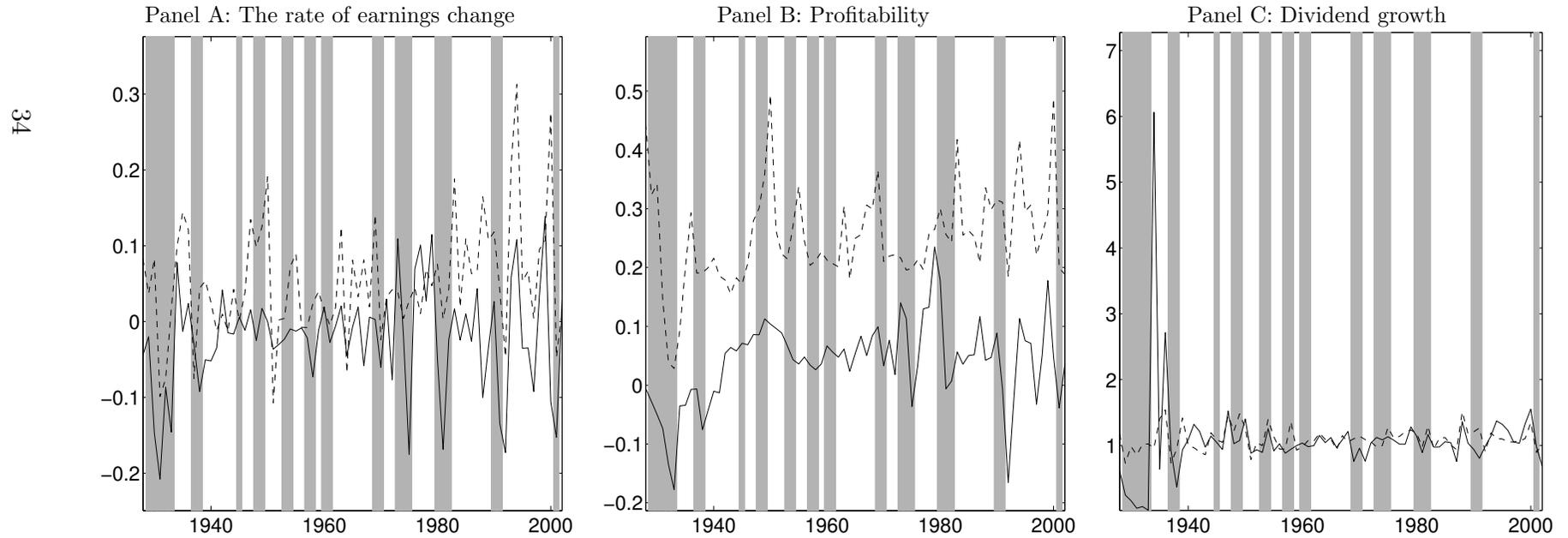


Figure 5 : Responses to Negative Aggregate Shocks: The Rate of Change in Earnings, Dividend Growth, and Profitability (1928–2002)

All series are shown as simple deviations from their values at the NBER Recession date. We plot simple deviations instead of log deviations as in Figure 2 because there are negative portfolio-level earnings in the long sample. The sample is from 1928 to 2002. Denote the variable of interest by x_t , where $t = -3, \dots, +3$ and $t=0$ is the beginning of a recession. The figure plots simple deviations, $x_t - x_0$, for three years before and three years after the event time 0. $\Delta e/b$ denotes the rate of change in earnings, defined as change in earnings divided by one-period-lagged book value, roe denotes profitability, defined as earnings divided by one-period-lagged book value, g_d denotes dividend growth with the two outliers in 1934 and 1936, and g_d^* denotes dividend growth without the outliers. In Panels A–D, the solid line represents the average simple deviations of value firms and the dotted line represents the average simple deviations of growth firms, both of which are averaged across the 13 NBER recessions in the sample. There are in total 14 lines in each panel from Panels E–L. The thickest solid curve is the average simple deviation across the 13 recession events. And the other curves correspond to the 13 simple deviations in the 13 recession events.

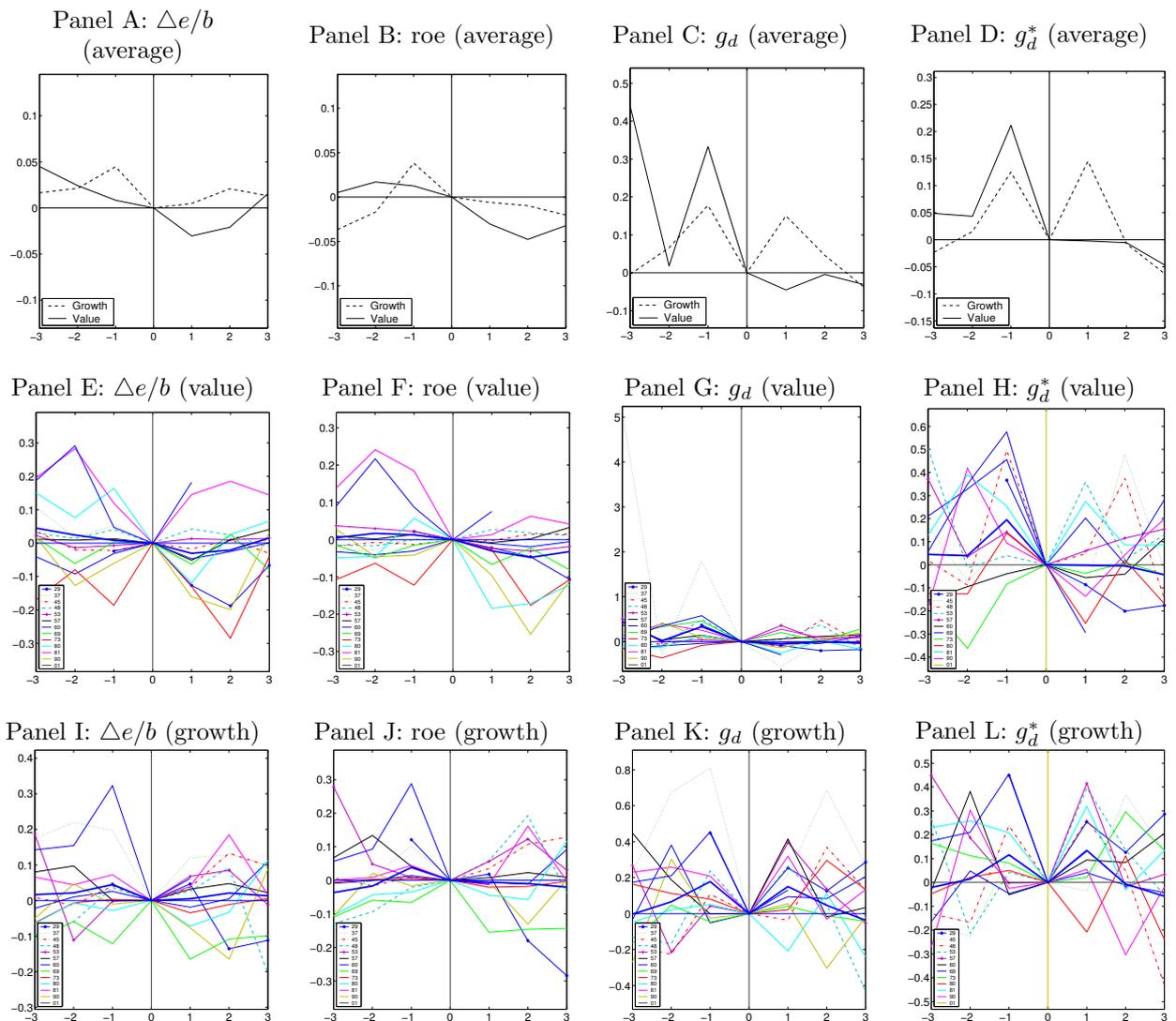


Figure 6 : Cumulative Responses to a One Standard-Deviation Negative Aggregate Shock (1928–2002)

The first row of panels represents the bivariate VARs that include a fundamental variable for either value or growth and the recession dummy. The second row of panels (denoted “diff”) represents the bivariate VARs that include the recession dummy and the difference in one fundamental variable between value and growth firms (value-minus-growth). All panels in this row report the cumulative response of the variable to a one-standard deviation positive shock to the recession dummy. This shock represents a negative business cycle shock because the dummy takes the value of one in recessions. In all panels, two standard-error bands also plotted. $\Delta e/b$ denotes the rate of change in earnings defined as change of earnings divided by one-period-lagged book value, roe denotes profitability defined as earnings divided by one-period-lagged book value, g_d is the dividend growth with the two outliers in 1934 and 1936, and g_d^* is the dividend growth without the two outliers. The sample is from 1928 to 2002.

