Essays on Capital Markets

by

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Abstract

Capital markets play an important role in the modern economy. This thesis consists of two essays on capital markets. In the first essay (Chapter 1), I study the effect of systematic news on a prominent capital markets anomaly, post-earnings announcement drift (PEAD), and use the effect to examine competing explanations of PEAD. In the second essay (Chapter 2), I study the real effects of capital markets development. The abstracts from each of the essays are as follows:

Chapter 1

Recent studies find that post-earnings announcement drift (PEAD) is related to the business cycle. Using quarterly data on U.S. public firms from 1973:Q1 to 2011:Q3, I find that PEAD is stronger when drift-period systematic news agrees with a firm's prior earnings news; PEAD is weaker, insignificant, or even reversed when drift-period systematic news disagrees with a firm's prior earnings news. The relation between systematic news and PEAD is consistent with the rational learning hypothesis, but cannot be explained by conventional behavioral models built on investor irrationality. The study suggests a channel linking PEAD to the business cycle. It provides empirical evidence that helps distinguish the rational learning hypothesis from conventional behavioral models, which previous studies attempting to use the rational learning theory to explain PEAD have found difficult. The findings indicate that anomalies need not imply investor irrationality. The effects of systematic shocks and information uncertainty on asset prices not captured by existing models offer a promising new direction for exploring PEAD as well as other anomalies.

Chapter 2

U.S. financial development varies a good deal over the last half century, primarily increasing since the 1980s. We ask whether this variation had consequences for the real economy. Difference-in-difference tests reveal that increases in financial development have disproportionate effects on industries that depend more on external finance. Higher financial development forecasts externally dependent industries using more external finance, having higher turnover of leading businesses, greater variation in firm-growth rates, more new firms entering, more mature firms exiting, lower concentration, and at the aggregate level more innovation and faster growth. The mosaic of our evidence is consistent with a Schumpeterian framework linking the supply of finance to competition, innovation, and growth. Our findings suggest that the growth in finance had some real effects that are socially beneficial.

Preface

Chapter 1 of this thesis is an original work by myself. Chapter 2 is a joint research effort with Professors David McLean and Mengxin Zhao at the University of Alberta. In the joint project, I was responsible for the data collection and analysis, and contributed to a minority share of the manuscript composition. Professors David McLean and Mengxin Zhao developed the research concept, assisted with the data collection and analysis, and contributed to the majority share of the manuscript composition.

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Introduction

This thesis consists of two essays on capital markets. Capital markets play an important role in the modern economy. In the first essay (Chapter 1), I study the effect of systematic news on a prominent capital markets anomaly, post-earnings announcement drift (PEAD), and use the effect to examine competing explanations of PEAD. Motivated by recent studies linking PEAD to the business cycle (e.g. Kothari, Lewellen, and Warner (2006), Chordia and Shivakumar (2005, 2006)), I ask whether systematic news arriving during the drift period has a significant effect on PEAD in the first part of the study. Using a sample of U.S. publicly listed firms and their quarterly stock price and financial data from 1973:Q1 to 2011:Q3, I find that PEAD is stronger when drift-period systematic news agrees with a firm's prior earnings news; PEAD is weaker, insignificant, or even reversed when drift-period systematic news disagrees with a firm's prior earnings news. In the second part of the study, I ask whether the effect of drift-period systematic news on PEAD can help shed light on the underlying mechanism of PEAD. Specifically, I use the relation between PEAD and drift-period systematic news to test the implication of three conventional behavioral models built on investor irrationality and the alternative rational learning hypothesis built on investor uncertainty about pricing parameters. The test results suggest that the relation between systematic news and PEAD is consistent with the rational learning hypothesis, but cannot be explained by conventional behavioral models built on investor irrationality. The findings in the study help distinguish the rational learning hypothesis from conventional behavioral models, which previous studies attempting to use the rational learning theory to explain PEAD have found difficult.

In the second essay (Chapter 2), I study the real effects of capital markets development in the U.S. over the past half century. This study is motivated by the significant development of U.S. financial markets during this period and the lack of academic research examining the implications of such development. This study begins by asking whether changes in U.S. financial development over the last half century have had consequences for the real economy and uses a difference-in-difference methodology to test whether changes in financial development over time forecasts differences in the use of external finance and various real effects across industries. The idea is that if the supply of external finance changes, it should have a disproportionate effect on industries that depend more on external finance. The study finds that Higher financial development forecasts externally dependent industries using more external finance, having higher turnover of leading businesses, greater variation in firm-growth rates, more new firms entering, more mature firms exiting, lower concentration, and at the aggregate level more innovation and faster growth. The mosaic of the findings is consistent with a Schumpeterian framework linking the supply of finance to competition, innovation, and growth, suggesting that the growth in finance had some real effects that are socially beneficial.

Chapter 1: Post-Earnings Announcement Drift and Systematic News

1.1. Introduction

Post-earnings announcement drift ("PEAD"), or sometimes referred to as earnings momentum, is one of the most prominent and robust return anomalies that defy market efficiency (e.g. Ball and Brown (1968), Foster, Olsen and Shevlin (1984), Bernard and Thomas (1989, 1990)), Fama (1998), Richardson, Tuna and Wysocki (2010)). This paper studies the impact of systematic news arriving during the post-announcement period (the "drift period") on PEAD. Using quarterly data of public firms in the United States from 1973:Q1 to 2011:Q3, I find that drift-period systematic news has a significant effect on PEAD. PEAD is stronger when drift-period systematic news agrees with a firm's prior earnings news (confirming systematic news); PEAD is weaker, insignificant, or reversed when drift-period systematic news disagrees with a firm's prior earnings news (disconfirming systematic news). The effect of systematic news on PEAD is observable with various earnings surprise measures based on reported earnings, analyst forecasts, or abnormal stock returns, as well as with various systematic news proxies derived from stock market returns or actual economic activity. The effect of drift-period systematic news on PEAD remains post the adjustments of pricing factors that are known to have cross-sectional explanatory power of returns, such as CAPM beta, size, book-to-market ratio, and momentum.

Although PEAD is often attributed to investor underreaction to firm earnings news due to behavioral biases as suggested by Bernard and Thomas (1990), Barberis, Shleifer and Vishny (1998), and Daniel, Hirshleifer and Subrahmanyam (1998), these conventional behavioral models are silent on the relation between PEAD and systematic news. Further analysis indicates that these models yield predictions that are not supported by empirical findings in this study.

Specifically, Bernard and Thomas (1990) find that firm earnings have positive autocorrelations for three quarters and PEAD also lasts for three quarters. Bernard and Thomas posit that investors ignore the autocorrelations of firm earnings surprises and underreact to earnings news at announcement. However, this study finds that for firms that are met with confirming systematic news during the drift period (and show a stronger PEAD) do not exhibit stronger autocorrelations of earnings surprises relative to firms that are met with disconfirming systematic news in the drift period (and show a weaker PEAD). Barberis et al. (1998) model PEAD as a result of conservatism bias. Under their model, investors hold wrong beliefs about a firm's earnings process, believing that earnings are either mean-reverting or trending, while the true earnings process is closer to a random walk with short-term autocorrelations. When investors believe that a firm's earnings process is in the mean-reverting state, i.e. investors assume that the earnings process is more stationary than it actually is, they underreact to firm earnings news and this underreaction leads to PEAD. Since investors form their beliefs about a firm's earnings process from observing past earnings, the Barberis et al. model implies that investors should have observed different earnings histories for firms that are met with confirming systematic news in the drift period relative to firms that are met with disconfirming systematic news in the drift period. The study finds that there is no evidence indicating that these two groups of firms exhibit different patterns of earnings history. In the third behavioral model, Daniel et al. (1998) hypothesize that PEAD arises from biased self-attribution. Investors grow overconfident when their private information is confirmed by public signals, but their confidence does not fall proportionately when public signals disconfirm their private information. This asymmetric response to public information (overreaction to confirming public information and underreaction to disconfirming public information) leads to short-term return momentum post an earnings announcement, which is followed by long-term return reversals as investor overreaction is eventually corrected by public information released in later periods. However, analysis in the study suggests that investors do not underreact to disconfirming systematic news in the drift period. Further, there are no prominent signs of post-PEAD return reversals.

A competing theory to the conventional behavioral explanations of PEAD is the rational learning hypothesis. Brav and Heaton (2002), Francis, Lafond, Olsson and Schipper (2007), and Han, Hong and Warachka (2009) apply the rational learning theory to explain PEAD, contemplating that PEAD may occur as rational investors encounter information uncertainty and must learn about the true value of a firm over time. The findings in the study are consistent with the rational learning hypothesis of PEAD. Specifically, Francis et al. (2007) show that firms with extreme earnings surprises tend to have high information uncertainty, and PEAD is also stronger among firms with higher information uncertainty. Due to the low precision of prior firm earnings news, investors assign less weight to the noisy prior earnings signals and more weight to new information when they evaluate firms with extreme earnings surprises. As a result, prices of these firms are more sensitive to the arrival of new information, i.e. prices are more likely to move in the direction of new information, firm-level or systematic, that arrives in the drift period. In addition to explaining the unconditional PEAD, this also helps explain the effect of drift-period systematic news on PEAD. Prices of firms with extreme earnings surprises have the tendency to drift the most unconditionally where the effect of firm earnings autocorrelation dominates[1], but the price drift of these firms is also most likely to change course conditioning on the direction of systematic news in the drift period. The findings in the study lend further support to the rational learning hypothesis, which is particularly encouraging to the hypothesis as

[1] Since systematic news is random, sometimes positive and sometimes negative, its net effect on unconditional PEAD is muted.

previous studies have found it difficult to empirically distinguish rational learning from conventional behavioral models.

This study contributes to the literature in several ways. First, it documents a new regularity of PEAD that extends our understanding of the anomaly. Second, the study advances the literature's recent endeavor on connecting PEAD with the business cycle (e.g. Kothari, Lewellen, and Warner (2006), Chordia and Shivakumar (2005, 2006)) by suggesting a channel directly linking macroeconomic shocks with PEAD. Finally, the study provides empirical evidence that distinguishes the rational learning hypothesis from conventional behavioral explanations. The findings in the study offer an alternative perspective on understanding PEAD. Information uncertainty and its implications on asset prices provide a promising new direction for exploring PEAD as well as other anomalies.

The remainder of this paper is organized as follows. In the next section, I discuss the motivation for the study and review relevant literature. In Section 1.3, I describe the sample and data. In Section 1.4, I investigate the effect of drift-period systematic news on PEAD. In Section 1.5, I test the implications of competing theories of PEAD. In Section 1.6, I present concluding remarks.

1.2. Prior Literature and Motivation

1.2.1. PEAD and firm-level information

A large body of literature has been devoted to PEAD since the publication of the seminal paper by Ball and Brown (1968). Richardson, Tuna, and Wysocki (2010) provide a detailed review of recent work on PEAD. PEAD is often attributed to investor underreaction arising from cognitive deficiency or behavioral biases. Bernard and Thomas (1990) find that the autocorrelation structure of firm earnings matches the pattern of PEAD and conclude that investors do not understand the time-series properties of firm earnings and underreact to earnings news at announcement. This underreaction leads to the price drift after an earnings announcement. Barberis et al. (1998) and Daniel et al. (1998) model investor underreaction to firm news resulting from behavioral biases. On the other hand, the search for a rational or risk-based explanation has not achieved much success. Bernard and Thomas (1989) test several possible misspecifications in pricing models but do not find support for any of them. Chan, Jegadeesh, and Lakonishok (1996) control for size, book-to-market, and momentum, and find that PEAD remains significant. Another strand of literature takes the middle ground between the conventional rational and behavioral camps and applies the rational learning theory to explain PEAD (Brav and Heaton (2002), Francis et al. (2007), Han et al. (2009)). These studies hypothesize that PEAD may arise when rational investors must learn about uncertain pricing parameters over time. However, as Brav and Heaton point out, rational learning and conventional behavioral models often yield similar predictions, so it is difficult to empirically distinguish rational learning models from conventional behavioral models built on investor irrationality.

1.2.2. PEAD and business cycle

Different from the aforementioned literature that focuses on the relations between PEAD and firm-level information, other recent studies find that PEAD is related to the business cycle. Kothari, Lewellen, and Warner (2006; KLW hereafter) extend the test in Bernard and Thomas (1990) to the aggregate level. Interestingly, they find that although earnings are more persistent at the aggregate level, there is no corresponding drift in aggregate prices. The finding seems to suggest that investors are quite alert to aggregate earnings news despite their underreaction to firm earnings news. KLW state that their study is not meant to be a direct test of behavioral models; nevertheless, they consider this contrast in investor alertness towards firm-level and aggregate news puzzling. Moreover, KLW find that aggregate earnings surprises are positively correlated with changes in discount rates, which leads to a negative contemporaneous relation between aggregate earnings surprises and market returns. In addition to the work by KLW, Chordia and Shivakumar (2005, 2006) also document that the abnormal profits from a PEAD-based trading strategy are related to future macroeconomic activities, such as inflation and GDP growth.

A growing literature in finance links return anomalies to the business cycle. For example, Liew and Vassalou (2000) find that SMB and HML contain information about future GDP growth, while Petkova (2006) shows that these two factors are correlated with innovations in macroeconomic variables. As to price momentum, Chordia and Shivakumar (2002) find that price momentum profits can be explained by a set of lagged macroeconomic variables. Cooper, Gutierrez, and Hameed (2004) discover that price momentum strategies are profitable only following positive market returns. More recently, Liu and Zhang (2008) find that recent winners have higher loadings on industrial production growth than recent losers, while Asem and Tian (2010) document that momentum profits are higher when the market continues in the same state. Although the connections between the aforementioned anomalies and the business cycle do not necessarily imply risk-based explanations, they provide an alternative channel for understanding these anomalies in addition to conventional behavioral theories.

1.2.3. Motivation

Motivated by the contrast observed by KLW regarding investor alertness to aggregate and firm-level news, and the connections between business cycles and anomalies documented in recent studies, I study the impact of systematic news arriving during the drift period on PEAD in this paper. I first examine how PEAD varies with drift-period systematic news. Then I use the finding to test conventional behavioral models and the alternative rational learning hypothesis.

1.3. Data and Sample

The full sample is comprised of U.S. firms in the CRSP-Compustat Merged Quarterly Database from January 1973 to September 2011. Non-U.S. firms, American depositary receipts (ADRs), investment funds, trust companies, and firms not listed on NYSE, Amex, or Nasdaq are excluded from the sample. U.S. firms are defined as firms that report in U.S. dollars and firms that are either incorporated or headquartered in the U.S. The full sample starts in 1973 because Compustat's coverage of earnings announcement dates is spotty before 1973. Following KLW, firms with stock prices less than $1 per share are excluded from the sample. Further, a size filter of $10 million (2005 dollars; inflation adjusted using the GDP deflator) is imposed. A firm's earnings surprise for quarter *t (DEP(t))* is measured as seasonally differenced earnings scaled by lagged stock market value, following KLW, and Livnat and Mendenhall (2006) (eq. (1)).[2] Earnings are obtained by multiplying earnings per share excluding extraordinary items by shares outstanding.

[2] Compared to *DEP* calculated with per share data, *DEP* estimated with a firm's total earnings and stock market value is less susceptible to measurement errors caused by stock splits or share repurchases. In unreported tests, I obtain similar results using *DEP* calculated with per share data.

$$DEP(t) = DEP_{i,t} = (\frac{dE}{P})_{i,t} = \frac{E_{i,t} - E_{i,t-4}}{Stock\ Market\ Value_{i,t-4}} \qquad (1)$$

In addition to *DEP*, I use two alternative earnings surprise measures based on the difference between actual earnings and analyst forecasts (*UEP*) and the abnormal stock return around the earnings announcement (*ABR*). Recent studies have found that the abnormal profits of a PEAD-based trading strategy are larger and more persistent when earnings surprises are determined using these two measures than when using measures based on seasonally differenced earnings or time-series models, such as *DEP* (Doyle, Lundholm and Soliman (2006), Livnat and Mendenhall (2006), Brandt et al. (2008)). These alternative measures aim to better capture the "surprise" component of firm earnings with the aid of market data. *UEP* measures the surprise by the discrepancy between the actual earnings announced and the prevailing market expectations prior to the announcement. *ABR* uses price response to firm earnings news to gauge the extent of the market's surprise. I calculate *UEP* following a procedure similar to that used in Doyle et al. (2006) and Livnat and Mendenhall (2006) by first taking the difference between the actual earnings per share (EPS) and the consensus EPS estimate and then scaling the difference by price per share (eq. (2)). The consensus EPS estimate is the median of EPS estimates surveyed by I/B/E/S during the last month of the quarter for which the earnings are measured. Price per share in the denominator is the share price on the date of the I/B/E/S survey. ABR is obtained by cumulating daily abnormal stock returns over a four-day window surrounding the earnings announcement (day -2 to day +1, with day 0 being the announcement day) following the procedure in Chan et al. (1996)(see eq. (3)). The daily abnormal return is the difference between a firm's stock return and that of the CRSP equal-weighted index.

$$UEP(t) = UEP_{i,t} = \frac{EPS_{i,t} - Consensus\ EPS_{i,t}}{P_{i,t}} \quad (2)$$

$$ABR(t) = ABR_{i,t} = \sum_{j=-2}^{+1} \left(R_{i,j} - R_{CRSP_{EW},j}\right) \quad (3)$$

Following KLW and as depicted in Figure 1. 1, quarter t refers to the period for which earnings and associated earnings surprises (*Surprise(t); Surprise = DEP, UEP, or ABR*) are measured. Quarter *t+1* is the period in which *Surprise(t)* is announced (the announcement quarter), while quarter *t+2* is the period in which PEAD is measured in regard to *Surprise(t)* (the drift quarter). Firms are restricted to those whose earnings are announced within 85 calendar days after quarter *t* ends to prevent contemporaneous price responses from entering returns measured for the drift quarter *t+2*.[3] The analysis is performed on a calendar quarter basis throughout the study. Following KLW, only companies with March, June, September, and December fiscal year ends are included in the sample.

Quarterly stock returns are attained by compounding monthly returns (including dividends) from CRSP. For *DEP* calculations, price and shares outstanding are from CRSP; quarterly financials are from Compustat. Components of *UEP*—consensus EPS estimate, actual EPS announced, and price per share on the survey date—are from I/B/E/S. *ABR* is based on daily stock returns from CRSP and quarterly earnings announcement dates from Compustat. All firm-level variables are winsorized at the 1% level. The *DEP* and *ABR* series start in 1973:Q1 and end in 2011:Q3. The *UEP* series starts in 1985:Q1 and ends in 2011:Q3 because I/B/E/S coverage of analyst estimates starts in the second half of 1984. When UEP is used as the earnings surprise measure, the sample consists of the intersection of the CRSP-Compustat Merged Database and I/B/E/S.

[3] This 85-day restriction removes approximately 2.4% of the firm-quarter observations.

Table 1.1 reports the summary statistics of the main variables (Panel A), the pair-wise correlations among the three earnings surprise measures (Panel B), and PEAD observed on the full sample (Panel C). All variables are measured at a quarterly frequency. The mean (0.39%) and median (0.21%) of *DEP* are similar in magnitude to those reported in KLW. Different from *DEP*, *ABR* and *UEP* are centered on zero with a mean or median close to zero. Quarterly stock returns (*R*) average 4.12% with a median of 1.92%, comparable to the magnitude of reported historical stock returns. The three earnings surprise measures are significantly correlated with pair-wise correlations in the range of 0.12 to 0.31, all significant at the 1% level.

Before testing how PEAD varies with systematic news in the drift period, I first test PEAD in the full sample without considering systematic news. Following the standard methodology in the anomaly literature, I first form decile portfolios by sorting firms into deciles based on earnings surprises measured for quarter *t* (*Surprise(t); Surprise = DEP, UEP, or ABR*), and equally weighting all firms in a decile. A zero-investment arbitrage portfolio is subsequently formed by longing the decile portfolio with the highest earnings surprises (D10) and shorting the decile portfolio with the lowest earnings surprises (D1), using each of the three earnings surprise measures.

Panel C reports the average buy-and-hold returns of the 11 portfolios (10 deciles + the arbitrage portfolio) measured for both the announcement quarter *t+1* and the drift quarter *t+2* using all three earnings surprise measures. As documented in the literature, earnings surprises have a significant effect on stock prices, and this effect extends beyond the announcement quarter. The quarterly portfolio returns increase monotonically from D1 to D10. The returns of the arbitrage portfolios D10–D1 are significantly positive for both the announcement quarter *t+1* and the drift quarter *t+2* regardless of which earnings surprise measure is used. The magnitude of the average profits associated with a PEAD-based trading strategy—*R(t+2)* of the arbitrage portfolios—is 2.9% to 3.7%, which is comparable to findings reported in the literature.

1.4. PEAD and Drift-Period Systematic News

1.4.1. Baseline analysis

In this section, I test how PEAD varies with drift-period systematic news where systematic news is proxied by the demeaned stock market return. Stock prices are assumed to incorporate price relevant information, so systematic news arriving in the drift period *t+2* can be inferred from the changes in aggregate prices, i.e. stock market return in quarter *t+2* ($R_{m,t+2}$). Specifically, the realized market return ($R_{m,t+2}$) is the sum of the expected market return ($E_{t+1}[R_{m,t+2}]$) and systematic news arriving during the drift period (μ_{t+2}) as shown in eq. (4a). For simplicity, the expected market return ($E_{t+1}[R_{m,t+2}]$) is approximated by the unconditional mean of the sample period ($\bar{R}_{m,t+2}$) and the demeaned stock market return ($R'_{m,t+2}$ or *R'(m,t+2)*) is used as the primary proxy for systematic news, μ_{t+2}, throughout the study (eq. (4b))[4]. The stock market return is measured with the return of the CRSP equal-weighted index (including dividends). The results are similar if the stock market return is measured with the return of the CRSP value-weighted index. In Section 1.4.2.4, I discuss the test results using alternative systematic news proxies.

$$R_{m,t+2} = E_{t+1}\left[R_{m,t+2}\right] + \mu_{t+2} \qquad (4a)$$

$$R_{m,t+2} = \bar{R}_{m,t+2} + R'_{m,t+2} \qquad (4b)$$

[4] The demeaned stock market return is a crude measure for systematic news, which is subject to measurement errors. On the other hand, there is little consensus regarding how to measure expected market returns. In untabulated sensitivity tests, I use the raw return ($R_{m,t+2}$) as the proxy for systematic news and obtain similar results.

Systematic news in the drift period *t+2* is designated as positive (negative) if the demeaned market return in *t+2*, *R'(m,t+2)*, is greater than zero (less than or equal to zero). Similarly, an earnings surprise measured for quarter *t* (*Surprise(t); Surprise = DEP, ABR or UEP*) is designated as positive (negative) if *Surprise(t)* is greater than zero (less than or equal to zero). Therefore, there are four (2 x 2) scenarios based on the signs of *Surprise(t)* and *R'(m,t+2)*. For each quarter, firms are grouped into one of the four categories. Within each category, decile portfolios and the arbitrage portfolio are formed based on *Surprise(t)*, and then the buy-and-hold portfolio returns are measured for the drift period *t+2*. The results are summarized in Table 1.2.

The results in Table 1.2 show a different pattern from those reported in Table 1.1, Panel C. The returns of the decile portfolios increase monotonically from D1 to D10, and the returns of the arbitrage portfolios D10–D1 are significantly positive only when the sign of drift-period systematic news agrees with the sign of *Surprise(t)*: positive systematic news (*t+2*) and positive *Surprise(t)*, or negative systematic news (*t+2*) and negative *Surprise(t)*. When the sign of drift-period systematic news disagrees with that of *Surprise(t)*, decile portfolio returns do not increase monotonically from D1 to D10 and the returns of the arbitrage portfolios become significantly negative in all six cases. Compared to the returns of the arbitrage portfolios in the full sample (the "undivided" sample; Table 1.1, Panel C, *t+2* columns), those in Table 1.2 are also greater (smaller) when the sign of drift-period systematic news agrees (disagrees) with the sign of *Surprise(t)*.

Based on the results of Table 1.2, I consolidate the four scenarios into two in the next set of tests. A firm is assigned to the "same direction" group if *Surprise(t)* and drift-period systematic news (*R'(m,t+2)*) have the same sign; otherwise, a firm is assigned to the "different direction" group. Decile portfolios sorted on *Surprise(t)* and an arbitrage portfolio are formed within each group, and the portfolios' returns during the drift period *t+2* are measured. Table 1.3 summarizes the results.

The results in Table 1.3 are consistent with those in Table 1.2. The returns of the decile portfolios increase monotonically from D1 to D10 and the profits of the arbitrage portfolios are significantly positive only for the same direction group. The profits of the arbitrage portfolios range from 5.9% to 6.8%, all statistically significant at the 1% level for the same direction group. For the different direction group, the returns of the decile portfolios do not increase monotonically from D1 to D10, and the profits of the arbitrage portfolios are all negative (in the range of -2.6% to -2.7%) and statistically significant at the 1% level. The differences in arbitrage profits between the two groups, i.e. D10–D1 (same direction) minus D10–D1 (different direction), are all positive and statistically significant at the 1% level. Further, the returns of the arbitrage portfolios in the same (different) direction group are also greater (smaller) than those in the undivided sample (Table 1.1, Panel C, t+2 columns).

In summary, the results in Tables 2 and 3 show that PEAD is stronger when the sign of drift-period systematic news agrees with that of a firm's prior earnings surprise; PEAD is weaker, in fact reversed, when the sign of drift-period systematic news disagrees with that of a firm's prior earnings surprise. The relation is observable using a systematic news measure derived from stock market returns and a variety of earnings surprise measures.

1.4.2. Robustness checks

1.4.2.1. Subperiod and subsample analyses

In a recent study, Chordia, Subrahmanyam, and Tong (2011) show that most of the well-known asset pricing anomalies have weakened in recent years. The authors attribute the changes to increased pricing efficiency due to improvements in trading technology, reductions in trading costs, and increases in arbitrage activity. The trend is consistent with the investor underreaction and limits-of-arbitrage (Mendenhall (2004), Ng et al. (2008), Chordia et al. (2009)) explanations of PEAD. Consistent with limits of arbitrage, some studies also show that PEAD is more prominent in small firms (Foster et al. (1984), Ng et al. (2008), Chordia et al. (2009)). In this section, I test whether the relation between PEAD and drift-period systematic news changes over time (subperiod analysis) or varies with firm size (subsample analysis).

The full sample period is divided into three subperiods and tests similar to those in Table 1.3 are conducted on each. The subperiods have roughly the same number of quarters:[5] Period 1: 1973:Q1–1984:Q4, Period 2: 1985:Q1–1998:Q4, and Period 3: 1999:Q1–2011:Q3. The breakpoint between Period 1 and Period 2 is aligned with the starting point of the *UEP* series. The emergence of hedge funds and algorithm trading since the late 1990s implies a distinct market dynamic for Period 3. Panel A of Table 1.4 summarizes the results of the subperiod analysis. For brevity, only the returns of the arbitrage portfolios D10–D1 are shown.

The results in Panel A of Table 1.4 are similar to those in Table 1.3. The returns of the arbitrage portfolios range from 5.2% to 8.3%, all significant at the 1% level, for the same

[5] The division of the subperiods is based on the quarter for which earnings surprises are measured. Therefore, for the last two quarters in Periods 1 and 2, the return data stretch to the next subperiod. For example, in Period 1, the last quarter of observations have earnings surprises measured for 1984Q4 and stock returns measured for 1985Q2. In Period 3, both earnings surprise and return data end in 2011Q3.

direction group. For the different direction group, the profits range from -0.5% to -5.8%, with six out of eight being significantly negative. The differences in arbitrage profit between the two groups, (D10–D1; same direction) - (D10–D1; different direction), are all positive and significant at the 1% level, ranging from 5.8% to 13.7%. These differences seem to have increased over time, especially in Period 3, indicating that the influence of drift-period systematic news on PEAD, may have increased over time. This trend is at odds with the trend documented in Chordia et al. (2011). In untabulated tests, I also find that PEAD in the undivided sample is weaker in Period 3, consistent with Chordia et al. (2011). Such a divergence in time trend seems to suggest that neither investor underreaction nor limits of arbitrage is responsible for the observed relation between PEAD and drift-period systematic news.

In the next set of tests, I divide the sample into two size subsamples (small and median-large) using the smallest firm in the NYSE 8th size decile[6] at the end of quarter *t* as the breakpoint and conduct the tests used in Table 1.3 on each size subsample. The two subsamples have approximately the same number of firm-quarter observations except when *UEP* is used as the earnings surprise measure.[7] Panel B in Table 1.4 reports the test results.

Panel B in Table 1.4 shows that the difference in the PEAD patterns between the same and different direction groups previously observed in the full sample is also observed in each of the size subsamples. The returns of the arbitrage portfolios are all significantly positive in the same direction group, but none of the returns of the arbitrage portfolios in the different direction group is significantly positive. The differences in arbitrage profits between the same and different direction groups are all positive and significant at the 1% level. Further, the magnitude

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[6] The NYSE size decile break points are from the CRSP Monthly Capitalization Decile Files. Different from common practice, CRSP assigns the largest firms to the 1st size decile and the smallest firms to the 10th size decile.
[7] In tests in which I use UEP as the earnings surprise measure, the size of the small-firm subsample is approximately 56% the size of the median- and large-firm subsample because small firms usually receive less analyst coverage.

of these differences measured on the median- and large-firm subsample (7.1% - 8.5%) is comparable to that measured on the small-firm subsample (7.5% - 9.1%). These results suggest that the influence of drift-period systematic news on PEAD is observable in both small- and larger-sized firms, and this influence seems to be independent of that of limits of arbitrage, consistent with the findings of the subperiod analysis.

1.4.2.2. Factor adjustment and cross-sectional regressions

The results discussed thus far have been based on buy-and-hold returns. I obtain similar results when returns are adjusted with a CAPM-based one-factor model, the Fama-French three-factor model (Fama and French (1993)) or the Carhart four-factor model (Carhart (1997)) as shown in Panel A of Table 1.5. The factors come from Ken French's website.[8] The results indicate that the influence of drift-period systematic news on PEAD cannot be explained by known pricing factors, such as CAPM beta, size, book-to-market ratio, or momentum.

In addition to the time-series tests discussed above, I also perform cross-sectional tests using Fama-MacBeth regressions (Fama and MacBeth (1973)). For each firm-quarter observation, the dummy variable *Dsame* is assigned a value of 1 if the sign of the earnings surprise, *Surprise(t)*, agrees with that of drift-period systematic news (*R'(m,t+2)*), and is assigned a value of 0 otherwise. Similarly, the dummy variable *Ddiff* is assigned a value of 1 if the sign of the earnings surprise, *Surprise(t)*, disagrees with that of drift-period systematic news, and is assigned a value of 0 otherwise. Firm stock returns in the drift period, *R(t+2)*, are regressed on Surprise(t)*Ddiff and Surprise(t)*Dsame to estimate PEAD for firms in the same and different direction groups separately (eq. (5a)). Similar to Section 1.4.2.3, I conduct the tests with three

[8] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

specifications: CAPM, Fama-French three factors and Carhart four factors. In the CAPM specification, only beta is included as the control variable. Beta, size and book-to-market ratio are included as control variables in the Fama-French three-factor specification. In the Carhart specification, momentum as well as the three aforementioned variables are included as controls. Beta is calculated with monthly returns from the prior 36 months. Size is measured with a firm's stock market value (*ME*). The book-to-market ratio (*BM*) is based on book and market values measured at the end of a quarter. Momentum (*MOM*) is measured by compounding the stock returns of the prior six months with the first month skipped, following the standard practice in the literature.[9] Beta, *ME*, *BM*, and *MOM* are all measured at the end of quarter *t*.

$$R_{j,t+2} = \alpha + \beta_1 * Surprise_{j,t} * Ddiff_{j,t,t+2} + \beta_2 * Surprise_{j,t} * Dsame_{j,t,t+2} + \sum \delta_k * Control_{k,j,t} + \varepsilon_{j,t+2} \qquad (5a)$$

Eq. (5a) is estimated using Fama-MacBeth regressions, and the results are reported in Panel B1 of Table 1.5. Similar to the results of the time-series tests in Panel A of Table 1.5, only firms in the same direction group show significant PEAD. The factor loadings on *Surprise(t)*Dsame* are all significantly positive, while none of the factor loadings on *Surprise(t)*Ddiff* are significantly positive, regardless of which earnings surprise measure is used.

In the next step, I test whether the difference in PEAD strength between the same and different direction groups are statistically significant. Eq. (5a) is modified to eq. (5b). Now the factor loadings on *Surprise(t)* measure PEAD strength for firms in the different direction group and the sums of factor loadings on *Surprise(t)* and *Surprise(t)*Dsame* measure PEAD strength

[9] For a quarter *t* ending in month *m*, *MOM* is measured as the cumulative 6-month return from the beginning of month *m-6* to the end of month *m-1*, with month m skipped due to market microstructure considerations.

for firms in the same direction group. The loadings on *Surprise(t)*Dsame* measure the difference in PEAD strength between firms in the same and different direction groups.

$$R_{j,t+2} = \alpha + \beta_1 * Surprise_{j,t} + \beta_3 * Surprise_{j,t} * Dsame_{j,t,t+2} + \sum \delta_k * Control_{k,j,t} + \varepsilon_{j,t+2} \qquad (5b)$$

Panel B2 of Table 1.5 reports the estimates of eq. (5b). The factor loadings on *Surprise(t)*Dsame* are all positive and statistically significant at the 1% level. The results are consistent with those of the time-series tests: there is a statistically significant difference in PEAD strength between firms in the same and different direction groups.

Overall, the results in Table 1.5 show that the influence of drift-period systematic news on PEAD remains post the adjustments of pricing factors that known to have cross-sectional explanatory power of returns, such as CAPM beta, size, book-to-market, and momentum.

1.4.2.3. Systematic news or firm news

Some may suspect that the influence of drift-period systematic news on PEAD discussed thus far arises from differences in firm news in the drift period. In the next set of tests, I add lead *DEP* terms to eq. (5b) to control for drift-period firm news, using lead *DEPs* as a proxy for firm news arriving during the drift period (eq. (6)). If firm news explains the difference in PEAD strength between firms in the same and different direction groups, the factor loading on *DEP(t)*Dsame* should become insignificant in eq. (6).

$$R_{j,t+2} = \alpha + \beta_1 * Surprise_{j,t} + \beta_3 * Surprise_{j,t} * Dsame_{j,t} + \sum_i \gamma_i * DEP_{j,t+i} + \sum \delta_k * Control_{k,j,t} + \varepsilon_{j,t+2} \qquad (6)$$

Since firm earnings for quarter *t+1* are announced in quarter *t+2*, I first include *DEP(t+1)* in eq. (6) to control for drift-period firm news and report the Fama-MacBeth regression estimates in Columns (1)-(3) in Table 1.6. For brevity, only the estimates using the Carhart four-factor specification are reported. The results are similar with the CAPM or Fama-French three-factor specifications. As expected, *DEP(t+1)* has strong explanatory power for *R(t+2)*. The coefficients of *DEP(t+1)* are large in magnitude and high in statistical significance. The presence of *DEP(t+1)* also turns the factor loadings on *Surprise(t)* negative, but the sum of the coefficients of *Surprise(t)* and *Surprise(t)*Dsame* remains positive in each of the three regressions. The results are consistent with those discussed in previous sections: PEAD is strong (weak or reversed) for firms in the same (different) direction group. Further, the coefficients of Surprise(t)*Dsame also remain significantly positive, with magnitude and statistical significance comparable to those reported in Panel B2 of Table 1.5. The results indicate that the inclusion of *DEP(t+1)* has only a marginal effect on the coefficient of *DEP(t)*Dsame*. In other words, the difference in PEAD strength between the same and different direction groups is robust to the inclusion of drift-period firm earnings news in the regressions.

In addition to *DEP(t+1)*, *DEP(t+2)* may also provide explanatory power for the drift-period return, *R(t+2)*. Although firms do not announce earnings for the drift quarter until *t+3*, investors can learn about the figures during the quarter from alternative sources of information. In fact, earnings guidance or pre-announcements issued by firms before the formal earnings releases have become popular in recent years (Anilowski, Feng and Skinner (2007)). Therefore, I further include *DEP(t+2)* in the regressions and report the test results in columns (4) - (6) of Table 1.6. Similar to *DEP(t+1)*, *DEP(t+2)* also has strong explanatory power for *R(t+2)*. The results indicate that during the drift period *t+2*, investors do learn about a firm's earnings for the quarter before the figures are formally announced in *t+3*. Similar to columns (1)-(3), the coefficients of *Surprise(t)* are all negative, the sums of factor loadings on *Surprise(t)* and *Surprise(t)*Dsame* are all positive, and the coefficients of the interaction term *Surprise(t)*Dsame* are all positive and significant at the 1% level.

In summary, the results in Table 1.6 suggest that the observed difference in PEAD strength between firms in the same and different groups cannot be attributed to differences in drift-period firm news.

1.4.2.4. Alternative systematic news proxies

Thus far, the analyses have been conducted with a systematic news proxy derived from stock market returns where the stock market return is measured with the return of the CRSP equal-weighted index. In this section, I discuss the test results with alternative systematic news measures that are either derived from real economic activity or an alternative proxy for the stock market. The systematic news proxies are meant to capture changes in the market's beliefs about the state of the economy. The stock market return is arguably the most direct measure of such belief changes. In addition to using the CRSP equal-weighted index to proxy for the stock market activity as in the previous sections, I show results using the CRSP value-weighted index to proxy for market activity in this section. Furthermore, I introduce two additional alternative systematic news proxies derived from changes in economic fundamentals: change in aggregate earnings growth and change in GDP growth. Different from the stock market returns, these two alternative proxies are based on realized economic activity. Although there is likely a discrepancy between the market's ex-ante expectations and the ex-post economic activity and thus potential measurement errors, investors' beliefs about economic states should correlate with actual economic activity on average. Another thing to note is that using the actual changes in aggregate earnings (or GDP) growth to proxy for the changes in investor beliefs about these values during the drift period t+2 assumes that investors have some knowledge of the actual values during the quarter before the figures are formally announced in t+3. This assumption is justifiable based on the results in Table 1.6 and the discussions in Section 1.4.2.3.

The first alternative systematic news proxy, the demeaned quarterly return of the CRSP value-weighted index, is the quarterly return of the index less the mean of the index's quarterly returns in the sample period, 1973:Q1 - 2011:Q3, similar to the procedure described in Section 1.4.1 where the CRSP equal weighted index is used to proxy for market activity. Change in aggregate earnings growth is calculated as the quarterly change in the cross-sectional average of *DEP* values of firms in the sample, i.e. average *DEP(t+2)* - average *DEP(t+1)*. In addition to serving as an earnings surprise measure, *DEP* measured for a quarter can also be thought of as a firm's seasonally adjusted earnings growth measured for that quarter. Therefore, I use average *DEP* as a measure for aggregate earnings growth and the quarterly change in *DEP* average as the measure for quarterly change in aggregate earnings growth. Change in GDP growth is simply the quarterly change in the U.S. GDP growth rate, i.e. GDP growth(t+2) - GDP growth(t+1).

Systematic news in the drift period t+2 is designated positive (negative) if the demeaned return of the CRSP value-weighted index, change in aggregate earnings growth, or change in GDP growth measured for t+2 is greater than zero (less than or equal to zero). Every quarter, firm-quarter observations are grouped into the "same" and "different" direction groups based on the agreement of the signs of Surprise(t) and systematic news (t+2), similar to the procedure discussed in previous sections. I conduct tests similar to those in Table 1.3 and report the results in Table 1.7.

The results in Table 1.7 are similar to those reported in Table 1.3. The average returns of the arbitrage portfolios D10–D1 are all positive and statistically significant at the 1% level for the same direction group, but none of the average returns of the arbitrage portfolios is significantly positive for the different direction group. The differences in arbitrage profits between the same and different direction groups are all positive and statistically significant (10% level or better), despite a smaller magnitude compared to those reported in Table 1.3. In untabulated tests, I also conduct the tests in Tables 2-6 using these alternative systematic news proxies and find qualitatively similar results.

Taken together, the results in Tables 2-7 indicate that drift-period systematic news has a significant effect on PEAD: PEAD is stronger when drift-period systematic news agrees with a firm's prior earnings news; PEAD is weaker, insignificant or reversed when drift-period systematic news disagrees with a firm's prior earnings news. The effect is observable with various earnings surprise and systematic news measures, on both the full sample and two size subsamples (small firms vs. medium and large firms), and on both the full sample period and three subperiods. Further, the effect cannot be attributed to differences in drift-period firm earnings news.

1.5. Possible Explanations

In Section 1.4, I show that drift-period systematic news has a significant effect on PEAD. The finding seems to suggest that investors are quite alert to systematic news, consistent with the observation by KLW. This poses challenges for conventional investor-underreaction explanations of PEAD as these theories are silent about the effect of systematic news on PEAD. On the other hand, the effect of drift-period systematic news on PEAD seems to be consistent with the rational learning hypothesis of PEAD in the sense that investors appear to be responsive to new information (systematic news here) and prices move in the direction of new information. In this section, I use the relation between PEAD and systematic news discussed in Section 1.4 to test the conventional behavioral models and the alternative rational learning hypothesis.

1.5.1. Rational learning

Different from the conventional rational expectations hypothesis that assumes investors to be both holders of full knowledge about an asset's pricing parameters and rational processers of information, the rational learning theory relaxes the assumption of full knowledge and posits that asset pricing anomalies may occur as investors gradually learn about uncertain pricing parameters and update their beliefs over time.[10] Lewellen and Shanken (2002) show that asset returns may appear predictable ex-post when investors must learn about uncertain pricing parameters, but investors do not perceive this predictability ex-ante. Brav and Heaton (2002; BH), Francis, Lafond, Olsson, and Schipper (2007; FLOS) and Han, Hong, and Warachka (2009; HHW) conjecture that PEAD may arise as investors encounter information uncertainty and must learn about the true value of a firm over time. FLOS and HHW show that firms with more extreme earnings surprises have higher information uncertainty and firms with higher information uncertainty exhibit stronger PEAD. Although the rational learning hypothesis

[10] Pastor and Veronesi (2009) survey the latest research efforts in applying the rational learning theory to explain capital market anomalies, such as volatility and predictability of asset returns, stock price bubbles, and the equity premium puzzle, etc.

provides an alternative explanation for PEAD, as BH point out, the mathematical and predictive similarities between rational learning and conventional behavioral models make them difficult to distinguish empirically. FLOS and HHW also concede that the empirical findings in their studies are consistent with conventional behavioral explanations rooted in investor irrationality. As investor wait for further information to resolve the information uncertainty associated with prior noisy public signals, it appears as if they underreact to prior signals. Daniel et al. (1998) also hypothesize that behavioral biases may be more prominent when information uncertainty is high. Indeed, Zhang (2006) documents that information uncertainty is positively related to price momentum and the price drift post analyst forecast revision but he interprets his results as supporting evidence for behavioral models proposed by Daniel et al. The observed relation between drift-period systematic news and PEAD offers a setting to further test the rational learning hypothesis with potential to yield empirical evidence that helps distinguish rational learning from conventional behavioral explanations.

The intuition of the rational learning hypothesis can be illustrated with the Bayesian learning framework discussed in Pastor and Veronesi (2009). A firm's stock price is a function of some uncertain parameters and investors learn about these parameters over time. A firm's stock price P can be described by the Gordon growth formula as shown in eq. (7). D is next period's dividend for the firm; r is the firm's discount rate; and g is the dividend growth rate. For simplicity and illustration purposes, the only uncertain parameter in the model is assumed to be g without loss of generality.

$$P = \frac{D}{r - g} \qquad (7)$$

Because g is not known for certain to investors, investors gather all available information to estimate g and revise their expectations about it as new information arrives according to Bayes' rule. Investors' prior beliefs about g are normally distributed with mean g_0 and variance σ_0^2. s is the new signal with variance σ_s^2. The revision in investors' beliefs about g, Δg, is given by eq. (8). When the new signal is positive ($s > g_0$), investors' beliefs about g are revised upward ($\Delta g > 0$), which leads to an increase in stock price P. If the new signal is negative ($s < g_0$), g is revised downward ($\Delta g < 0$), which leads to a decrease in stock price. When a firm has higher information uncertainty (greater σ_0^2), the magnitude of Δg would be greater. As a result, the firm's price will show a greater response to the new signal, s.

$$\Delta g = \frac{\frac{1}{\sigma_s^2}}{\frac{1}{\sigma_0^2} + \frac{1}{\sigma_s^2}}(s - g_0) \qquad (8)$$

Therefore, when a firm first releases an earnings surprise, investors form expectations about the firm's future dividend growth, g. As new information (firm or systematic) arrives, investors update their beliefs about g. This revision in beliefs should be more pronounced in firms with higher information uncertainty. FLOS show that firms with extreme earnings surprises tend to have high information uncertainty, so sorting firms on earnings surprise is akin to sorting firms on information uncertainty. Because firm earnings surprises have positive autocorrelations for three quarters, the releases of earnings in the subsequent three quarters would lead to stronger price movements in the direction of the initial earnings surprise, i.e. stronger PEAD, in firms with extreme earnings surprises as widely documented in the literature. When it comes to stock price response to systematic news, a similar logic applies. Under the rational learning hypothesis, systematic news arriving during the drift period should cause a stronger price response in firms with extreme earnings surprises or in firms with high information uncertainty. In addition, the magnitude of price response should be greater when the signal strength is higher (larger absolute value of $(s - g_0)$) as suggested by eq. (8).

To summarize, the rational learning hypothesis predicts that stock price responses to systematic news arriving in the drift period should be stronger: (i) in firms with more extreme earnings surprises; (ii) in firms with higher information uncertainty; and (iii) when the strength of systematic news is greater. I next test these predictions. For predictions (i) and (ii), I double sort firms on earnings surprise (*Surprise(t); Surprise = DEP, ABR or UEP*) and information uncertainty to form 5x5 portfolios following FLOS and Zhang (2006) and measure the buy-and-hold returns of these portfolios in the drift quarter *t+2*. For prediction (iii), I double sort firms on earnings surprise and strength of drift-period systematic news and measure portfolio returns in *t+2*. The strength of drift-period systematic news is measured with the absolute value of the demeaned stock market return (*Abs(R'(m,t+2)*). In both sets of tests, I further divide the sample into four groups based on the relation between the signs of earnings surprise and drift-period systematic news similar to the procedure described in Section 1.4.1.

Panel A of Table 1.8 reports the test results of predictions (i) and (ii). Following Zhang (2006), I use cash flow volatility, stock price volatility, firm size, firm age, analyst coverage and analyst forecast dispersion to measure information uncertainty. For brevity, only results with cash flow volatility (*CVOL*) as the information uncertainty measure and *DEP* as the earnings surprise measure are shown although tests conducted with alternative measures of information uncertainty or earnings surprise yield similar results. *CVOL* is the standard deviation of cash flow from operations in the past five years following Zhang (2006).[11] When positive firm earnings news measured for quarter *t* is followed by systematic news of the same sign in the drift period (positive *DEP(t)*, positive *R'(m,t+2)*; Panel A1), the drift-period return increases as earnings surprise becomes more extreme (*DEP* sorts: Q1 -> Q5) or as information uncertainty increases (*CVOL* sorts: Q1 -> Q5). The differences in portfolio returns between high and low *DEP* sorts (*DEP* sorts: Q5 - Q1) and between high and low *CVOL* sorts (*CVOL* sorts: Q5 - Q1) are all positive and statistically significant at the 1% level. On the other hand, when positive *DEP(t)* is followed by systematic news of the opposite sign in the drift period (positive *DEP(t)*, negative *R'(m,t+2)*; Panel A2), the drift-period return seems to decrease more, or move in the direction of systematic news more, as earnings surprise becomes more extreme (*DEP* sorts: Q1 -> Q5) or as information uncertainty increases (*CVOL* sorts: Q1 -> Q5). The differences in portfolio returns between high and low *DEP* sorts (*DEP* sorts: Q5 - Q1) are negative in four out of five cases and statistically significant in two out of four negative values. The differences in portfolio returns between high and low *CVOL* sorts (*CVOL* sorts: Q5 - Q1) are all negative and statistically significant at the 1% level. The results in Panels A1 and A2 indicate that firms reporting more extreme earnings surprises in a prior period or firms with higher information uncertainty exhibit greater price movements in the drift period towards the direction of arriving systematic news. Panels A3 and A4 show similar patterns. When negative *DEP(t)* is followed by systematic news of the same sign in the drift period (negative *DEP(t)*, negative *R'(m,t+2)*; Panel A3), the drift-period return becomes more negative as earnings surprise becomes more extreme (*DEP* sorts: Q5 -> Q1) or as information uncertainty increases (*CVOL* sorts: Q1 -> Q5). When negative *DEP(t)* is followed by systematic news of the opposite sign in the drift period

[11] Cash flow from operations is earnings before extraordinary items minus total accruals, scaled by average total assets. Total accruals = changes in current assets - changes in cash - changes in current liabilities - depreciation expense + changes in short-term debt.

(negative *DEP(t)*, positive *R'(m,t+2)*; Panel A4), the drift-period return becomes more positive as earnings surprise becomes more extreme (*DEP* sorts: Q5 -> Q1) or as information uncertainty increases (*CVOL* sorts: Q1 -> Q5). Taken together, the results in Panel A of Table 1.8 suggest that stock price responses to systematic news are stronger in firms with more extreme earnings surprises or in firms with higher information uncertainty, consistent with predictions (i) and (ii).

Panel B of Table 1.8 reports the test results of prediction (iii). Firms are double sorted on earnings surprise (*DEP(t)*) and the strength of drift-period systematic news (*Abs(R'(m,t+2))*) to form 5x5 portfolios. The buy-and-hold returns of the portfolios are then measured for the drift period *t+2*. Since sorting on *Abs(R'(m,t+2))* results in firms in different quintiles being drawn from different time periods, excess returns (net of 1M T-bill rates) are shown in Panel B instead. In Panel B1, where both *DEP(t)* and *R'(m,t+2)* are positive (same direction), the drift-period return increases as earnings surprise becomes more extreme (*DEP* sorts: Q1 -> Q5) or when the strength of systematic news is greater (*Abs(R'(m,t+2))* sorts: Q1 -> Q5). Further, the differences in portfolio returns between high and low *DEP* sorts (*DEP* sorts: Q5 - Q1) increase as the strength of systematic news becomes greater (*Abs(R'(m,t+2))* sorts: Q1 -> Q5)) and the differences in portfolio returns between high and low *Abs(R'(m,t+2))* sorts (*Abs(R'(m,t+2))* sorts: Q5 - Q1) also increase as earnings surprises become more extreme (*DEP* sorts: Q1 -> Q5). The results in Panel B1 indicate that firms reporting more extreme earnings surprises in a prior period exhibit greater price movements in the drift period towards the direction of arriving systematic news. These price movements are more pronounced when systematic news has greater strength. Panels B2-B4 show similar patterns. Overall, the results in Panel B of Table 1.8 suggest that price responses to systematic news are stronger in firms with more extreme earnings surprises and these responses increase with the strength of systematic news, consistent with prediction (iii).

Taken together, the results in Table 1.8 are consistent with the predictions of the rational learning hypothesis. These results, together with the hypothesis, help explain the observed influence of drift-period systematic news on PEAD. A firm's stock price incorporates responses to both firm and systematic news. When a firm announces a positive earnings surprise measured for quarter *t*, firm news arriving in the drift period *t+2* is likely to be positive due to the positive autocorrelation among earnings surprises. However, systematic news arriving in t+2 is random[12], which can be positive or negative. As a result, the stock price will exhibit a stronger PEAD if a positive earnings surprise is followed by positive systematic news in the drift period because the price response to positive firm news arriving in the drift period is strengthened by the price response to positive systematic news arriving in the same period ("drift with a lift"). On the other hand, when a positive earnings surprise is followed by negative systematic news in the drift period, the stock price will exhibit a weaker or reversed PEAD because the response to positive firm news arriving in the drift period is weakened or reversed by the response to negative systematic news ("drift with a drag"). Figure 1. 2 illustrates the process. In the undivided sample, stock price responses to systematic news are neutralized because systematic news is random, sometimes positive and sometimes negative. As a result, stock price responses to firm news dominate and the PEAD pattern mirrors the structure of earnings surprise autocorrelation. When firms are divided into groups based on the agreement between earnings surprise measured for quarter *t* and systematic news arriving in the drift quarter *t+2*, firm price responses to systematic news become more prominent and thus the diverging PEAD patterns for firms in the same and different direction groups can be observed.

[12] I do not find quarterly stock market returns to exhibit serial correlations in untabulated tests.

1.5.2. Conventional Behavioral explanations

I next discuss whether three often cited behavioral models of investor underreaction arising from cognitive deficiency or behavioral biases can be used to explain the impact of drift-period systematic news on PEAD.

1.5.2.1. Ignorance about earnings surprise autocorrelation

Bernard and Thomas (1990; BT) document that firm earnings surprises have positive autocorrelations for three quarters and PEAD also lasts for three quarters. They conclude that PEAD occurs because investors fail to take into account the implications of earnings surprise autocorrelation. In untabulated tests, I check earnings surprise autocorrelation and drift length using DEP as the earnings surprise measure and find results similar to those documented in the literature (BT, KLW). If the BT model provides a complete description for PEAD, I would expect firms in the same and different direction groups to exhibit different patterns of earnings surprise autocorrelation given the results discussed in Section 1.4. Earnings surprise autocorrelation should be weak, insignificant or negative for firms in the different direction group but positive and strong for firms in the same direction group according to the BT model. Therefore, I test earnings surprise autocorrelation separately for firms in the same and different direction groups with the help of the dummy variables *Ddiff and Dsame*. The test specification takes the form of eq. (9a). In the next step, I modify eq. (9a) to eq. (9b) to test the difference in the strength of the earnings surprise autocorrelation between firms in the same and different direction groups.

$$DEP_{j,t+i(i=1,2)} = \alpha + \rho_{11} * DEP_{j,t} * Ddiff_{j,t,t+2} + \rho_{12} * DEP_{j,t} * Dsame_{j,t,t+2} + \varepsilon_{t+1} \qquad (9a)$$

$$DEP_{j,t+i(i=1,2)} = \alpha + \rho_{11} * DEP_{j,t} + \rho_{13} * DEP_{j,t} * Dsame_{j,t,t+2} + \varepsilon_{t+1} \qquad (9b)$$

There are two things to note here. First, only the autocorrelation structure of *DEP* is examined because BT posit that investors ignore the serial pattern of reported earnings. Second, under the BT model, the predictive power of *DEP(t)* on drift-period return, *R(t+2)*, comes from the correlations between DEP(t) and its lead terms. Since Table 1.6 shows that both *DEP(t+1)* and *DEP(t+2)* have explanatory power for *R(t+2)*, I examine the correlations between *DEP(t)* and these two lead terms (*i*=1,2 in eqs. (9a) and (9b)).

Panel A1 of Table 1.9 reports the estimates of eq. (9a) using Fama-MacBeth regressions. The factor loadings on *DEP(t)*Ddiff* and *DEP(t)*Dsame* are all positive, sizable, and statistically significant at the 1% level, indicating that firms in both the same and different direction groups display strong correlations between *DEP(t)* and its two lead terms. In other words, the weak or reversed PEAD exhibited by firms in the different direction group during the drift period *t+2* is not mirrored in the autocorrelation structure of *DEP* for firms in the group as predicted by the BT model. The estimates of eq. (9b) reported in Panel A2 further demonstrate that the difference in *DEP* autocorrelation between firms in the same and different direction groups is not statistically significant as none of the factor loadings on *DEP(t)*Dsame* is significant at conventional levels. The results in Panel A2 indicate that the difference in PEAD strength between the same and different direction groups observed during the drift period *t+2* is not reflected in the difference in *DEP* autocorrelation between these two groups, either.

In summary, the results in Panels A1 and A2 of Table 1.9 show that when firms are conditioned on the agreement between firm earnings surprise and drift-period systematic news, the relation between PEAD and earnings surprise autocorrelation is not as consistent as that observed on the undivided sample or as that documented in the literature. These results suggest that the BT model cannot be used to explain the impact of drift-period systematic news on PEAD.

1.5.2.2. Conservatism bias

Barberis, Shleifer and Vishny (1998; BSV) hypothesize that the conservatism bias documented in the psychology literature (Edwards (1968)) is responsible for investor underreaction to firm earnings news. In the BSV model, investors are subject to two types of biases: conservatism and representativeness biases. As a result, investors hold inaccurate beliefs about a firm's earnings process. Investors assume that earnings progression switches between two regimes, mean-reverting or trending, while the true earnings process is closer to a random walk with short-term autocorrelations. PEAD arises when investors are under the influence of conservatism and assign a firm to the mean-reverting state. Since investors wrongfully believe that the earnings process is more stationary than it actually is, it leads to their underreaction to earnings news and subsequently the PEAD. In the BSV model, the only problem investors have is the wrong beliefs they hold about a firm's earnings process, so investors are Bayesian updaters in the model: they observe a firm's earnings and update their beliefs about the firm's state every period according to Bayes' rule.

Under the BSV framework, investors would have to place more (less) weight on the mean-reverting state for firms in the same (different) direction group in order to explain the stronger (weaker) PEAD exhibited by firms in the same (different) direction group. Since investors form their beliefs from observing a firm's prior earnings, the difference in probability weighting implies that investors observe different patterns of earnings progression leading up to the drift period $t+2$ for firms in the same and different direction groups. In the next step, I examine whether these two groups exhibit different earnings histories. Eq. (10a) is the test specification. The dependent variable is either *DEP(t+1)* or *DEP(t+2)* because the results in Table 1.6 suggest that these two DEP terms are relevant for drift-period returns. The independent variables are the four lags of the dependent variable. Similar to eq. (9a), *DEP* terms on the right hand side are interacted with dummy variables *Ddiff* and *Dsame*, so the earnings history can be estimated separately for firms in the same and different direction groups.

$$DEP_{j,t+i(i=1,2)} = \alpha + \sum_{k=1}^{4} \rho_{k1} * DEP_{j,t+i-1} * Ddiff_{j,t,t+2} + \sum_{k=1}^{4} \rho_{k2} * DEP_{j,t+i-1} * Dsame_{j,t,t+2} + \varepsilon_{t+1} \qquad (10a)$$

$$DEP_{j,t+i(i=1,2)} = \alpha + \sum_{k=1}^{4} \rho_{k1} * DEP_{j,t+i-1} + \sum_{k=1}^{4} \rho_{k3} * DEP_{j,t+i-1} * Dsame_{j,t,t+2} + \varepsilon_{t+1} \qquad (10b)$$

I estimate eq. (10a) using Fama-MacBeth regressions and report the results in Panel B1 of Table 1.9. The results suggest that firms in the same and different direction groups share a similar pattern of earnings history - three lags of positive autocorrelation that reverses in the fourth lag. With *DEP(t+1)* on the left-hand side, the coefficients of the four lagged *DEP* terms are 0.269, 0.124, 0.083, -0.387 (0.256, 0.122, 0.069, -0.384) for firms in the different (same) direction group. With *DEP(t+2)* on the left-hand side, the coefficients of the four lagged *DEP* terms are 0.245, 0.109, 0.076, -0.392 (0.256, 0.128, 0.075, -0.380) for firms in the different (same) direction group.

Applying a technique similar to the one discussed in Section 1.5.2.1., I modify eq. (10a) to eq. (10b) to test whether there is a statistically significant difference in earnings history for firms in the same and different direction groups and report the results in Panel B2 of Table 1.9. The results show that none of the interaction terms between *Dsame* and the *DEP* lags is sizable or statistically significant. Taken together, the results in Table 1.9 indicate that firms in the same and different direction groups share a similar pattern of earnings progression leading up to the drift quarter. It is perplexing as to why investors would place more (less) weight on the mean-reverting state for firms in the same (different) direction group if one attempts to explain the difference in PEAD strength between the same and different direction groups using the BSV model.

1.5.2.3. Biased self-attribution

Another behavioral model that is frequently cited in the PEAD literature is the one developed by Daniel, Hirshleifer, and Subrahmanyam (1998; DHS). DHS model PEAD as a result of biased self-attribution. Investors subject to biased self-attribution attribute success to their abilities and failure to bad luck. They become more confident when public information confirms their private information but their confidence does not fall proportionately if public information disconfirms their private information. As a result, investors overreact to private information when it is confirmed by public signals but they fail to adjust appropriately or underreact to public information when their private information is disconfirmed by public signals. This asymmetric response to public signals leads to short-term return momentum following earnings announcements, i.e. PEAD. Specifically, if a firm announces a positive earnings surprise, investors who held a positive view on the stock prior to the announcement gain further confidence and become more positive on the stock's outlook. This overreaction leads to further price appreciation post the announcement of the positive earnings news. Although the mispricing caused by the overreaction is eventually corrected by public signals released in later periods, the correction occurs slowly as investors tend to underreact to public news that disconfirms their private information. Therefore, the DHS model predicts short-term return momentum following a firm's earnings announcement and long-term return reversals.

DHS further posit that investors are more susceptible to biased self-attribution when information uncertainty in high. In other words, they are more likely to overreact to private information (when private information is confirmed by public signals) and underreact to public signals (when private information is disconfirmed by public signals) when information uncertainty is high. This can explain why firms with high information uncertainty exhibit stronger PEAD in the same direction group (a positive/negative earnings surprise is followed by confirming positive/negative systematic news), but it cannot explain why high-information-uncertainty firms in the different direction group show more reversed PEAD, or greater price movements towards the direction of disconfirming systematic news.

The DHS model also predicts long-run return reversals following PEAD. Although there is a sizable literature documenting long-run return reversals (e.g. De Bondt and Thaler (1985), Lakonishok, Shleifer, and Vishny (1994)), empirical evidence directly linking PEAD to subsequent return reversals has been evasive (Chan et al. (1996)). The failure to find strong evidence of post-PEAD reversals may be due to a lack of power in detecting long-run reversals (Daniel et al. (1998)). The strengthened PEAD exhibited by firms in the same direction group offers an improved setting for detecting long-run reversals. Specifically, if PEAD arises from investor overreaction to private information according to the DHS model, a stronger PEAD implies a greater overreaction, which should be followed by a stronger return reversal. In other words, it should be easier to detect post-PEAD return reversals using firms in the same direction group than using all firms in the sample, which is the way tests are typically performed in the prior literature.

Following a procedure similar to that used in Chan et al. (1996), I follow firms in the same direction group for five years post the drift quarter and record the yearly buy-and-hold returns of decile portfolios formed by these firms sorted on earnings surprise measured for quarter *t*. For brevity, I only show the results using *DEP* as the earnings surprise measure (Table 1.10). The results are similar when earning surprise is measured with *ABR* or *UEP*. The results in Table 1.10 suggest that there is no statistically significant return reversal for firms in the same direction group despite a stronger PEAD exhibited by these firms. Similar to Chan et al., I do not find empirical evidence that shows post-PEAD return reversals predicted by the DHS model, despite employing a setting that is supposed to have greater power in detecting the reversals.

Taken together, the results in Tables 8-10 suggest that the observed impact of drift-period systematic news on PEAD is consistent with the predictions of the rational learning hypothesis but cannot be explained by popular behavioral models of investor underreaction rooted in investor irrationality. Prior studies applying the rational learning theory to explain PEAD focus on learning about firm-level information. These studies have difficulty finding empirical evidence that distinguishes rational learning from conventional behavioral explanations because firm earnings news has positive autocorrelations. Since systematic news arriving in the drift period is random, studying the consequences of investors learning about systematic news helps distinguish the rational learning hypothesis from conventional behavioral models built on investor irrationality.

1.6. Conclusion

In this study, I find that drift-period systematic news has a significant effect on PEAD. PEAD is stronger when drift-period systematic news agrees with a firm's earnings surprise; PEAD is weaker, insignificant or reversed when drift-period systematic news disagrees with a firm's prior earnings news. Further analysis indicates that the relation between PEAD and systematic news is consistent with the predictions of the rational learning hypothesis but inconsistent with the predictions of conventional behavioral models of investor underreaction built on investor irrationality.

The findings in the study provide empirical evidence that distinguishes the rational learning hypothesis from conventional behavioral explanations built on investor irrationality. This is encouraging to the rational learning hypothesis of PEAD as prior studies have found it difficult to empirically distinguish rational learning from conventional behavioral models. Perhaps equally important, the findings in the study make the interpretation of the rational learning hypothesis more intuitive. The common critique of the rational learning hypothesis is that as investors wait for further information to resolve information uncertainty associated with prior noisy firm earnings news, they appear to underreact to prior earnings news, given the known autocorrelation pattern of firm earnings surprises. The study shows that firms with extreme earnings surprises are also highly sensitive to systematic shocks. The stock return of a good news firm can easily turn negative in the drift period if systematic news arriving in the period is negative. To the extent that a long position of good news firms cannot always be easily matched with a corresponding short position on bad news firms due to various short sale constraints in practice, the effect of drift-period systematic news on PEAD makes it easier to understand why investors do not aggressively trade up good news firms at the time of the initial news announcement.

Despite sharing similar predictions often, the rational learning theory and conventional behavioral theories have an important difference in their assumptions about investor rationality. While conventional behavioral theories assume that investors are irrational, the rational learning theory assumes that investors are rational but their decisions are impeded by information uncertainty. The findings in the study suggest that asset pricing anomalies need not imply investor rationality. Information uncertainty can contribute to the occurrence of anomalies even if investors are fully rational.

However, it would be premature to conclude that the findings in the study invalidate behavioral explanations for PEAD. It is quite possible that PEAD arises from multiple causes and some of them become more prominent under certain circumstances. Finally, the findings in the study suggest a channel linking PEAD to the business cycle. Systematic shocks, information uncertainty, and their implications on asset prices not capture by existing pricing models offer a promising new direction for exploring PEAD as well as other anomalies.

Chapter 2: U.S. Financial Markets Growth and the Real Economy

2.1. Introduction

In this paper, we ask whether changes in U.S. financial development over the last 52 years have had consequences for the real economy. Financial development refers to the ease with which firms can raise capital via arm's length transactions. Although financial economists typically describe the U.S. as having the world's most developed capital markets, the development of U.S. capital markets has varied a good deal over the last half century. Using financial development measures common to the literature, we show that both equity market and credit market developments were relatively stable during the 1960s and 1970s, but then increased significantly beginning in the 1980s. Rajan and Zingales (2003a) and Brown and Kapadia (2008) make similar observations. What real effects resulted from the increase in financial development is still an open question, and the focus of our study.

Empirically linking financial development to real effects is challenging, because the same set of factors that affect financial development could also influence the real outcomes. We therefore use a difference-in-difference methodology, and test whether changes in financial development over time *forecast differences* in the use of external finance and various real effects across industries. The idea is that if the supply of external finance changes, it should have a disproportionate effect on industries that depend more on external finance (external dependence). Our methodology therefore consists of testing whether differences in financial development over time forecast disproportionate effects in industries that are more externally dependent.[13]

[13] A similar identification approach is used in monetary economics studies that link recessions to financial constraints. See Kashyap, Lamont, and Stein (1994), and Carpenter, Fazzari, and Petersen (1994), Bernake, Gertler, and Gilchrist (1996), and McLean and Zhao (2013).

Our study begins by asking whether higher financial development leads to a disproportionate increase in equity and debt issuances in externally dependent industries. If financial development does not lead to more external finance, then it is unlikely that it causes any real effects. For this reason, we start our analyses by relating increases in financial development to external funding.

We then examine three sets of interrelated real effects. We first ask whether higher financial development forecasts more "Schumpeterian" disruptions, such as leading business turnover and entrance and exit. This investigation is motivated by the insights of Schumpeter (1911), King and Levine (1993a), and Rajan and Zingales (2003a, 2003b). The idea is that an increase in the supply of external finance allows financially constrained firms to fund growth opportunities and enter the marketplace with new products and processes. This in turn creates more competition and turnover of leading firms, as new entrants replace some incumbent firms. We therefore test whether higher financial development forecasts higher turnover of leading firms, greater variation in firm-growth rates, more new firms entering, more mature firms exiting, and less concentration within industries that rely more on external finance.

Our second set of tests relates financial development to innovation.[14] An increase in the supply of external finance could allow firms that are dependent on external finance to fund innovative projects, previously skipped due to financial constraints. This idea can be traced to Schumpeter (1911), King and Levine (1993a), and Hall (2002). We measure innovation as research and development spending, patent awards, and growth in intangible assets, and test whether greater financial development portends higher levels of innovation in externally dependent industries.

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[14] Cross-country evidence of this effect is provided in Brown, Martinson, and Petersen (2012) and Hsu, Tian, and Xu (2013).

Our final set of analyses relates financial development to economic growth. We measure growth in revenues, value-added, and total assets, and test whether financial development portends faster growth in more externally dependent industries. The idea here is simply that an increase in the supply of finance should be more beneficial to industries that are more likely to be in need of external funding. This argument originates in Schumpeter (1911), and is further developed in King and Levine (1993a, 1993b) and Rajan and Zingales (1998).

We conduct our analyses using a sample of publicly traded firms over a 52-year period. Financial development does lead to an increase in external finance; higher financial development forecasts greater equity issues and debt issues in externally dependent industries. Economically, the effects are larger for equity issues. We further find that financial development forecasts a number of interesting real effects. Financial development portends higher turnover of leading firms, greater variation in firm-growth rates, more new firms entering, and more mature firms exiting in industries that are more dependent on external finance. These effects are associated with less concentration (more competition), as Herfindahl indices for externally dependent industries are lower during years of high financial market development.

Financial development impacts innovation. We observe disproportionately high levels of R&D spending, patent awards, and growth in intangible assets in externally dependent industries following increase in financial development. Here the effects are greatest, as the differences in innovation across industries are greater than the other differences documented in the paper. Finally, financial development appears to enable growth, as it portends externally dependent industries growing at disporportianately faster rates.

Although one can never be sure about causality, we do find that the difference-in-differences documented in this study are robust to changes in both sample and measurement. Using different instruments for financial development and external dependence does not change our findings. The business cycle could affect the supply of external finance, so we control for GDP growth, and our results do not change.[15] There was a good deal of deregulation in non-financial industries during our sample period, however excluding deregulated industries does not change our findings, nor does excluding high-technology industries that are known for both financial dependence and innovation.[16]

To the best of our knowledge, this is the first paper to empirically relate a wide range of both financial and real firm-level effects to the increase in financial development. Our paper is related to an emerging literature that asks whether this growth in finance has been beneficial to societal welfare (see Phillippon and Reshef (2013), Greenwood and Scharfstein (2013), and Cochrane (2013)). These papers focus on the asset management industry and wages in the financial sector, and do not study the effects that we do in this paper. Although our paper does not provide a welfare analysis, the findings in our study suggest that the growth in finance has had some benefits.

Our findings could be helpful to macroeconomists who are trying to better understand how the financial sector affects the real economy. Bernanke (2010) and Brunnermeier, Eisenbach, and Sannikov (2012) argue that the importance of this research agenda has increased since the financial crisis, and contend that further study of this relation is needed. Our paper provides a rich set of stylized facts gathered over a long sample period, which could be useful to theorists and empiricists alike when postulating new research questions in this area.

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[15] For a review of this literature, see Bernanke, Gertler, and Gilchrist (1996).

[16] For evidence that deregulation promotes entry and competition see Bertrand and Kramarz (2002), Black and Strahan (2002), Klapper, Laeven, and Rajan (2006), Bertrand, Schoar, and Thesmar (2007), Kerr and Nanda (2009), and Irvine and Pontiff (2009).

The remainder of this paper is organized as follows. Section 2.2 describes the paper's sample and measures. Section 2.3 reports the paper's main findings. Section 2.4 is the robustness section. Section 2.5 concludes the paper.

2.2. Data, Measurement, and Methodology

2.2.1. Data

We obtain firm-level accounting data from Compustat for U.S. firms during the period 1960-2011. We exclude financial companies, utilities, and American Depositary Receipts from our analyses. The final U.S. sample consists of 242,062 firm-year observations. We also obtain firm-level accounting data from Compustat for Canadian firms during the period 1960-2011. These data are used to construct the industry-level measures of financial dependence, described in Section 2.2.4 below. The Canadian sample consists of 24,914 firm-year observations. All of the accounting variables are winsorized at the 1^{st} and 99^{th} percentiles. We define industries using the 49 industry definitions that are posted in Ken French's website.

Patent grants data are obtained from the NBER Patent Data Project (PDP), which compiles U.S. utility patent grants from 1976 to 2006. Data on bank credit and private credit are obtained from the World Bank Development Index Database.

2.2.2. Financial Development

In this section of the paper we describe various measures of financial development. The measures are summarized in Table 2.1 and plotted in Figures 2.1-2.3.

Equity Market Development. We construct three different measures of equity market development, each of which has been used in previous studies (e.g., Rajan and Zingales (1998, 2003a), Demirguc-Kunt and Maksimovich (1998), Levine and Zervos (1998), Wurgler (2000), Love (2003), and Brown and Kapadia (2008)). We generate each of the three measures on a yearly basis. The first measure is the total market capitalization of the U.S. stock market, scaled by GDP. The second measure is the dollar value of shares traded scaled by GDP. The third measure is total turnover, which is computed as total shares traded scaled by total shares outstanding.

The three equity development measures are plotted in the three panels of Figure 2.1. The plots indicate that the U.S. equity market has developed a good deal over the last half century. Equity market development was relatively flat during the 1960s and 1970s, but then began to increase sharply beginning in the 1980s. The increase coincides with regulatory changes that were aimed at increasing equity market participation.[17] We see that market capitalization scaled by GDP peaks in 2000 at the end of the internet bubble, and then declines, although it is still significantly higher post-2000 as compared to the 1960s and 1970s. Turnover and dollar volume both continue to increase after 2000. Levine and Zervos (1998) provide evidence that stock market liquidity better reflects the availability of external financing than does market capitalization.

Credit Market Development. We incorporate two different measures of credit market development. The first is the total amount of private credit in the economy, scaled by GDP. The second is the total amount of bank credit in the economy, scaled by GDP. We obtain both of these measures from the World Bank. Both of these variables have been used to reflect the

[17] Individual retirement accounts (IRAs) were introduced in 1974, and expanded to allow investors with other qualified retirement accounts in 1984. Defined contribution (401(k)) plans were introduced by congressional legislation in 1978. The Tax Reform Act of 1984 included several items that made employee stock ownership plans (ESOPs) more attractive.

supply of credit in cross-country studies (see Rajan and Zingales (1998), Demirguc-Kunt and Maksimovich (1998), Levine and Zervos (1998), Wurgler (2000), and Love (2003)).

The credit market development indices are plotted in the two panels of Figure 2.2. Both indices increase significantly over the sample period. The private credit index increases throughout the entire 52 year period, although its slope becomes steeper around 1980, and then again in the 1990s. Bank credit is relatively flat throughout the 1960s and 1970s, and then begins to steadily increase beginning in the 1980s. Generally, the patterns with credit market development are similar to those with equity market development, as both show an increase over the last half century. The timing of the increase in the credit indices coincides with the deregulations that took place in the 1980s and 1990s.[18]

Measuring Overall Financial Development. To create a single financial development index we take the first principal component of the five indices described above.[19] We use this index as a proxy for financial development throughout the paper. This index is plotted in Figure 2.3. Similar to its five components, the index is relatively flat in the 1960s and 1970s, and then begins to steadily increase beginning in the 1980s. The main message from all of the figures is that it has probably been easier to raise capital since the 1990s as compared to during the 1960s and 1970s.

[18] The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 removed all state barriers to interstate banking, allowing financial institutions to locate branches in other states and to merge with banks headquartered in other states. The Gramm-Leach-Bliley Act (1999) repealed part of Glass-Steagall, which had separated banking, insurance and investments. Jayaratne and Strahan (1998) report that between 1972 and 1998, 35 states deregulated their restrictions on interstate branching.
[19] The results do not change if we instead use a rank variable, which is the average of the ranks of the five different indices.

2.2.3. Relating Financial Development to Real Outcomes

Relating financial development to real outcomes is difficult, due to the endogeneity regarding finance and the real effects. Our identification strategy therefore involves relating changes in financial development over time to differences in real effects *across* industries. Although this identification strategy does not show clear causality, it helps to rule out certain alternative explanations where a set of hidden variables influence both financial development and the real outcomes during the sample period, such as deregulation, trade liberalization, and information technology development etc. As we mention previously, a similar approach is taken in monetary economics, as several papers show that recessions have a disproportionate effect on financially constrained firms (see Kashyap, Lamont, and Stein (1994), and Carpenter, Fazzari, and Petersen (1994), Bernake, Gertler, and Gilchrist (1996), and McLean and Zhao (2013)). Rajan and Zingales (1998) also take this approach in their international study, and relate financial development to growth in externally dependent industries across countries.

Our regression equation is described in Eq. (1), in which α represents either industry or time fixed effects:

$$Outcome_{i,t\ to\ t+5} = \alpha_i + \alpha_t + \beta_1 Market\ Share_{i,t} + \beta_2 Financial\ Market\ Development_t \times External\ Dependence_i + \varepsilon_{i,t} \quad (1)$$

The dependent variable in Eq. (1) reflects an outcome (e.g, equity issues, leading firm turnover, log number of new entrants, aggregate growth) among the firms of industry *i* during the 5-year period beginning at the end of period *t*. Each of these variables is summarized in Table 2.2. The 5-year measurement period should result in less noisy measurement relative to 1-year variables, although in unreported tests we do find similar results using 3-year and 1-year measures. Due to the industry and year fixed effects the coefficient of interest, β_2, reflects a differential in the dependent variable between industries during the same period, based on the equity dependence of the industry, and the financial market development observed at the beginning of the period. This allows us to compute difference-in-differences, as we explain below.

We do not include external dependence and financial market development in Eq. (1) because the year and industry fixed effects make these variables irrelevant by themselves. The regression standard errors need to be adjusted due to the persistence in the variables caused by the overlap, so we cluster on both year and industry (see Petersen (2009)).

2.2.4. Estimating Financial Dependence

We use two industry-level measures of external dependence, both of which are from Rajan and Zingales (1998). As we mention previously, we use the Fama and French 49 industry definitions.

Financial Dependence. We estimate financial dependence as capital expenditures minus cash flows, all scaled by capital expenditures. We measure this variable for each firm over the entire sample period, and then take the median within each industry to come up with a single value for each industry. We estimate internally generated cash flow as net income plus depreciation and amortization.

Equity dependence. We measure equity dependence as net equity issues scaled by capital expenditures. As with financial dependence, we measure this variable for each firm over the entire sample period, and then take the median within each industry to produce a single industry value. We measure net equity issues as change in book equity, plus the change in deferred taxes, minus the change in retained earnings. This measure of net equity issues follows Baker, Stein, and Wurgler (2003) and McLean and Zhao (2012).

In an effort to create external dependence variables that are exogenous to the growth and financing of the firms in our sample, we use publicly traded Canadian firms to estimate our financial dependence measures. We do not include the Canadian firms in our analyses. If we instead report results using U.S. dependence measures our conclusions do not change. The U.S. and Canadian versions of the measures are highly correlated (both correlations are greater than 0.75), and in the robustness tests reported in Table 2.10 and described in Section 2.4 of the paper we report similar results using U.S. measures. Hence, using Canadian firms to measure external dependence creates valid instruments for measuring external dependence; the Canadian measures are correlated with the U.S. measures, and exogenous with respect to the financing and investment decisions of the U.S. firms in our sample. We require there to be at least five firms in each industry, so we are able to make the external dependence measures for 38 of the 49 Fama and French industries.

Similarly, Rajan and Zingales (1998) use U.S. data to compute industry-financial dependence measures for their sample of non-U.S. countries. In their Table 2.7, Rajan and Zingales (1998) report finding similar results using Canadian firms to compute their external dependence measures, so the use of Canadian data for this purpose is not without precedent.

2.3. Main Findings

In this section of the paper we discuss our main findings. Section 2.3.1 relates financial development to the use of external finance. Sections 2.3.2-2.3.5 test whether financial development increases business turnover and competition. Section 2.3.6 reports tests that relate financial development to innovation. Section 2.3.7 discusses whether financial development causes economic growth.

2.3.1. External Finance

In this section we ask whether higher financial development leads to a disproportionate increase in equity and debt issuances in firms in externally dependent industries. As we mention previously, if financial development does not lead to more external finance, then it is unlikely that it causes any real effects.

In Table 2.3 we use three different measures of external finance: equity issues; debt issues, and total external finance (equity issues + debt issues). Equity (debt) issues are measured as each industry's aggregate net equity (debt) issues over each 5-year period, scaled by assets measured at the beginning of the measurement period. Total external finance is measured similarly.

Table 2.3 shows that external finance increase during years in which financial development is greater. The economic significance of the effects is reported in the bottom row, which reports the difference-in-difference estimates (in percentage terms; the differential is scaled by the mean value of the dependent variable). The difference-in-differences are for the average external funding of an industry at the 75th percentile level of external dependence versus an industry at the 25th percentile level of external dependence, when compared in a year at the 75th percentile of financial development versus a year at the 25th percentile. The effects are economically significant; the difference-in-differences are 11.8% and 19.2% for equity issues, and 4.1% and 5.3% for debt issues. The results here suggest that increases in financial development reduce the cost of external finance, which in turn leads to more equity and debt issues. In the next sections we ask whether there are any associated real effects.

2.3.2. Leading Business Turnover

The regressions in Table 2.4 use within-industry leading business turnover as the dependent variable. The idea here is that finance often benefits non-incumbent firms, which in turn leads to turnover among the leading businesses (Schumpeter, 1911). To measure an industry's leading business turnover, we generate a subsample that consists of all firms that are in our sample in both years *t* and *t+5*. We rank firms on revenues, valued-added, and assets in both years, and then measure the percentage of firms that are in the top tercile in year *t*, but not in year *t+5*.[20] A higher value of this measure shows more turnover of leading businesses.

$$Leading\ Business\ Turnover_t = \frac{1}{n}\sum_{i=0}^{n} E_i$$

$$E = 1\ if\ the\ firm\ is\ not\ in\ the\ top\ tercile\ in\ year\ t+5;0\ otherwise$$

The turnover variables are then used as the dependent variable in Eq. (1), and are regressed on financial development interacted with one of the two measures of external dependence, along with industry and year fixed effects. Standard errors are clustered on industry and year.
In Table 2.4 all six of the coefficients are positive, and five of the six are statistically significant. What the results show is that when financial development is initially greater, big businesses are more likely to leave the top tercile, and be replaced by firms that were not previously in the top

[20] Value-added is operating income before depreciation plus labour and related expenses, which follows Chun, Kim, Morck, and Yeung (2008).

tercile. These findings suggest that financial development is more beneficial to medium sized and smaller firms as compared to larger incumbents.

The economic significance of the effects is shown in the bottom row, which reports the difference-in-difference estimate. Like with external finance in the previous table, the difference-in-differences are for the leading business turnover of an industry at the 75th percentile level of external dependence versus an industry at the 25th percentile level of external dependence, when compared in a year at the 75th percentile of financial development versus a year at the 25th percentile. The difference-in-difference estimates range from 1.4% to 3.1%. The findings here show that when the supply of finance increases it is not the largest firms that benefit most, but rather it is the smaller and medium-sized firms that seem to grow the fastest. The findings here are consistent with our first hypothesis, and Schumpeter (1911) and Rajan and Zingales (2003a, 2003b), who argue that finance generally benefits newer firms at the expense of larger incumbents.

2.3.3. Variation in Firm-Growth Rates

The regressions in Table 2.5 use within-industry variation in firm-growth rates as the dependent variable. We construct this measure by measuring the standard deviation of 5-year growth rates in revenues, value-added, or assets within each industry. Hence, we first measure each firm's 5-year growth rate, and then take the standard deviation within each industry. These regressions are a complement to the regressions in Table 2.3, and ask more generally if financial development is associated with an unevenness in growth rates across firms.

In Table 2.5 all six of the interactions are positive and significant, showing that financial development is associated with higher standard deviation in growth rates. The difference-in-differences range from 1.2% to 4.6%, which are economically significant effects. Hence, financial development creates uneven effects, with some firms benefitting more than others. This finding is sensible, as not all externally dependent firms have high levels of growth opportunities. When external funding becomes more available, firms with higher levels of growth opportunities begin to grow more quickly, creating dispersion in the growth rates of firms in the industry, consistent with our first hypothesis.

2.3.4. Entrance and Exit

Building on the findings in the previous tables, we now ask whether financial development encourages greater entrance and exit within externally dependent industries. With respect to entrance, if external finance is more readily available, then we should expect more firms to become public, and for this effect to be greater in industries that rely more on finance. With respect to exit, tables 4 and 5 show that financial development does not benefit all firms evenly, and Table 2.4 suggests financial development has a more favorable effect on non-leading firms. Financial development could therefore also be associated with greater exit rates.

The methodology here follows those in the previous tables. We use either the log of the number of new entrants, or the log of the number of exits for each industry over each 5-year period as the dependent variable, and regress it on the same set of independent variables that are in Eq. (1). New entrants are defined as newly listed firms. Exits are defined as delisted firms. Fama and French (2004) show that most newly listed firms do not survive for very long, so we limit exits to firms that were listed at least three years prior to the beginning of the measurement period. We also break exits into two groups: exits due to mergers, and exits not due to mergers. We are able to classify merger delistings with CRSP delisting codes.

The results in Table 2.6 show that financial development is associated with higher entrance and exit rates. In the first two regressions, entrance is the dependent variable. The results show that with both of the external dependence measures, entrance is disproportionately higher in externally dependent industries during years in which financial development is greater. The regressions reported in the third and fourth columns show similar effects with exits; with both of the external dependence measures, there are elevated rates of exits in externally dependent industries during years in which financial development is greater.

As in the previous tables, the effects here are economically significant. The difference-in-differences reported in the bottom row show that the effects range from 3.3% to 4.4% for new entrants, and from 5.3% to 6.4% for exits. This means that an increase in financial development from the 25^{th} to 75^{th} percentile leads to at least a 3.3% (5.3%) greater increase in entrance (exits) within an industry at the 75^{th} percentile of external dependence as compared to an industry at the 25^{th} percentile of external dependence.

The next four regressions decompose exits into merger exits and non-merger exits. The results show that exits increase for both merger and non-merger exits during years in which financial development is initially greater. The difference-in-differences are 7.7% and 9% for non-merger exits, and 6.2% and 7.5% for merger exits, revealing a slightly larger effect for non-merger exits. Hence, consistent with our first hypothesis, when external finance increases, there are both winners and losers, as shown by the greater exit rates here, and by the increase in leading business turnover in Table 2.4.

2.3.5. Industry Concentration and Competition

In this section we test whether financial development impacts industry concentration and competition. We measure industry concentration by constructing yearly Herfindahl indices for each industry. We construct the indices using both sales and value-added. We then test whether concentration is lower when financial development is initially higher.

Lower concentration is consistent with small and medium-sized firms performing relatively well as compared to large firms. Concentration can also decline if entrance and exits are elevated, as shown in the previous table, assuming that the mature firms exiting are larger than the new firms entering. Hence, if financial development is especially helpful to smaller and younger firms, then we should expect lower concentration during periods in which financial development is higher.

The four regressions in Table 2.7 show that industry concentration declines when financial development is initially higher. All four of the interactions are positive and statistically significant. The difference-in-differences are 1.9% and 3.1% for the concentration measured with sales, and 2.8% and 4.6% for the concentration measured with value-added. Hence, financial development appears to increase competition, and benefit smaller firms at the expense of larger incumbents. This is consistent with Schumpeter (1911) and Rajan and Zingales (2003a, 2003b).

2.3.6. Innovation

Prior studies suggest a relation between financial development and innovation. Schumpeter (1911) and King and Levine (1993b) contend external finance is needed to fund innovation, as often the most innovative firms are financially constrained. Across countries, Brown, Martinson, and Petersen (2012) and Hsu, Tian, and Xu (2013) show that higher levels of equity market development are associated with more innovation. Brown, Fazzari, and Petersen (2009) and Brown and Petersen (2010) use the stock market boom of the 1990s to show that equity financing is important for R&D spending among high-technology firms. Hou and Robinson (2005) link lower industry concentration (more competition) to innovation. The results in previous section show that financial development is associated with declining concentration, suggesting a relation between financial development and innovation, per Hou and Robinson.

To test for the effects of financial development on innovation, we regress various industry-level innovation measures on the same set of independent variables that are in Eq. (1). We measure innovation four different ways: (i) R&D spending scaled by either assets or (ii) sales; (iii) growth in intangible assets; and (iv) patent grants per number of employees. R&D/assets (sales) is the industry aggregate research and development expenditure over year t to t+5 scaled by aggregate industry assets (sales) in year t. Intangible assets are a balance sheet item reported in Compustat. Intangibles growth is the log growth of aggregate industry intangible assets from year t to year t+5. Patents per employee is the aggregate industry patent grants from year t to year t+5 scaled by the aggregate number of employees within the industry at year t.

The results in Table 2.8 show that financial development leads to higher innovation. All six of the interactions are positive and statistically significant. The economic significance is larger here than in the previous tables. As examples, in the first regression we see that the difference-in-difference for R&D is 29.1%; in the seventh regression for patents per employee the difference-in-difference is 20.5%. The findings are consistent with financial development enabling an increase in innovation, consistent with the studies mentioned above. Moreover, in Table 2.3 we found that the increase in financial development had a greater effect on equity issues as compared to debt issues. Hall (2002), Brown, Martinson, and Petersen (2012), Hsu, Tian, and Xu

(2013), Brown, Fazzari, and Petersen (2009), and Brown and Petersen (2010), all stress that equity finance is especially important for innovation, so our findings are consistent with these studies.

2.3.7. Growth

In this section of the paper we ask whether financial development is related to economic growth. This idea goes back to Schumpter (1911) who reasons that a healthy financial sector can best allocate capital to its most efficient use. Rajan and Zingales (1998) further develop this idea, arguing that finance should have the greatest effect on the growth of industries that rely more on external finance. As we explain previously, this approach allows for difference-in-difference testing between industries, making identification more believable.

We measure industry-level growth for each industry over 5-year periods for aggregate revenues, value-added, and assets, and test whether growth is greater in externally dependent industries when financial development is higher. In Table 2.9, all six of the interactions are positive and statistically significant. Hence, when financial development is initially higher, there is a disproportionate effect on the subsequent growth of industries that are more dependent on external finance. The difference-in-differences range from 3.5% to 13.8%, which are economically significant effects. This within-country effect is consistent with the cross-country effects documented in Rajan and Zingales (1998), and more generally a litereature that relates financial development to growth across cuontries (see King and Levine (1993b), Rajan and Zingales (1998), Demirguc-Kunt and Maksimovich (1998), Levine and Zervos (1998), and Wurgler (2000)).[21] [22]

[21] Similarly, Fogel, Morck, and Yeung (2008) show that countries with more leading business turnover grow faster.

2.4. Robustness

In this section of the paper we probe the robustness of our findings. These tests are reported in Table 2.10. The robustness tests consist of (i) using industries that are not externally dependent to measure financial market development; (ii) using U.S. firms to measure external dependence; (iii) controlling for the effects of GDP growth; (iv) the exclusion of industries that were deregulated during our sample period; and (v) the exclusion of high-tech industries. We repeat all of the tests reported in tables 3-9 using these five alternative criteria. For brevity, we only report the first two columns of each table in Table 2.10.

2.4.1. Alternative Measures of Financial Development

An Equity Market Development Index that Excludes Externally Dependent Industries. The three equity market development indices plotted in Figure 2.1 are constructed using all of the firms in CRSP. The indices could be forward looking, so one concern is that they could forecast growth for externally dependent industries. We therefore construct an alternative equity market development index using only firms from industries with below median values of equity dependence, as defined in Section 2.2.4. As we explain previously, we have 38 industries, so this index uses data from the 19 industries that have below median values of industry equity dependence.

We construct a single equity market development index that is the first principal component of the three equity market development indices described in Figure 2.1, constructed with firms

[22] Jayaratne and Strahan (1998) show at the state-level that bank deregulation led to faster economic growth. They argue that deregulation caused more efficient lending, which in turn caused greater growth, whereas in our paper and in the above cross-country studies the size of the financial sector is related to growth.

from the 19 less externally dependent industries. Figure 2.4 shows that this equity market development index has the same times-series variations as the indices plotted in Figure 2.1, which include all firms, so the increase in equity market development reported in Figure 2.1 is not driven by firms in equity dependent industries.

Panel A of Table 2.10 repeats the first 2 regressions from tables 3-9, using this equity market development index instead of the financial development index, and the results do not change. Hence, the results in the previous tables are not driven by forward looking effects in the equity market development indices.

2.4.2. Using U.S. Firms to define External Dependence

As we mention in Section 2.2.4, we use publicly traded Canadian firms that are not listed in the U.S. to estimate our external dependence measures. We do this so the measurement of external dependence is exogenous with respect to the financing of the firms in our sample. As we explain previously, this approach creates a valid instrument for measuring external dependence; the Canadian external dependence measures are correlated with U.S. external dependence measures, and exogenous with respect to the financing and investment decisions of the U.S. firms in our sample.

In this section we ask whether the results change if we instead use U.S. firms to measure financial dependence and equity dependence. In Panel B we reconstruct our industry-level measures of external dependence using U.S. firms instead of Canadian firms. Panel B of Table 2.10 repeats the first 2 regressions from tables 3-9, using the U.S. measures of equity dependence. Panel B shows that the results are virtually the same when this alternative method of measuring external dependence is used.

2.4.3. Controlling for GDP Growth

As we mention in the Introduction, there is a literature suggesting that the supply of finance varies over the business cycle, in that raising capital is less costly in expansions. In this section we therefore ask whether our results hold if GDP growth is controlled for. Panel C of Table 2.10 repeats the first two regressions from tables 3-9, but includes an interaction between the external dependence measures and GDP growth. The external dependence-financial development interactions are still mostly positive and statistically significant, similar to the results in tables 3-9, so controlling for GDP growth does not change the tenor of our findings.

2.4.4. Deregulation

Greenspan (2002) contends that deregulation caused a wave of creative destruction in the U.S. economy during the later part of the 20th century. Irvine and Pontiff (2009) show that deregulated industries had large increases in idiosyncratic volatility, which could reflect an increase in competition due to deregulation. We therefore ask whether our results are robust to excluding industries that deregulated during our sample period.

We re-estimate our primary tests after excluding Fama and French industries 7, 30, and 41, which contain the deregulated industries studied in Irvine and Pontiff (2009). These results are reported in Panel D, which repeats the first two regressions from tables 3-9. The results in Panel D are similar to the results reported throughout the paper, in that in all of the regressions the interaction coefficients are positive and statistically significant, showing our results are not explained by deregulated industries.

2.4.5. The Exclusion of High-Tech Industries

Brown and Petersen (2010) and Brown, Fazzari, and Petersen (2009) show that equity finance, especially during the tech bubble in the late 1990s, led to more IPOs, higher R&D spending, and smaller firms making gains against larger firms in high-tech industries during our sample period. To test whether our findings are caused by these high-tech industries, we re-estimate the first two regressions from Tables 3-9 excluding the industries studied in these papers. We exclude Fama and French industries 12, 35, 37, and 38, which contain the 3-digit SIC industries used in Brown and Petersen and Brown, Fazzari, and Petersen. Our findings in Panel E are similar to those in tables 3-9, so these high-tech industries do not drive our findings.

2.5. Conclusion

Financial development varies a good deal in the U.S. over the last half century, mainly increasing since the 1980s. The effect is such that a public firm should find it substantially easier to access external finance in the 1990s and onwards as compared to in the 1960s and 1970s. This is true for both equity and debt financing.

In this paper, we ask whether the growth in financial development has had any real effects on publicly traded U.S. firms. To establish causality, we use a difference-in-difference framework that is predicated on the idea that financial development has a disproportionate effect on industries that are more dependent on external finance. Our analyses consist of measuring financial development, and then testing whether differences in financial development over time have greater effects on industries that depend more on external finance.

We find that higher financial development forecasts higher equity and debt issues, greater leading business turnover, higher within-industry variance in growth rates, higher entrance and exit, more innovation, and ultimately faster growth in externally dependent industries relative to less dependent industries. The findings suggest that changes in a country's financial development over time can enable changes in the real economy. To the best of our knowledge, ours is the first paper to relate the increase in financial development to a wide range of real effects. Our findings suggest that the increase in finance had significant real effects, some of which are socially beneficial.

Conclusion

In Chapter 1 of the thesis, I study the effect of systematic news on a prominent capital markets anomaly, post-earnings announcement drift (PEAD), and use the effect to examine competing explanations of PEAD. I find that drift-period systematic news has a significant effect on PEAD. PEAD is stronger when drift-period systematic news agrees with a firm's earnings surprise; PEAD is weaker, insignificant or reversed when drift-period systematic news disagrees with a firm's prior earnings news. Further analysis indicates that the relation between PEAD and systematic news is consistent with the predictions of the rational learning hypothesis but inconsistent with the predictions of conventional behavioral models of investor underreaction built on investor irrationality.

This study contributes to the literature in several ways. First, it documents a new regularity of PEAD that extends our understanding of the anomaly. Second, the study advances the literature's recent endeavor on connecting PEAD with the business cycle by suggesting a channel directly linking macroeconomic shocks with PEAD. Finally, the study provides empirical evidence that distinguishes the rational learning hypothesis from conventional behavioral explanations. This is encouraging to the rational learning hypothesis of PEAD as prior studies have found it difficult to empirically distinguish rational learning from conventional behavioral models. The findings in the study offer an alternative perspective on understanding PEAD. Asset pricing anomalies need not imply investor rationality. Information uncertainty can contribute to the occurrence of anomalies even if investors are fully rational. Information uncertainty and its implications on asset prices provide a promising new direction for exploring PEAD as well as other anomalies.

In Chapter 2 of the thesis, I study the effect of U.S. financial market development over the past half century on the real economy. Financial development varies a good deal in the U.S. over the last half century, mainly increasing since the 1980s. The effect is such that a public firm should find it substantially easier to access external finance in the 1990s and onwards as compared to in the 1960s and 1970s. This is true for both equity and debt financing. This study asks whether the growth in financial development has had any real effects on publicly traded U.S. firms and uses a difference-in-difference framework to establish causality that is predicated on the idea that financial development has a disproportionate effect on industries that are more dependent on external finance. The analyses consist of measuring financial development, and then testing whether differences in financial development over time have greater effects on industries that depend more on external finance. The study finds that higher financial development forecasts higher equity and debt issues, greater leading business turnover, higher within-industry variance in growth rates, higher entrance and exit, more innovation, and ultimately faster growth in externally dependent industries relative to less dependent industries. The findings suggest that changes in a country's financial development over time can enable changes in the real economy.

This is the first paper to empirically relate a wide range of both financial and real firm-level effects to the increase in financial development. It is related to an emerging literature that asks whether this growth in finance has been beneficial to societal welfare (see Phillippon and Reshef (2013), Greenwood and Scharfstein (2013), and Cochrane (2013)). These papers focus on the asset management industry and wages in the financial sector, and do not study the effects documented in this paper. Although the study does not provide a welfare analysis, the findings suggest that the growth in finance has had some benefits. The findings in the study could also be helpful to macroeconomists who are trying to better understand how the financial sector affects the real economy. Bernanke (2010) and Brunnermeier, Eisenbach, and Sannikov (2012) argue that the importance of this research agenda has increased since the financial crisis, and contend that further study of this relation is needed. This study provides a rich set of stylized facts gathered over a long sample period, which could be useful to theorists and empiricists alike when postulating new research questions in this area.

Table 1.1: Summary Statistics, Correlations and PEAD in the Sample

Table 1.1 reports the summary statistics of the main variables (Panel A), the pair-wise correlations of the three earnings surprise measures (Panel B), and the PEAD measured in the study sample (Panel C). All variables are measured at a quarterly frequency. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. For a firm i, $DEP(t) = DEP_{i,t} = (\frac{dE}{P})_{i,t} = \frac{E_{i,t}-E_{i,t-4}}{StockMarketValue_{i,t-4}}$. *UEP* is the difference between actual EPS and the consensus EPS estimate, scaled by price, i.e. $UEP(t) = \frac{EPS_{i,t}-Consensus\ EPS_{i,t}}{P_{i,t}}$. The consensus EPS estimate is the median of analyst EPS estimates surveyed by I/B/E/S during the last month of quarter t; price is the share price as of the I/B/E/S survey date. *ABR* is the cumulative abnormal return of the four-day window (*t-2* to *t+1*; *t*=0: earnings announcement date) around the announcement of quarter *t* earnings, i.e. $ABR(t) = \sum_{j=-2}^{+1}(R_{i,j} - R_{CRSP\_EW,j})$. The daily abnormal return on day *j* is measured as the difference between a firm's stock return and the return of the CRSP equal-weighted index on that day. *R* is the quarterly stock return obtained by compounding monthly stock returns (including dividends) from the CRSP monthly database. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A Summary Statistics

Variable (%)	*N*	Mean	25th Percentile	50th Percentile	75th Percentile	Standard Deviation	Sample Period
DEP	431,991	0.39	-0.63	0.21	1.03	5.98	1973:Q1 - 2011:Q3
ABR	469,638	0.02	-3.71	-0.23	3.47	7.97	1973:Q1 - 2011:Q3
UEP	214,445	-0.27	-0.21	0.00	0.19	1.95	1985:Q1 - 2011:Q3
R	522,263	4.12	-10.57	1.92	15.30	26.43	1973:Q1 - 2011:Q3

Panel B Correlation Matrix of Earnings Surprise Measures

	DEP	*ABR*	*UEP*
DEP	1.00		
ABR	0.12***	1.00	
UEP	0.31***	0.15***	1.00

Table 1.1: Summary Statistics, Correlations and PEAD in the Sample

Panel C: PEAD in the Sample

Panel C reports the buy-and-hold returns of portfolios sorted on earnings surprise. In each quarter, a firm is sorted into deciles according to Surprise(t). *Surprise(t)* is the earnings surprise measured for quarter *t* with *DEP*, *ABR*, or *UEP*. Decile portfolios D1 to D10 are formed by equally weighting firms in the decile, and a zero-investment arbitrage portfolio, D10–D1, is formed by longing D10 and shorting D1. The returns of the decile portfolios as well as those of the arbitrage portfolios are measured for quarters *t+1* and *t+2*. Ann. Qtr (*t+1*) is the quarter in which earnings for quarter *t* are announced. Drift Qtr (*t+2*) is the quarter for which PEAD is measured. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Average Portfolio Returns Measured for the Announcement and Drift Quarters

Surprise(t):	*DEP(t)*		*ABR(t)*		*UEP(t)*	
	Ann. Qtr	Drift Qtr	Ann. Qtr	Drift Qtr	Ann. Qtr	Drift Qtr
Holding period:	*t+1*	*t+2*	*t+1*	*t+2*	*t+1*	*t+2*
D1 (low)	-0.033	0.017	-0.100	0.015	-0.052	0.017
D2	-0.012	0.021	-0.030	0.025	-0.017	0.023
D3	0.001	0.024	-0.005	0.033	-0.003	0.026
D4	0.013	0.029	0.014	0.033	0.004	0.027
D5	0.026	0.032	0.022	0.034	0.018	0.026
D6	0.039	0.038	0.036	0.036	0.034	0.026
D7	0.052	0.042	0.050	0.035	0.048	0.033
D8	0.066	0.045	0.069	0.039	0.068	0.036
D9	0.078	0.048	0.091	0.041	0.091	0.040
D10 (high)	0.099	0.054	0.169	0.044	0.115	0.046
D10 - D1	0.131***	0.037***	0.268***	0.029***	0.167***	0.029***
	(33.02)	(9.50)	(42.76)	(9.42)	(32.42)	(5.96)
n	154	153	154	153	106	105

Table 1.2: PEAD and Drift-Period Systematic News: Four Groups

Table 1.2 reports the buy-and-hold returns of portfolios double sorted on earnings surprise and drift-period systematic news. In each quarter, firms are first divided into 4 groups based on the sign of earnings surprise measured for quarter t (*Surprise(t)*) and the sign of systematic news in the drift quarter *t+2*. Drift-period systematic news is proxied by the demeaned stock market return measured for the drift quarter (*R'(m,t+2)*).
Group 1: positive R'(m,t+2) and positive Surprise(t); Group 2: positive R'(m,t+2) and negative (or zero) Surprise(t)
Group 3: negative (or zero) R'(m,t+2) and negative (or zero) Surprise(t); Group 4: negative (or zero) R'(m,t+2) and positive Surprise(t)
Within each of the 4 groups, firms are sorted into deciles based on Surprise(t), and then decile portfolios D1 to D10 are formed by equally weighting firms in the decile. A zero-investment arbitrage portfolio, D10–D1, is formed by longing D10 and shorting D1. The returns of the decile portfolios as well as those of the arbitrage portfolios in each of the 4 groups are measured for drift quarter *t+2*. *Surprise(t)* is the earnings surprise measured for quarter *t* with *DEP*, *ABR*, or *UEP*. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. *UEP* is the difference between actual EPS and the consensus EPS estimate, scaled by price. *ABR* is the cumulative abnormal return of the four-day window (*t-2* to *t+1*; *t*=0: earnings announcement date) around the announcement of quarter t earnings. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973:Q1-2011:Q3. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Average Portfolio Returns Measured for the Drift Quarter (t+2)

Earnings surprise:	*DEP*				*ABR*				*UEP*			
Systematic news (t+2) sign:	Positive		Negative		Positive		Negative		Positive		Negative	
Surprise (t) sign:	Positive	Negative	Negative	Positive	Positive	Negative	Negative	Positive	Positive	Negative	Negative	Positive
D1 (low)	0.098	0.137	-0.104	-0.037	0.113	0.130	-0.108	-0.037	0.092	0.141	-0.101	-0.029
D2	0.101	0.127	-0.093	-0.030	0.114	0.131	-0.085	-0.036	0.104	0.134	-0.080	-0.030
D3	0.106	0.123	-0.079	-0.028	0.107	0.129	-0.075	-0.039	0.107	0.120	-0.067	-0.036
D4	0.110	0.123	-0.073	-0.032	0.117	0.124	-0.062	-0.038	0.115	0.124	-0.058	-0.034
D5	0.119	0.117	-0.074	-0.032	0.122	0.120	-0.056	-0.041	0.116	0.110	-0.050	-0.032
D6	0.128	0.113	-0.064	-0.036	0.125	0.119	-0.047	-0.043	0.126	0.109	-0.046	-0.041
D7	0.133	0.111	-0.056	-0.037	0.130	0.112	-0.044	-0.048	0.130	0.104	-0.041	-0.037
D8	0.143	0.108	-0.051	-0.043	0.139	0.113	-0.040	-0.050	0.135	0.100	-0.035	-0.042
D9	0.161	0.102	-0.045	-0.050	0.145	0.111	-0.039	-0.052	0.139	0.089	-0.024	-0.046
D10 (high)	0.172	0.104	-0.042	-0.058	0.165	0.112	-0.041	-0.074	0.168	0.107	-0.042	-0.048
D10 - D1	0.074***	-0.033***	0.061***	-0.021***	0.052***	-0.018**	0.066***	-0.037***	0.076***	-0.035***	0.059***	-0.019**
	(9.41)	(3.30)	(8.55)	(3.28)	(6.90)	(2.16)	(10.38)	(6.84)	(5.68)	(2.71)	(6.21)	(2.25)
n	75	75	78	78	75	75	78	78	49	49	56	56

Table 1.3: PEAD and Drift-Period Systematic News: Two Groups

Table 1.3 reports the buy-and-hold returns of portfolios sorted on earnings surprise, conditioned on the agreement between earnings surprise and drift-period systematic news. In each quarter, firms are first divided into 2 groups based on the agreement between the sign of earnings surprise measured for quarter *t* (*Surprise(t)*) and the sign of the demeaned stock market return measured for the drift quarter *t+2* (*R'(m,t+2)*). The demeaned stock market return serves as a proxy for systematic news.
Same direction: R'(m,t+2) >0 *and Surprise(t)* >0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* ≤ 0
Different direction: R'(m,t+2) >0 *and Surprise(t)* ≤ 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* >0
Within each of the 2 groups, firms are sorted into deciles based on *Surprise(t)*, and then decile portfolios D1 to D10 are formed by equally weighting firms in the decile. A zero-investment arbitrage portfolio, D10–D1, is formed by longing D10 and shorting D1. The returns of the decile portfolios as well as those of the arbitrage portfolios in each of the 2 groups are measured for the drift quarter *t+2*. *Surprise(t)* is earnings surprise measured for quarter *t* with *DEP*, *ABR*, or *UEP*. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. *UEP* is the difference between actual EPS and the consensus EPS estimate, scaled by price. *ABR* is the cumulative abnormal return of the four-day window (*t-2* to *t+1*; *t*=0: earnings announcement date) around the announcement of quarter t earnings. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973:Q1-2011:Q3. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Average Portfolio Returns Measured for the Drift Quarter (t+2)

Earnings surprise:	*DEP*		*ABR*		*UEP*	
Group:	Same direction	Different direction	Same direction	Different direction	Same direction	Different direction
D1 (low)	-0.005	0.048	0.000	0.045	-0.011	0.050
D2	0.002	0.047	0.012	0.046	0.006	0.047
D3	0.012	0.046	0.014	0.043	0.014	0.037
D4	0.017	0.044	0.026	0.041	0.023	0.040
D5	0.021	0.041	0.031	0.038	0.027	0.034
D6	0.030	0.037	0.037	0.036	0.034	0.029
D7	0.037	0.036	0.042	0.031	0.039	0.029
D8	0.044	0.031	0.048	0.030	0.044	0.024
D9	0.056	0.025	0.052	0.028	0.053	0.016
D10 (high)	0.063	0.021	0.060	0.017	0.056	0.024
D10 - D1	0.068***	-0.027***	0.059***	-0.027***	0.067***	-0.026***
	(12.69)	(4.57)	(12.00)	(5.56)	(8.32)	(3.52)
n	153	153	153	153	105	105
Same - Different	0.095***		0.087***		0.094***	
(D10 - D1)	(9.54)		(9.67)		(6.66)	

Table 1.4: Subperiod and Subsample Analyses

Table 1.4 repeats the analysis in Table 1.3 for each of three subperiods (Panel A) and on two size subsamples (Panel B). In each quarter, firms are first divided into 2 groups based on the agreement between *Surprise(t)* and drift-period systematic news proxied by the demeaned stock market return *R'(m,t+2)*.
Same direction: R'(m,t+2) > 0 *and Surprise(t)* > 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* ≤ 0
Different direction: R'(m,t+2) > 0 *and Surprise(t)* ≤ 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* > 0
Within each of the 2 groups, firms are sorted into deciles based on Surprise(t), and then decile portfolios D1 to D10 are formed by equally weighting firms in the decile. A zero-investment arbitrage portfolio, D10–D1, is formed by longing D10 and shorting D1. The returns of the decile portfolios as well as those of the arbitrage portfolios in each of the 2 groups are measured for the drift quarter *t+2*. *Surprise(t)* is earnings surprise measured for quarter t with *DEP*, *ABR*, or *UEP*. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. *UEP* is the difference between actual EPS and the consensus EPS estimate, scaled by price. *ABR* is the cumulative abnormal return of the four-day window (*t-2* to *t+1*; *t*=0: earnings announcement date) around the announcement of quarter t earnings. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973:Q1-2011:Q3. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Subperiod Analysis

Period 1: 1973:Q1 –1984:Q4
Period 2: 1985:Q1 –1998:Q4
Period 3: 1999:Q1 –2011:Q3

Average Portfolio Returns Measured for the Drift Quarter (t+2)

	Period 1 1973:Q1 - 1984:Q4		Period 2 1985:Q1 - 1998:Q4			Period 3 1999:Q1 - 2011:Q3		
Surprise measure:	*DEP*	*ABR*	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*
D10 - D1:								
Same direction	0.071***	0.057***	0.055***	0.052***	0.053***	0.079***	0.070***	0.083***
	(7.16)	(8.22)	(7.78)	(7.72)	(5.32)	(7.39)	(6.08)	(6.55)
Different direction	-0.005	-0.017**	-0.018**	-0.015**	-0.005	-0.058***	-0.052***	-0.051***
	(0.42)	(2.41)	(2.30)	(2.28)	(0.50)	(5.55)	(4.77)	(4.55)
Same - Different	0.076***	0.074***	0.073***	0.067***	0.058***	0.137***	0.122***	0.135***
	(4.17)	(6.49)	(5.41)	(5.44)	(3.29)	(7.25)	(5.85)	(6.35)
n	48	48	56	56	56	49	49	49

Table 1.4: Subperiod and Subsample Analyses

Panel B: Subsample Analysis: Small vs. Median and Large Firms

- Small firms: firms whose market values fall in the 9th and 10th deciles of NYSE firms at the end of quarter *t*
- Median and large firms: firms whose market values fall in the 1st to 8th deciles of NYSE firms at the end of quarter *t*.

note: the NYSE size decile break points are from CRSP Monthly Capitalization Decile Files. According to CRSP definition, largest firms are in the 1st size decile and smallest firms are in the 10th size decile.

Average Portfolio Returns Measured for the Drift Quarter (t+2)

	Small firms			Median and large firms		
Earnings surprise:	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*
D10 - D1:						
Same direction	0.060***	0.058***	0.066***	0.051***	0.042***	0.047***
	(10.64)	(10.43)	(6.21)	(10.17)	(7.61)	(6.71)
Different direction	-0.019***	-0.016***	-0.025**	-0.034***	-0.032***	-0.025***
	(2.99)	(2.84)	(2.20)	(5.90)	(6.20)	(3.38)
Same - Different	0.079***	0.075***	0.091***	0.085***	0.075***	0.071***
	(7.96)	(7.71)	(5.20)	(9.81)	(7.87)	(5.86)
n	153	153	105	153	153	105

Table 1.5: Factor-Adjusted PEAD Profits and Cross-Sectional Regressions

Table 1.5 reports factor-adjusted profits of a PEAD-based trading strategy (Panel A) and cross-sectional regression test results of PEAD using Fama-MacBeth regressions (Panel B), conditioned on the agreement between firm earnings surprise (*Surprise(t)*) and drift-period systematic news proxied by the demeaned stock market return (*R'(m,t+2)*). In each quarter, firms are first divided into 2 groups based on the signs of *Surprise(t)* and *R'(m,t+2)*.

- *Same direction: R'(m,t+2)* > 0 *and Surprise(t)* > 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* ≤ 0
- *Different direction: R'(m,t+2)* > 0 *and Surprise(t)* ≤ 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* > 0

Surprise(t) is the earnings surprise measured for quarter *t* with *DEP*, *ABR*, or *UEP*. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. *UEP* is the difference between actual EPS and the consensus EPS estimate, scaled by price. *ABR* is the cumulative abnormal return of the four-day window (*t-2* to *t+1*; *t*=0: earnings announcement date) around the announcement of quarter t earnings. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973:Q1-2011:Q3. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Factor-Adjusted PEAD Profits

Firms within each of the two groups are sorted into deciles based on *Surprise(t)*, and then decile portfolios D1 to D10 are formed by equally weighting firms in the decile. A zero-investment arbitrage portfolio, D10–D1, is formed by longing D10 and shorting D1. The returns of the arbitrage portfolios in each of the 2 groups are measured for the drift quarter t+2 and then regressed against (i) RMRF (CAPM); (ii) RMRF, SMB, HML (Fama-French three factors); or (iii) RMRF, SMB, HML, WML (Carhart four factors). The intercepts are reported in the table. RMRF is market return minus risk free rate. SMB is the size factor, HML is the book-to-market factor, and WML is the momentum factor. The factors are from Ken French's website.

CAPM-based model:

$$R_{D10,t+2} - R_{D1,t+2} = \alpha + b * RMRF_{t+2} + \varepsilon_{t+2}$$

Fama-French three-factor model:

$$R_{D10,t+2} - R_{D1,t+2} = \alpha + b * RMRF_{t+2} + s * SMB_{t+2} + h * HML_{t+2} + \varepsilon_{t+2}$$

Carhart four-factor model:

$$R_{D10,t+2} - R_{D1,t+2} = \alpha + b * RMRF_{t+2} + s * SMB_{t+2} + h * HML_{t+2} + w * WML_{t+2} + \varepsilon_{t+2}$$

Average Portfolio Returns Measured for the Drift Quarter (t+2), Factor-Adjusted

	CAPM			Fama-French three factors			Carhart four factors		
Earnings surprise:	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*
D10 - D1:									
Same direction	0.068***	0.060***	0.067***	0.064***	0.058***	0.063***	0.062***	0.058***	0.068***
	(12.52)	(11.57)	(8.57)	(11.48)	(11.98)	(8.35)	(10.84)	(11.12)	(8.41)
Different direction	-0.026***	-0.028***	-0.027***	-0.021***	-0.026***	-0.024***	-0.028***	-0.032***	-0.029***
	(4.48)	(5.85)	(3.76)	(3.48)	(5.73)	(3.33)	(4.47)	(6.63)	(3.78)
Same - Different	0.094***	0.087***	0.094***	0.085***	0.084***	0.086***	0.090***	0.090***	0.097***
	(9.37)	(9.65)	(7.04)	(8.21)	(9.80)	(6.72)	(8.49)	(9.77)	(6.95)
n	153	153	105	153	153	105	153	153	105

Table 1.5: Factor-Adjusted PEAD Profits and Cross-Sectional Regressions

Panel B: Cross-Sectional Regressions (Fama-MacBeth)

R is a firm's quarterly stock return obtained by compounding monthly stock returns (including dividends) from the CRSP monthly database. Dummy variable *Dsame* = 1 if firms are in the same direction group and 0 otherwise; dummy variable *Ddiff* = 1 if firms are in the different direction group and 0 otherwise. Control variables Beta, *ME*, *BM*, and *MOM* are all measured at the end of quarter *t*. Beta is calculated using the monthly returns from the prior 36 months. *ME* is the market value of equity, inflation adjusted with GDP deflator to 2005 dollars. *BM* is the book-to-market ratio (book value / market value). *MOM* is momentum, measured as the cumulative stock return of the prior six months with the first month skipped, i.e. the return from the beginning of month *m-6* to the end of month *m-1* for a quarter *t* ending in month *m*. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel B1:

$$R_{j,t+2} = \alpha + \beta_1 * Surprise_{j,t} * Ddiff_{j,t,t+2} + \beta_2 * Surprise_{j,t} * Dsame_{j,t,t+2} + \sum \delta_k * Control_{k,j,t} + \varepsilon_{j,t+2}$$

Panel B1

	CAPM			Fama-French three factors			Carhart four factors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Earnings surprise:	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*
Dep. variable:	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*
*Surprise(t)*Ddiff*	-0.032	-0.042*	-0.055	0.019	-0.013	0.102	-0.014	-0.020	0.060
	(0.74)	(1.96)	(0.31)	(0.55)	(0.67)	(0.62)	(0.44)	(1.08)	(0.36)
*Surprise(t)*Dsame*	0.323***	0.242***	1.190***	0.287***	0.201***	1.084***	0.262***	0.195***	1.020***
	(10.59)	(13.57)	(6.40)	(11.39)	(12.49)	(6.60)	(10.47)	(12.21)	(6.44)
Beta	0.002	0.003	0.004	0.002	0.002	0.004	0.003	0.003	0.002
	(0.34)	(0.46)	(0.58)	(0.30)	(0.33)	(0.63)	(0.60)	(0.55)	(0.31)
Log (ME)				-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
				(1.04)	(0.99)	(0.45)	(1.06)	(0.95)	(0.40)
Log (BM)				0.007***	0.006**	-0.000	0.009***	0.009***	0.002
				(2.80)	(2.33)	(0.14)	(4.18)	(3.90)	(0.64)
MOM							0.028***	0.032***	0.020***
							(4.92)	(5.52)	(2.79)
Constant	0.035***	0.035***	0.028***	0.044***	0.044***	0.031***	0.042***	0.041***	0.030**
	(5.94)	(6.14)	(3.90)	(4.75)	(4.72)	(2.65)	(4.59)	(4.49)	(2.61)
Observations	355655	360750	163192	346856	351619	158650	346317	351005	158623
Number of periods	153	153	105	153	153	105	153	153	105
R-squared	0.05	0.04	0.05	0.07	0.07	0.07	0.07	0.07	0.08

Table 1.5: Factor-Adjusted PEAD Profits and Cross-Sectional Regressions

Panel B: Cross-Sectional Regressions (Fama-MacBeth; continued)

Panel B2:

$$R_{j,t+2} = \alpha + \beta_1 * Surprise_{j,t} + \beta_3 * Surprise_{j,t} * Dsame_{j,t,t+2} + \sum \delta_k * Control_{k,j,t} + \varepsilon_{j,t+2}$$

Panel B2

	CAPM			Fama-French three factors			Carhart four factors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Earnings surprise:	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*
Dep. variable:	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*
Surprise(t)	-0.032	-0.042*	-0.055	0.019	-0.013	0.102	-0.014	-0.020	0.060
	(0.74)	(1.96)	(0.31)	(0.55)	(0.67)	(0.62)	(0.44)	(1.08)	(0.36)
*Surprise(t)*Dsame*	0.356***	0.284***	1.245***	0.269***	0.214***	0.982***	0.276***	0.215***	0.960***
	(6.09)	(8.20)	(4.40)	(6.35)	(6.97)	(3.95)	(6.47)	(7.19)	(3.89)
Beta	0.002	0.003	0.004	0.002	0.002	0.004	0.003	0.003	0.002
	(0.34)	(0.46)	(0.58)	(0.30)	(0.33)	(0.63)	(0.60)	(0.55)	(0.31)
Log (ME)				-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
				(1.04)	(0.99)	(0.45)	(1.06)	(0.95)	(0.40)
Log (BM)				0.007***	0.006**	-0.000	0.009***	0.009***	0.002
				(2.80)	(2.33)	(0.14)	(4.18)	(3.90)	(0.64)
MOM							0.028***	0.032***	0.020***
							(4.92)	(5.52)	(2.79)
Constant	0.035***	0.035***	0.028***	0.044***	0.044***	0.031***	0.042***	0.041***	0.030**
	(5.94)	(6.14)	(3.90)	(4.75)	(4.72)	(2.65)	(4.59)	(4.49)	(2.61)
Observations	355655	360750	163192	346856	351619	158650	346317	351005	158623
Number of periods	153	153	105	153	153	105	153	153	105
R-squared	0.05	0.04	0.05	0.07	0.07	0.07	0.07	0.07	0.08

Table 1.6: Drift-Period Firm Earnings News

Table 1.6 reports Fama-MacBeth regression test results of PEAD, conditioned on the agreement between firm earnings surprise (*Surprise(t)*) and drift-period systematic news proxied by the demeaned stock market return (*R'(m,t+2)*), with lead *DEP* terms (*DEP(t+1)*, *DEP(t+2)*) included to control for drift-period firm earnings news. In each quarter, firms are first divided into 2 groups based on the signs of *Surprise(t)* and *R'(m,t+2)*.

- *Same direction: R'(m,t+2)* > 0 *and Surprise(t)* > 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* ≤ 0
- *Different direction: R'(m,t+2)* > 0 *and Surprise(t)* ≤ 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* > 0

R is a firm's quarterly stock return obtained by compounding monthly stock returns (including dividends) from the CRSP monthly database. Dummy variable *Dsame* = 1 if firms are in the same direction group and 0 otherwise. *Surprise(t)* is the earnings surprise measured for quarter *t* with *DEP*, *ABR*, or *UEP*. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. *UEP* is the difference between actual EPS and the consensus EPS estimate, scaled by price. *ABR* is the cumulative abnormal return of the four-day window (*t-2* to *t+1*; *t*=0: earnings announcement date) around the announcement of quarter *t* earnings. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973Q1-2011Q3. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

$$R_{j,t+2} = \alpha + \beta_1 * Surprise_{j,t} + \beta_3 * Surprise_{j,t} * Dsame_{j,t,t+2} + \sum_{i=1,2} \gamma_i * DEP_{j,t+i} + \delta * Beta_{j,t} + s * \log(ME_{j,t}) + b * \log(BM_{j,t}) + m * MOM_{j,t} + \varepsilon_{j,t+2}$$

	(1)	(2)	(3)	(4)	(5)	(6)
Earnings surprise:	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*
Dependent Variable:	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*	*R(t+2)*
Surprise(t)	-0.149***	-0.055***	-0.243	-0.179***	-0.073***	-0.528***
	(5.13)	(3.05)	(1.51)	(6.06)	(4.05)	(3.40)
*Surprise(t)*Dsame*	0.270***	0.205***	0.974***	0.257***	0.202***	0.986***
	(6.19)	(6.95)	(4.16)	(5.88)	(6.86)	(4.48)
DEP(t+1)	0.539***	0.519***	0.482***	0.431***	0.407***	0.379***
	(24.80)	(24.12)	(16.03)	(24.12)	(22.93)	(13.60)
DEP(t+2)				0.468***	0.462***	0.597***
				(25.47)	(25.15)	(17.73)
Beta	0.003	0.002	0.002	0.003	0.003	0.002
	(0.59)	(0.49)	(0.30)	(0.64)	(0.52)	(0.30)
Log (ME)	-0.001	-0.001	-0.000	-0.001	-0.001	-0.000
	(0.92)	(0.82)	(0.21)	(0.82)	(0.69)	(0.15)
Log (BM)	0.010***	0.010***	0.004	0.011***	0.011***	0.005*
	(4.66)	(4.35)	(1.20)	(5.23)	(4.93)	(1.81)
MOM	0.017***	0.015***	0.008	0.016***	0.013**	0.005
	(2.95)	(2.64)	(1.19)	(2.80)	(2.33)	(0.71)
Constant	0.042***	0.041***	0.030***	0.041***	0.040***	0.032***
	(4.57)	(4.47)	(2.64)	(4.56)	(4.42)	(2.80)
Observations	344484	345523	157438	343303	344190	157121
Number of periods	153	153	105	153	153	105
R-squared	0.09	0.09	0.09	0.11	0.11	0.11

Table 1.7: Alternative Systematic News Proxies

Table 1.7 reports the buy-and-hold profits of a PEAD-based trading strategy, conditioned on the agreement between firm earnings surprise (*Surprise(t)*) and drift-period systematic news proxied by three alternative systematic news measures: (i) the demeaned quarterly return of the CRSP value-weighted index, (ii) the quarterly change in aggregate earnings growth, and (iii) the quarterly change in U.S. GDP growth. In each quarter, firms are first divided into 2 groups based on the signs of *Surprise(t)* and systematic news (t+2).

- *Same direction: Systematic news (t+2)* > 0 *and Surprise(t)* > 0 *or Systematic news (t+2)* ≤ 0 *and Surprise(t)* ≤ 0
- *Different direction: Systematic news (t+2)* > 0 *and Surprise(t)* ≤ 0 *or Systematic news (t+2)* ≤ 0 *and Surprise(t)* > 0

Within each of the 2 groups, firms are sorted into deciles based on *Surprise(t)*, and then decile portfolios D1 to D10 are formed by equally weighting firms in the decile. A zero-investment arbitrage portfolio, D10– D1, is formed by longing D10 and shorting D1. The returns of the arbitrage portfolios in each of the 2 groups are measured for the drift quarter t+2. *Surprise(t)* is earnings surprise measured for quarter t with *DEP*, *ABR*, or *UEP*. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. *UEP* is the difference between actual EPS and the consensus EPS estimate, scaled by price. *ABR* is the cumulative abnormal return of the four-day window (*t-2* to *t+1*; *t*=0: earnings announcement date) around the announcement of quarter t earnings. Demeaned return of CRSP value-weighted index is the quarterly return of the index less the mean over the sample period (1973:Q1-2011Q3). Change in aggregate earnings growth is the quarterly change of the cross-sectional average of *DEP* values of firms in the sample. Change in GDP growth is the quarterly change of the U.S. GDP growth rate. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Average portfolio Returns Measured for the Drift Quarter (t+2)

Systematic news measure:	Demeaned return of CRSP value-weighted index			Change in aggregate earnings growth			Change in GDP growth		
Surprise measure:	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*	*DEP*	*ABR*	*UEP*
D10 - D1:									
Same direction	0.048***	0.051***	0.051***	0.040***	0.038***	0.044***	0.034***	0.033***	0.037***
	(7.98)	(9.81)	(6.05)	(6.29)	(6.70)	(4.68)	(5.37)	(5.58)	(4.12)
Different direction	-0.007	-0.019***	-0.010	0.001	-0.006	-0.003	0.007	-0.001	0.004
	(0.98)	(3.48)	(1.15)	(0.16)	(1.08)	(0.37)	(0.93)	(0.15)	(0.46)
Same - Different	0.054***	0.070***	0.061***	0.039***	0.045***	0.047***	0.028**	0.034***	0.032*
	(4.63)	(7.11)	(3.87)	(3.19)	(4.13)	(2.89)	(2.26)	(3.06)	(1.97)
n	153	153	105	153	153	105	153	153	105

Table 1.8: Information Uncertainty and Signal Strength of Systematic News

Table 1.8 reports the returns of portfolios double sorted on (i) earnings surprise and information uncertainty (Panel A); and (ii) earnings surprise and strength of drift-period systematic news (Panel B). In each quarter, firms are first divided into 4 groups based on the sign of earnings surprise measured for quarter *t* (*Surprise(t)*; *Surprise* = *DEP*) and the sign of the demeaned stock market return measured for the drift quarter *t+2* (*R'(m,t+2)*). The demeaned stock market return serves as a proxy for systematic news. Within each of the 4 groups, firms are double sorted into 5x5 portfolios and the buy-and-hold returns are measured for the drift quarter *t+2*. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973:Q1-2011:Q3. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A Earnings Surprise and Information Uncertainty

In Panel A, firms in each of the 4 groups are double sorted on *DEP(t)* and information uncertainty measured with *CVOL*. *CVOL* is the standard deviation of cash flow from operations in the past 5 years following Zhang (2006). Cash flow from operations is earnings before extraordinary items minus total accruals, scaled by average total assets. Total accruals = changes in current assets - changes in cash - changes in current liabilities - depreciation expense + changes in short-term debt.

Panel A1: Average Portfolios Returns (*t+2*): Positive *DEP(t)* and Same Direction (Positive *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			0.001	0.004	0.009	0.018	0.087	
CVOL sorts and quintile mean *CVOL* values	Q1	0.02	0.083	0.089	0.095	0.101	0.133	0.050***
	Q2	0.04	0.093	0.103	0.111	0.133	0.151	0.058***
	Q3	0.06	0.107	0.111	0.135	0.146	0.156	0.049***
	Q4	0.08	0.116	0.128	0.135	0.151	0.170	0.054***
	Q5	0.18	0.118	0.128	0.142	0.153	0.175	0.057***
	Q5 - Q1		0.034***	0.038***	0.046***	0.051***	0.042***	

Panel A2: Average Portfolios Returns (*t+2*): Positive *DEP(t)* and Different Direction (Negative *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			0.001	0.004	0.008	0.018	0.085	
CVOL sorts and quintile mean *CVOL* values	Q1	0.02	-0.011	-0.011	-0.014	-0.009	-0.033	-0.023***
	Q2	0.04	-0.027	-0.020	-0.026	-0.031	-0.039	-0.012
	Q3	0.06	-0.032	-0.028	-0.030	-0.037	-0.048	-0.016**
	Q4	0.09	-0.053	-0.040	-0.041	-0.043	-0.053	0.000
	Q5	0.18	-0.060	-0.056	-0.055	-0.061	-0.064	-0.004
	Q5 - Q1		-0.049***	-0.045***	-0.041***	-0.052***	-0.030***	

Table 1.8: Information Uncertainty and Signal Strength of Systematic News

Panel A Earnings Surprise and Information Uncertainty (continued)

Panel A3: Average Portfolios Returns (*t+2*): Negative *DEP(t)* and Same Direction (Negative *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			-0.090	-0.022	-0.011	-0.005	-0.001	
CVOL sorts and quintile mean *CVOL* values	Q1	0.02	-0.065	-0.036	-0.026	-0.025	-0.018	0.047***
	Q2	0.04	-0.078	-0.052	-0.046	-0.038	-0.033	0.045***
	Q3	0.06	-0.068	-0.061	-0.059	-0.046	-0.038	0.030***
	Q4	0.09	-0.095	-0.070	-0.067	-0.054	-0.055	0.040***
	Q5	0.20	-0.104	-0.099	-0.095	-0.079	-0.067	0.037***
	Q5 - Q1		-0.039***	-0.063***	-0.068***	-0.054***	-0.049***	

Panel A4: Average Portfolios Returns (*t+2*): Negative *DEP(t)* and Different Direction (Positive *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			-0.095	-0.024	-0.011	-0.005	-0.001	
CVOL sorts and quintile mean *CVOL* values	Q1	0.02	0.116	0.106	0.098	0.090	0.088	-0.028**
	Q2	0.04	0.130	0.116	0.117	0.118	0.116	-0.014
	Q3	0.06	0.136	0.118	0.114	0.114	0.105	-0.031***
	Q4	0.09	0.142	0.125	0.131	0.127	0.124	-0.018*
	Q5	0.19	0.143	0.134	0.128	0.118	0.123	-0.021*
	Q5 - Q1		0.027**	0.028**	0.030**	0.028**	0.035***	

Table 1.8: Information Uncertainty and Signal Strength of Systematic News

Panel B Earnings Surprise and Systematic News Signal Strength

In Panel B, firms in each of the 4 groups are double sorted on *DEP(t)* and the strength of systematic news measured by the absolute value of *R'(m,t+2)* (*Abs(R'(m,t+2))*). Since sorting on *Abs(R'(m,t+2))* results in firms in different quintiles being drawn from different time periods, excess returns (net of 1M T-bill rates) are shown in Panel B instead

Panel B1: Average Portfolios Excess Returns (*t+2*): Positive *DEP(t)* and Same Direction (Positive *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			0.001	0.004	0.009	0.018	0.090	
Abs(R'(m,t+2)) sorts and quintile mean *R'(m,t+2)* values	Q1	0.02	0.028	0.035	0.051	0.057	0.069	0.041***
	Q2	0.05	0.042	0.056	0.063	0.073	0.091	0.049***
	Q3	0.08	0.092	0.102	0.115	0.126	0.138	0.045***
	Q4	0.13	0.099	0.108	0.129	0.144	0.193	0.094***
	Q5	0.23	0.170	0.173	0.191	0.223	0.277	0.107***
	Q5 - Q1		0.142***	0.138***	0.141***	0.166***	0.208***	

Panel B2: Average Portfolios Excess Returns (*t+2*): Positive *DEP(t)* and Different Direction (Negative *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			0.001	0.004	0.008	0.018	0.088	
sorts and quintile mean *R'(m,t+2)* values	Q1	-0.01	0.015	0.021	0.019	0.023	0.014	-0.002
	Q2	-0.04	-0.006	-0.002	-0.002	-0.008	-0.014	-0.008
	Q3	-0.07	-0.031	-0.030	-0.027	-0.033	-0.045	-0.014
	Q4	-0.10	-0.051	-0.042	-0.052	-0.063	-0.079	-0.028***
	Q5	-0.22	-0.158	-0.158	-0.170	-0.180	-0.207	-0.049**
	Q5 - Q1		-0.174***	-0.179***	-0.190***	-0.203***	-0.221***	

Table 1.8: Information Uncertainty and Signal Strength of Systematic News

Panel B Earnings Surprise and Systematic News Signal Strength (continued)

Panel B3: Average Portfolios Excess Returns (*t+2*): Negative *DEP(t)* and Same Direction (Negative *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			-0.095	-0.023	-0.011	-0.005	-0.001	
Abs(R'(m,t+2)) sorts and quintile mean *R'(m,t+2)* values	Q1	-0.01	-0.027	-0.007	-0.011	0.002	0.008	0.035***
	Q2	-0.04	-0.056	-0.043	-0.032	-0.023	-0.011	0.044***
	Q3	-0.07	-0.077	-0.061	-0.060	-0.043	-0.040	0.037***
	Q4	-0.10	-0.135	-0.110	-0.095	-0.078	-0.063	0.072***
	Q5	-0.22	-0.257	-0.219	-0.207	-0.188	-0.173	0.083***
	Q5 - Q1		-0.230***	-0.212***	-0.196***	-0.190***	-0.182***	

Panel B4: Average Portfolios Excess Returns (*t+2*): Negative *DEP(t)* and Different Direction (Positive *R'(m,t+2)*)

			DEP sorts and quintile mean *DEP* values					
			Q1	Q2	Q3	Q4	Q5	Q5 - Q1
			-0.098	-0.024	-0.011	-0.005	-0.001	
sorts and quintile mean *R'(m,t+2)* values	Q1	0.02	0.024	0.023	0.026	0.023	0.025	0.001
	Q2	0.05	0.056	0.047	0.051	0.051	0.044	-0.012
	Q3	0.08	0.088	0.099	0.088	0.084	0.094	0.005
	Q4	0.13	0.154	0.147	0.125	0.124	0.104	-0.049**
	Q5	0.23	0.272	0.233	0.218	0.198	0.183	-0.089***
	Q5 - Q1		0.248***	0.210***	0.192***	0.175***	0.157***	

Table 1.9: Autocorrelation and History of Earnings Surprises

Table 1.9 studies whether the difference in PEAD patterns between firms in the same and different direction groups can be attributed to differences in earnings surprise autocorrelation. Panel A reports the autocorrelations between *DEP(t)* and its two lead terms: *DEP*(*t+i*; *i*=1,2). Panel B reports the autocorrelations between *DEP*(*t+i*; *i*=1,2) and the four lags of *DEP(t+i)*. In each quarter, firms are first divided into 2 groups based on the agreement between firm earnings surprise (*Surprise(t)*; *Surprise = DEP*) and drift-period systematic news proxied by the demeaned stock market return (*R'(m,t+2)*).
Same direction: R'(m,t+2) > 0 *and Surprise(t)* > 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* ≤ 0
Different direction: R'(m,t+2) > 0 *and Surprise(t)* ≤ 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* > 0
DEP is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973:Q1-2011:Q3. Dummy variable *Dsame* = 1 if firms are in the same direction group and 0 otherwise; dummy variable *Ddiff* = 1 if firms are in the different direction group and 0 otherwise. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Autocorrelation between DEP(t) and Its Two Lead Terms

Panel A1: $DEP_{j,t+i(i=1,2)} = \alpha + \rho_{11} * DEP_{j,t} * Ddiff_{j,t,t+2} + \rho_{12} * DEP_{j,t} * Dsame_{j,t,t+2} + \varepsilon_{t+1}$

Panel A2: $DEP_{j,t+i(i=1,2)} = \alpha + \rho_{11} * DEP_{j,t} + \rho_{13} * DEP_{j,t} * Dsame_{j,t,t+2} + \varepsilon_{t+1}$

Panel A1

	(1)	(2)
Dep. variable:	*DEP(t+1)*	*DEP(t+2)*
*DEP(t)*Ddiff*	0.297***	0.155***
	(20.16)	(11.88)
*DEP(t)*Dsame*	0.294***	0.175***
	(22.94)	(15.49)
Constant	0.001**	0.001**
	(2.15)	(2.29)
Observations	417191	409466
Number of groups	153	153
R-squared	0.09	0.03

Panel A2

	(1)	(2)
Dep. variable:	*DEP(t+1)*	*DEP(t+2)*
DEP(t)	0.297***	0.155***
	(20.16)	(11.88)
*DEP(t)*Dsame*	-0.003	0.020
	(0.16)	(1.19)
Constant	0.001**	0.001**
	(2.15)	(2.29)
Observations	417191	409466
Number of groups	153	153
R-squared	0.09	0.03

Table 1.9: Autocorrelation and History of Earnings Surprises

Panel B: DEP History Leading Up to Drift Period t+2

Panel B1:

$$DEP_{j,t+i(i=1,2)} = \alpha + \sum_{k=1}^{4} \rho_{k1} * DEP_{j,t+i-1} * Ddiff_{j,t,t+2} + \sum_{k=1}^{4} \rho_{k2} * DEP_{j,t+i-1} * Dsame_{j,t,t+2} + \varepsilon_{t+1}$$

Panel B2:

$$DEP_{j,t+i(i=1,2)} = \alpha + \sum_{k=1}^{4} \rho_{k1} * DEP_{j,t+i-1} + \sum_{k=1}^{4} \rho_{k3} * DEP_{j,t+i-1} * Dsame_{j,t,t+2} + \varepsilon_{t+1}$$

Panel B1

	(1)	(2)
Dep. variable:	*DEP(t+i; i=1)*	*DEP(t+i; i=2)*
*DEP(t+i-1)*Ddiff*	0.269***	0.245***
	(17.86)	(22.01)
*DEP(t+i-2)*Ddiff*	0.124***	0.109***
	(14.05)	(11.09)
*DEP(t+i-3)*Ddiff*	0.083***	0.076***
	(9.02)	(10.05)
*DEP(t+i-4)*Ddiff*	-0.387***	-0.392***
	(27.25)	(27.42)
*DEP(t+i-1)*Dsame*	0.256***	0.256***
	(22.00)	(21.94)
*DEP(t+i-2)*Dsame*	0.122***	0.128***
	(15.09)	(13.35)
*DEP(t+i-3)*Dsame*	0.069***	0.075***
	(9.03)	(8.01)
*DEP(t+i-4)*Dsame*	-0.384***	-0.380***
	(29.28)	(29.95)
Constant	0.002***	0.001***
	(5.20)	(4.14)
Observations	383949	386658
Number of groups	153	153
R-squared	0.23	0.22

Panel B2

	(1)	(2)
Dep. variable:	*DEP(t+i; i=1)*	*DEP(t+i; i=2)*
DEP(t+i-1)	0.269***	0.245***
	(17.86)	(22.01)
DEP(t+i-2)	0.124***	0.109***
	(14.05)	(11.09)
DEP(t+i-3)	0.083***	0.076***
	(9.02)	(10.05)
DEP(t+i-4)	-0.387***	-0.392***
	(27.25)	(27.42)
*DEP(t+i-1)*Dsame*	-0.013	0.012
	(0.80)	(1.11)
*DEP(t+i-2)*Dsame*	-0.003	0.019
	(0.26)	(1.31)
*DEP(t+i-3)*Dsame*	-0.014	-0.001
	(1.24)	(0.10)
*DEP(t+i-4)*Dsame*	0.003	0.012
	(0.22)	(0.92)
Constant	0.002***	0.001***
	(5.20)	(4.14)
Observations	383949	386658
Number of groups	153	153
R-squared	0.23	0.22

Table 1.10: Post-PEAD Return Reversals: Same Direction Group

Table 1.10 studies whether the stronger PEAD exhibited by firms in the same direction group is reversed in the subsequent 5 years following the drift quarter. In each quarter, firms are first divided into 2 groups based on the agreement between firm earnings surprise (*Surprise(t)*; *Surprise = DEP*) and drift-period systematic news proxied by the demeaned stock market return (*R'(m,t+2)*).

- *Same direction: R'(m,t+2)* > 0 *and Surprise(t)* > 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* ≤ 0
- *Different direction: R'(m,t+2)* > 0 *and Surprise(t)* ≤ 0 *or R'(m,t+2)* ≤ 0 *and Surprise(t)* > 0

Within each of the 2 groups, firms are sorted into deciles based on *Surprise(t)*, and then decile portfolios D1 to D10 are formed by equally weighting firms in the decile. A zero-investment arbitrage portfolio, D10–D1, is formed by longing D10 and shorting D1. The buy-and-hold returns of the decile portfolios as well as those of the arbitrage portfolios in each of the 2 groups are measured for the 1st, 2nd, 3rd, 4th and 5th year post the drift quarter *t+2*. Only the results for firms in the same direction group are reported in Table 1.9. *DEP* is seasonally differenced quarterly earnings scaled by the four-quarter-lagged market value. Demeaned stock market return is the quarterly return of the CRSP equal-weighted index (including dividends) minus its mean measured over the entire sample period 1973:Q1-2011:Q3. T-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Average Annual Portfolio Returns: Same Direction Group

Earnings surprise:	*DEP*				
Year post drift quarter t+2:	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
D1 (low)	0.146	0.161	0.179	0.168	0.165
D2	0.151	0.173	0.164	0.153	0.155
D3	0.148	0.172	0.164	0.164	0.161
D4	0.153	0.165	0.163	0.152	0.170
D5	0.157	0.162	0.156	0.157	0.170
D6	0.151	0.171	0.160	0.160	0.170
D7	0.159	0.170	0.167	0.164	0.172
D8	0.157	0.164	0.161	0.172	0.157
D9	0.151	0.170	0.161	0.165	0.154
D10 (high)	0.154	0.163	0.160	0.170	0.162
D10 - D1	0.008	0.002	-0.018	0.002	-0.003
	(0.64)	(0.13)	(1.31)	(0.12)	(0.21)
n	149	145	141	137	133

Table 2.1: Financial Development Measures

Table 2.1 reports the summary statistics of yearly financial development measures used in the study for the period 1960-2011 in the U.S. Market cap / GDP is the total market capitalization, scaled by GDP. Yearly market capitalization is estimated by the mean of monthly aggregate market capitalizations of the 12 months in a year. Dollar value traded / GDP is the annual aggregate dollar trading volume, scaled by GDP. Turnover is the annual turnover of shares trading in the U.S. stock markets. We first calculate each firm's monthly share turnover as shares traded in the month scaled by total shares outstanding, and then average the monthly share turnover values across firms to obtain the cross-sectional mean of monthly turnover (monthly turnover). The annual turnover is calculated as the average of the 12 monthly turnover values in a year multiplied by 12. Private credit / GDP is the total amount of private credit in the economy, scaled by GDP. Private credit refers to domestic credit provided to the private sector through loans, purchase of nonequity securities, trade credits and other accounts receivable. Bank credit / GDP is the total amount of bank credit in the economy, scaled by GDP. Bank credit refers to domestic credit provided by the banking sector, which includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The overall Financial Development Index is the first principal component of the five indices describe above. Data source: CRSP and World Bank Development Index Database.

Variables	Observations	Mean	25th Percentile	Median	75th Percentile	Standard Deviation
Equity Market Development						
Market Cap / GDP	52	0.718	0.488	0.631	0.910	0.300
Dollar Value Traded / GDP	52	0.697	0.105	0.286	1.199	0.835
Turnover	52	0.749	0.379	0.466	0.849	0.625
Credit Market Development						
Private Credit / GDP	52	1.261	0.932	1.108	1.646	0.422
Bank Credit / GDP	52	1.560	1.180	1.439	1.978	0.441
Overall Financial Development Index	52	2.093	0.495	1.044	3.973	2.119

Table 2.2: Industry-Level Variables

Table 2.2 reports summary statistics of industry-level variables used in the study. All industry-level variables are measured on a rolling 5-year basis except for industry external financial dependence measures. Leading business turnover is measured as the percentage of firms that rank in the top tercile in an industry based on sales, value-added (VA) or assets in year t but fall out of the top tercile in year t+5. Variation in firm-growth rates are measured as the standard deviation of 5-year growth rates in sales, VA or assets for firms in an industry. Entrance (exits) is the log value of the aggregate number of firms entering (exiting) an industry during years t to t+5. Exits excluding mergers and acquisitions or exits due to mergers and acquisitions are also reported. Industry concentration and competition is measured by the rolling 5-year mean of yearly Herfindahl index (sum of within-industry market share squared) based on sales or VA. Industry innovation is measured with four measures: R&D/sales (assets) is the industry aggregate research and development expenditure over years t to t+5 scaled by aggregate industry sales (assets) in year t. Intangibles growth is the log growth of aggregate industry intangible assets from year t to year t+5. Patents / employee is the aggregate industry patent grants from year t to year t+5 scaled by aggregate number of employees within the industry at year t. External finance is measured with three measures: Equity issuance, Debt issuance and Equity + Debt issuance. Equity (Debt) issuance is aggregate industry equity (debt) issue over years t to t+5, scaled by total industry assets in year t. Industry growth is measured as the log change of sales, VA or assets from year t to year t+5. Industry external financial dependence measures - Financial dependence and Equity dependence - are based on a sample of Canadian publicly listed firms. Industries are defined by the Fama-French 49 industry classification. Industry *i*'s Financial dependence is the industry median of capital expenditure minus cash flow scaled by capital expenditure. Equity dependence is the industry median of equity issues scaled by capital expenditures. We measure these two variables for each firm in the Canadian sample over the entire sample period 1960-2011, and then take the median within each industry to come up with a single value for each industry.

Variables	Observations	Mean	25th Percentile	Median	75th Percentile	Standard Deviation
Leading Business Turnover						
Sales Turnover	1769	0.125	0.071	0.119	0.167	0.083
VA Turnover	1773	0.175	0.111	0.167	0.227	0.106
Assets Turnover	1778	0.129	0.074	0.125	0.177	0.085
Variation in Firm-Growth Rates						
Variation in Sales Growth	2021	0.688	0.503	0.659	0.832	0.254
Variation in VA Growth	2019	0.902	0.753	0.901	1.054	0.252
Variation in Assets Growth	2021	0.651	0.495	0.642	0.789	0.213
Entrance and Exit						
Log (New Entrance)	2021	2.737	1.792	2.773	3.664	1.283
Log (Exit)	2021	1.978	0.693	2.197	3.045	1.326
Log (Exit excluding M&A)	2021	1.295	0.000	1.099	2.197	1.109
Log (Exit due to M&A)	2021	1.611	0.693	1.609	2.565	1.182

Table 2.2: Industry-Level Variables (Continued)

Variables	Observations	Mean	25th Percentile	Median	75th Percentile	Standard Deviation
Industry Concentration and Competition						
Herfindahl (Sales)	2021	0.144	0.059	0.093	0.181	0.138
Herfindahl (VA)	2005	0.196	0.091	0.144	0.246	0.157
Innovation						
R&D / Sales	2021	0.105	0.006	0.032	0.144	0.164
R&D / Assets	2021	0.111	0.006	0.033	0.159	0.159
Intangibles Growth	2021	0.786	0.246	0.712	1.273	0.961
Patent / Employee	1247	4.299	0.271	1.721	5.836	6.600
External Finance						
Equity Issue / Assets	1892	0.117	0.039	0.080	0.148	0.183
Debt Issue / Assets	1892	0.338	0.171	0.281	0.420	0.369
Equity + Debt Issue / Assets	1892	0.482	0.242	0.394	0.596	0.515
Growth						
Sales Growth	2021	0.390	0.173	0.405	0.605	0.364
VA Growth	2017	0.357	0.099	0.384	0.614	0.497
Assets Growth	2021	0.424	0.220	0.434	0.626	0.379
Industry External Financial Dependence Measures						
Financial Dependence	38	1.048	-0.240	0.119	1.053	2.592
Equity Dependence	38	1.267	0.253	0.350	1.050	2.361

Table 2.3: External Finance

This table reports results from regressions of external finance within each industry on the interaction of financial market development and industry financial dependence, along with industry fixed effects, year fixed effects, and each industry's yearly size. Equity issuance and debt issuance are aggregate industry equity and debt issue over years t to t+5, scaled by total industry assets in year t. Debt issuance is the change in assets, minus the change in book equity, minus the change in deferred taxes. Equity issuance is change in book equity, plus change in deferred taxes, minus change in retained earnings. Debt and equity issuances are available from 1963 to 2011 because Compustat coverage of book equity does not become more complete until 1962. Industry share is measured as the industry's aggregate sales for the year, scaled by the aggregate sales of the entire sample for the year. Financial development index (Fin. Dev.) is the value in year t of the first principal component of five financial market development measures: Market cap/GDP, Dollar value traded/GDP, Turnover, Private credit/GDP and Bank credit/GDP. Industry-level financial and equity dependence variables are based on a sample of Canadian publicly listed firms measured over the entire sample period. Industries are defined by the Fama-French 49 industry classification. Equity dependence (Eq. Dep.) is the industry median of equity issues scaled by capital expenditures. Financial dependence (Fin. Dep.) is the industry median of capital expenditure minus cash flow scaled by capital expenditure. The economic significance is reported in the bottom row, which reports a difference-in-difference estimate (in percentage terms; the differential is scaled by the mean value of the dependent variable) between financially dependent and non-dependent industries during years of high and low equity market development. More precisely, it is a difference-in-difference of the dependent variable of an industry at the 75th percentile level of financial dependence versus an industry at the 25th percentile level of financial dependence, when compared in a year at the 75th percentile of financial market development versus a year at the 25th percentile. Standard errors are cluster by year and by industry. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Equity Issuance		Debt Issuance		Equity + Debt Issuance	
	(1)	(2)	(3)	(4)	(5)	(6)
Eq. Dep. * Fin. Dev.	0.005***		0.005***		0.010***	
	(6.08)		(6.46)		(7.22)	
Fin. Dep. * Fin. Dev.		0.005***		0.004***		0.009***
		(6.85)		(6.58)		(9.29)
Industry Share (Sales)	-0.841**	-0.745**	-1.680	-1.580	-1.900	-1.727
	(2.66)	(2.34)	(0.86)	(0.81)	(0.94)	(0.87)
Observations	1672	1672	1672	1672	1672	1672
R-squared	0.107	0.106	0.164	0.163	0.140	0.139
Diff-in-Diff	11.8%	19.2%	4.1%	5.3%	5.7%	8.4%

Table 2.4: Leading Business Turnover

This table reports results from regressions of within-industry leading business turnover on the interaction of financial market development and industry financial dependence, along with industry fixed effects, year fixed effects, and each industry's yearly size. Leading business turnover is measured as the percentage of firms that rank in the top tercile in an industry based on sales, value-added (VA) or assets in year t but fall out of the top tercile in year t+5. VA is operating income before depreciation plus labor and related expenses. Financial development index (Fin. Dev.) is the value in year t of the first principal component of five financial market development measures: Market cap/GDP, Dollar value traded/GDP, Turnover, Private credit/GDP and Bank credit/GDP. Industry size is measured as the industry's market share based on aggregate sales (VA or assets) for the year, scaled by the aggregate sales (VA or assets) of the entire sample for the year. Industry-level financial and equity dependence variables are based on a sample of Canadian publicly listed firms measured over the entire sample period. Industries are defined by the Fama-French 49 industry classification. Equity dependence (Eq. Dep.) is the industry median of equity issues scaled by capital expenditures. Financial dependence (Fin. Dep.) is the industry median of capital expenditure minus cash flow scaled by capital expenditure. The economic significance is reported in the bottom row, which reports a difference-in-difference estimate (in percentage terms; the differential is scaled by the mean value of the dependent variable) between financially dependent and non-dependent industries during years of high and low equity market development. More precisely, it is a difference-in-difference of the dependent variable of an industry at the 75th percentile level of financial dependence versus an industry at the 25th percentile level of financial dependence, when compared in a year at the 75th percentile of financial market development versus a year at the 25th percentile. Standard errors are cluster by year and by industry. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Turnover (Sales)		Turnover (VA)		Turnover (Assets)	
	(1)	(2)	(3)	(4)	(5)	(6)
Equity Dep. * Fin. Dev.	0.078*		0.139**		0.125***	
	(1.93)		(2.65)		(3.29)	
Fin. Dep. * Fin. Dev.		0.040		0.121***		0.072*
		(1.21)		(2.82)		(1.99)
Industry Share (Sales)	-31.820***	-29.275***				
	(3.01)	(2.87)				
Industry Share (VA)			-36.362***	-34.619***		
			(3.85)	(3.63)		
Industry Share (Assets)					-70.361***	-65.461***
					(5.65)	(5.26)
Observations	1689	1689	1695	1695	1697	1697
R-squared	0.071	0.070	0.052	0.051	0.089	0.086
Diff-in-Diff	1.7%	1.4%	2.2%	3.1%	2.7%	2.5%

Table 2.5: Variation in Firm-Growth Rates

This table reports results from regressions of within-industry variation in firm-growth rates on the interaction of financial market development and industry financial dependence, along with industry fixed effects, year fixed effects, and each industry's yearly size. Variation in firm-growth rates are measured as the standard deviation of 5-year growth rates in sales, value-added (VA) or assets for firms in an industry. VA is operating income before depreciation plus labor and related expenses. Industry size is measured as the industry's market share based on aggregate sales (VA or assets) for the year, scaled by the aggregate sales (VA or assets) of the entire sample for the year. Financial development index (Fin. Dev.) is the value in year t of the first principal component of five financial market development measures: Market cap/GDP, Dollar value traded/GDP, Turnover, Private credit/GDP and Bank credit/GDP. Industry-level financial and equity dependence variables are based on a sample of Canadian publicly listed firms measured over the entire sample period. Industries are defined by the Fama-French 49 industry classification. Equity dependence (Eq. Dep.) is the industry median of equity issues scaled by capital expenditures. Financial dependence (Fin. Dep.) is the industry median of capital expenditure minus cash flow scaled by capital expenditure. The economic significance is reported in the bottom row, which reports a difference-in-difference estimate (in percentage terms; the differential is scaled by the mean value of the dependent variable) between financially dependent and non-dependent industries during years of high and low equity market development. More precisely, it is a difference-in-difference of the dependent variable of an industry at the 75th percentile level of financial dependence versus an industry at the 25th percentile level of financial dependence, when compared in a year at the 75th percentile of financial market development versus a year at the 25th percentile. Standard errors are cluster by year and by industry. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Variation in Growth (Sales)		Variation in Growth (VA)		Variation in Growth (Assets)	
	(1)	(2)	(3)	(4)	(5)	(6)
Equity Dep. * Fin. Dev.	0.008***		0.004***		0.005***	
	(6.79)		(5.05)		(6.87)	
Fin. Dep. * Fin. Dev.		0.007***		0.003***		0.004***
		(7.00)		(4.45)		(7.75)
Industry Share (Sales)	0.267	0.416				
	(0.81)	(1.27)				
Industry Share (VA)			-0.740***	-0.666**		
			(2.97)	(2.61)		
Industry Share (Assets)					-0.375*	-0.288
					(1.95)	(1.45)
Observations	1786	1786	1784	1784	1786	1786
R-squared	0.337	0.335	0.129	0.127	0.438	0.439
Diff-in-Diff	3.2%	4.6%	1.2%	1.5%	2.1%	2.8%

Table 2.6: Entrance and Exit

This table reports results from regressions of industry entrance and exit on the interaction of financial market development and industry financial dependence, along with industry fixed effects, year fixed effects, and each industry's yearly size. Entrance (exits) is the log value of the aggregate number of firms entering (exiting) an industry during years t to t+5. Exits excluding mergers or acquisitions (columns 5-6) and exits due to mergers and acquisitions (colums 7-8) are also reported. Fama and French (2004) and Kerr and Nanda (2009) show that most newly incorporated firms do not survive for very long, so we limit exits to firms that were listed at least three years prior to the beginning of the measurement period. Industry size is measured as the industry's market share based on aggregate sales for the year, scaled by the aggregate sales of the entire sample for the year. Financial development index (Fin. Dev.) is the value in year t of the first principal component of five financial market development measures: Market cap/GDP, Dollar value traded/GDP, Turnover, Private credit/GDP and Bank credit/GDP. Industry-level financial and equity dependence variables are based on a sample of Canadian publicly listed firms measured over the entire sample period. Industries are defined by the Fama-French 49 industry classification. Equity dependence (Eq. Dep.) is the industry median of equity issues scaled by capital expenditures. Financial dependence (Fin. Dep.) is the industry median of capital expenditure minus cash flow scaled by capital expenditure. The economic significance is reported in the bottom row, which reports a difference-in-difference estimate (in percentage terms; the differential is scaled by the mean value of the dependent variable) between financially dependent and non-dependent industries during years of high and low equity market development. More precisely, it is a difference-in-difference of the dependent variable of an industry at the 75th percentile level of financial dependence versus an industry at the 25th percentile level of financial dependence, when compared in a year at the 75th percentile of financial market development versus a year at the 25th percentile. Standard errors are cluster by year and by industry. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Entrance		Exits		Exits (excluding M&A)		Exits (due to M&A)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Equity Dep. * Fin. Dev.	0.033***		0.038***		0.036***		0.036***	
	(7.31)		(13.03)		(12.38)		(11.88)	
Fin. Dep. * Fin. Dev.		0.027***		0.028***		0.026***		0.027***
		(7.14)		(12.20)		(10.38)		(11.81)
Industry Share (Sales)	11.399***	12.089***	14.492***	15.361***	9.744***	10.592***	15.001***	15.800***
	(4.46)	(4.65)	(7.46)	(7.82)	(8.71)	(9.40)	(6.61)	(6.91)
Observations	1786	1786	1786	1786	1786	1786	1786	1786
R-squared	0.562	0.556	0.785	0.780	0.710	0.703	0.718	0.713
Diff-in-Diff	3.3%	4.4%	5.3%	6.4%	7.7%	9.0%	6.2%	7.5%

Table 2.7: Industry Concentration and Competition

This table reports results from regressions of industry concentration and competition on the interaction of financial market development and industry financial dependence, along with industry fixed effects, year fixed effects, and each industry's yearly size. Industry concentration and competition is measured by the rolling 5-year mean of yearly Herfindahl index (sum of within-industry market share squared) based on sales or value-added (VA). VA is operating income before depreciation plus labor and related expenses. Industry size is measured as the industry's market share based on aggregate sales (or VA) for the year, scaled by the aggregate sales (or VA) of the entire sample for the year. Financial development index (Fin. Dev.) is the value in year t of the first principal component of five financial market development measures: Market cap/GDP, Dollar value traded/GDP, Turnover, Private credit/GDP and Bank credit/GDP. Industry-level financial and equity dependence variables are based on a sample of Canadian publicly listed firms measured over the entire sample period. Industries are defined by the Fama-French 49 industry classification. Equity dependence (Eq. Dep.) is the industry median of equity issues scaled by capital expenditures. Financial dependence (Fin. Dep.) is the industry median of capital expenditure minus cash flow scaled by capital expenditure. The economic significance is reported in the bottom row, which reports a difference-in-difference estimate (in percentage terms; the differential is scaled by the mean value of the dependent variable) between financially dependent and non-dependent industries during years of high and low equity market development. More precisely, it is a difference-in-difference of the dependent variable of an industry at the 75th percentile level of financial dependence versus an industry at the 25th percentile level of financial dependence, when compared in a year at the 75th percentile of financial market development versus a year at the 25th percentile. Standard errors are cluster by year and by industry. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Herfindahl (Sales)		Herfindahl (VA)	
	(1)	(2)	(3)	(4)
Equity Dep. * Fin. Dev.	-0.001***		-0.002***	
	(10.32)		(8.46)	
Fin. Dep. * Fin. Dev.		-0.001***		-0.002***
		(9.61)		(14.49)
Industry Share (Sales)	-1.384***	-1.418***		
	(7.83)	(7.95)		
			-1.017***	-1.025***
Industry Share (VA)			(7.76)	(7.81)
Observations	1786	1786	1770	1770
R-squared	0.120	0.116	0.112	0.114
Diff-in-Diff	1.9%	3.1%	2.8%	4.6%

Table 2.8: Innovation

This table reports results from regressions of innovation within each industry on the interaction of financial market development and industry financial dependence, along with industry fixed effects, year fixed effects, and each industry's yearly size. R&D/sales (assets) is the industry aggregate research and development expenditure over years t to t+5 scaled by aggregate industry assets (sales) in year t. Intangibles growth is the log growth of aggregate industry intangible assets from year t to year t+5. Patent/Employee is the aggregate industry patent grants from year t to year t+5 scaled by aggregate number of employees within the industry at year t. Patent grants data are available from 1976 to 2006. Industry size is measured as the industry's aggregate sales for the year, scaled by the aggregate sales of the entire sample for the year. Financial development index (Fin. Dev.) is the value in year t of the first principal component of five financial market development measures: Market cap/GDP, Dollar value traded/GDP, Turnover, Private credit/GDP and Bank credit/GDP. Industry-level financial and equity dependence variables are based on a sample of Canadian publicly listed firms measured over the entire sample period. Industries are defined by the Fama-French 49 industry classification. Equity dependence (Eq. Dep.) is the industry median of equity issues scaled by capital expenditures. Financial dependence (Fin. Dep.) is the industry median of capital expenditure minus cash flow scaled by capital expenditure. The economic significance is reported in the bottom row, which reports a difference-in-difference estimate (in percentage terms; the differential is scaled by the mean value of the dependent variable) between financially dependent and non-dependent industries during years of high and low equity market development. More precisely, it is a difference-in-difference of the dependent variable of an industry at the 75th percentile level of financial dependence versus an industry at the 25th percentile level of financial dependence, when compared in a year at the 75th percentile of financial market development versus a year at the 25th percentile. Standard errors are cluster by year and by industry. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	R&D / Sales		R&D / Assets		Intangibles Growth		Patent / Employee	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Eq. Dep. * Fin. Dev.	0.011***		0.005***		0.009***		0.318***	
	(10.75)		(5.37)		(3.03)		(7.78)	
Fin. Dep. * Fin. Dev.		0.009***		0.004***		0.012***		0.264***
		(10.96)		(5.18)		(4.02)		(10.66)
Industry Share (Sales)	-0.134	0.052	-0.240	-0.150	-6.429***	-6.413***	49.684***	55.354***
	(1.13)	(0.41)	(1.45)	(0.88)	(3.64)	(3.66)	(5.39)	(5.80)
Observations	1786	1786	1786	1786	1786	1786	1102	1102
R-squared	0.478	0.465	0.287	0.280	0.246	0.247	0.271	0.257
Diff-in-Diff	29.1%	38.7%	12.5%	16.3%	3.2%	6.9%	20.5%	27.6%

Table 2.9: Growth

This table reports results from regressions of aggregate industry growth on the interaction of financial market development and industry financial dependence, along with industry fixed effects, year fixed effects, and each industry's yearly size. Industry aggregate growth is measured as the log change in sales, value-added (VA) or assets from year t to year t+5. VA is operating income before depreciation plus labor and related expenses. Industry size is measured as the industry's market share based on aggregate sales (VA or assets) for the year, scaled by the aggregate sales (VA or assets) of the entire sample for the year. Financial development index (Fin. Dev.) is the value in year t of the first principal component of five financial market development measures: Market cap/GDP, Dollar value traded/GDP, Turnover, Private credit/GDP and Bank credit/GDP. Industry-level financial and equity dependence variables are based on a sample of Canadian publicly listed firms measured over the entire sample period. Industries are defined by the Fama-French 49 industry classification. Equity dependence (Eq. Dep.) is the industry median of equity issues scaled by capital expenditures. Financial dependence (Fin. Dep.) is the industry median of capital expenditure minus cash flow scaled by capital expenditure. The economic significance is reported in the bottom row, which reports a difference-in-difference estimate (in percentage terms; the differential is scaled by the mean value of the dependent variable) between financially dependent and non-dependent industries during years of high and low equity market development. More precisely, it is a difference-in-difference of the dependent variable of an industry at the 75th percentile level of financial dependence versus an industry at the 25th percentile level of financial dependence, when compared in a year at the 75th percentile of financial market development versus a year at the 25th percentile. Standard errors are cluster by year and by industry. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Growth (Sales)		Growth (VA)		Growth (Assets)	
	(1)	(2)	(3)	(4)	(5)	(6)
Eq. Dep. * Fin. Dev.	0.005***		0.011***		0.010***	
	(6.62)		(11.91)		(8.12)	
Fin. Dep. * Fin. Dev.		0.005***		0.011***		0.010***
		(9.82)		(11.59)		(11.92)
Industry Share (Sales)	-5.330***	-5.278***				
	(8.05)	(7.97)				
Industry Share (VA)			-4.540***	-4.443***		
			(5.58)	(5.46)		
Industry Share (Assets)					-6.745***	-6.639***
					(9.34)	(9.19)
Observations	1786	1786	1782	1782	1786	1786
R-squared	0.464	0.466	0.304	0.305	0.345	0.348
Diff-in-Diff	3.5%	5.8%	8.5%	13.8%	6.5%	10.6%

Table 2.10: Robustness Checks

This table repeats the first two regressions in Tables 2.3-2.9 with alternative measures or model specifications. Panel A replaces the financial development index with an equity market development index that is constructed with only firms in the industries that are less equity dependent. We have 38 different industries and this index uses data from the 19 industries whose equity dependence values are below the sample median. Panel B estimates industry external dependence based on U.S. public firms. Panel C includes an interaction between the external dependence measures and GDP growth. Panel D excludes Fama and French industries 7, 30, and 41, which contain the deregulated industries studied in Irvine and Pontiff (2009). In Panel E, we exclude high-tech industries studied in Brown, Fazzari, and Petersen (2009) and Brown and Petersen (2010), i.e. Fama and French industries 12, 35, 37, and 38, which contain the 3-digit SIC industries studied in these papers. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2.10: Robustness Checks (Continued)

Panel A: Equity Market Development Based on Less Equity-Dependent Industries

In Panel A, the equity market development index is calculated with firms from the 19 industries (half of the 38 industries included in the study) with equity dependence values that are below the sample median. We repeat the first two regressions from tables 3-9.

	Equity Issuance		Turnover (Sales)		Variation in Growth (Sales)		Entrance		Herfindahl (Sales)		R&D / Sales		Growth (Sales)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Eq. Dep.* Fin. Dev.	0.007***		0.103*		0.010***		0.036***		-0.002***		0.014***		0.006***	
	(5.44)		(1.79)		(6.00)		(6.10)		(8.91)		(10.00)		(5.71)	
Fin.Dep.* Fin. Dev.		0.007***		0.046		0.008***		0.029***		-0.001***		0.013***		0.007***
		(6.18)		(1.06)		(6.19)		(5.93)		(7.87)		(10.16)		(9.20)
Ind. Share (Sales)	-0.790**	-0.715**	-30.880***	-28.754***	0.404	0.514	12.066***	12.494***	-1.402***	-1.427***	-0.000	0.144	-5.260***	-5.237***
	(2.52)	(2.26)	(2.93)	(2.82)	(1.18)	(1.53)	(4.51)	(4.68)	(7.81)	(7.94)	(0.00)	(1.06)	(7.91)	(7.88)
Observations	1672	1672	1689	1689	1786	1786	1786	1786	1786	1786	1786	1786	1786	1786
R-squared	0.104	0.104	0.071	0.070	0.326	0.324	0.548	0.545	0.117	0.115	0.401	0.393	0.463	0.465
Diff-in-Diff	10.0%	16.3%	1.4%	1.0%	2.4%	3.2%	2.2%	2.9%	2.3%	1.9%	22.4%	33.8%	2.6%	4.9%

Table 2.10: Robustness Checks (Continued)

Panel B: Industry Financial Dependence Based on U.S. Firms

In Panel B, industry financial dependence is estimated with a sample of U.S. publicly listed firms over the sample period 1960-2011. We repeat the first two regressions from tables 3-9.

	Equity Issuance		Turnover (Sales)		Variation in Growth (Sales)		Entrance		Herfindahl (Sales)		R&D / Sales		Growth (Sales)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Eq. Dep.* Fin. Dev.	0.014***		0.230***		0.022***		0.080***		-0.006***		0.024***		0.011***	
	(5.27)		(2.81)		(7.06)		(6.90)		(8.70)		(11.59)		(7.04)	
Fin.Dep.* Fin. Dev.		0.012***		0.230***		0.012***		0.049***		-0.004***		0.015***		0.014***
		(7.75)		(3.88)		(3.37)		(6.21)		(3.92)		(12.83)		(11.26)
Ind. Share (Sales)	-1.146***	-0.999***	-32.758***	-32.285***	0.057	0.480	10.813***	12.164***	-1.092***	-1.188***	-0.391***	0.015	-5.852***	-5.886***
	(3.93)	(3.25)	(3.06)	(3.02)	(0.17)	(1.61)	(4.40)	(4.80)	(7.80)	(8.54)	(3.57)	(0.12)	(8.64)	(8.63)
Observations	1892	1892	1769	1769	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021
R-squared	0.106	0.115	0.065	0.067	0.283	0.268	0.543	0.535	0.071	0.067	0.472	0.389	0.427	0.433
Diff-in-Diff	14.1%	20.5%	2.2%	3.7%	3.8%	3.5%	3.5%	3.6%	4.9%	5.5%	27.1%	28.6%	3.3%	7.2%

Table 2.10: Robustness Checks (Continued)

Panel C: Controlling for GDP Growth

In Panel C, we add interaction variables of U.S. real GDP growth (Real GDP) in year t with either equity dependence, or financial dependence in each regression. We repeat the first two regressions from tables 3-9.

	Equity Issuance		Turnover (Sales)		Variation in Growth (Sales)		Entrance		Herfindahl (Sales)		R&D / Sales		Growth (Sales)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Eq. Dep.* Fin. Dev.	0.005***		0.081**		0.008***		0.033***		-0.001***		0.011***		0.005***	
	(6.04)		(2.09)		(6.64)		(7.18)		(9.99)		(10.80)		(6.80)	
Fin.Dep.* Fin. Dev.		0.005***		0.042		0.007***		0.027***		-0.001***		0.009***		0.005***
		(6.84)		(1.36)		(6.81)		(7.03)		(9.36)		(11.02)		(9.96)
Eq. Dep.* Real GDP	-0.065*		6.213*		-0.084		-0.471		0.013		-0.105*		0.048	
	(1.74)		(1.79)		(0.93)		(1.16)		(0.92)		(1.72)		(0.70)	
Fin.Dep.* Real GDP		-0.053		5.870**		-0.111		-0.338		0.008		-0.088*		0.030
		(1.47)		(2.03)		(1.33)		(1.07)		(0.75)		(1.76)		(0.47)
Ind. Share (Sales)	-0.847**	-0.750**	-31.346***	-28.830***	0.261	0.407	11.362***	12.063***	-1.383***	-1.417***	-0.143	0.045	-5.326***	-5.276***
	(2.67)	(2.35)	(2.96)	(2.82)	(0.79)	(1.25)	(4.44)	(4.63)	(7.83)	(7.95)	(1.20)	(0.36)	(8.03)	(7.95)
Observations	1672	1672	1689	1689	1786	1786	1786	1786	1786	1786	1786	1786	1786	1786
R-squared	0.107	0.106	0.073	0.072	0.337	0.336	0.562	0.556	0.120	0.116	0.482	0.468	0.464	0.466
Diff-in-Diff	11.8%	19.2%	1.8%	1.5%	3.2%	4.6%	3.3%	4.4%	1.9%	3.1%	29.1%	38.7%	3.5%	5.8%

Table 2.10: Robustness Checks (Continued)

Panel D: Excluding Deregulated Industries

In Panel D, we exclude deregulated industries (Fama and French Industry groups 7, 30, 41). We repeat the first two regressions from tables 3-9.

	Equity Issuance		Turnover (Sales)		Variation in Growth (Sales)		Entrance		Herfindahl (Sales)		R&D / Sales		Growth (Sales)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		
Eq. Dep.* Fin. Dev.	0.006***		0.087**		0.008***		0.033***		-0.001***		0.011***		0.005***	
	(6.45)		(2.11)		(7.00)		(7.38)		(11.57)		(10.98)		(6.68)	
Fin.Dep.* Fin. Dev.		0.005***		0.050		0.007***		0.026***		-0.001***		0.010***		0.005***
		(7.30)		(1.48)		(6.99)		(6.94)		(11.19)		(11.21)		(9.65)
Ind. Share (Sales)	-1.270**	-1.146**	-39.594**	-36.097**	0.402	0.584	16.440***	17.316***	-2.111***	-2.146***	-0.167	0.054	-5.798***	-5.737***
	(2.29)	(2.05)	(2.51)	(2.34)	(0.80)	(1.15)	(4.87)	(5.10)	(10.20)	(10.39)	(0.86)	(0.27)	(6.17)	(6.10)
Observations	1540	1540	1548	1548	1645	1645	1645	1645	1645	1645	1645	1645	1645	1645
R-squared	0.109	0.108	0.071	0.070	0.323	0.321	0.567	0.561	0.147	0.145	0.486	0.475	0.452	0.453
Diff-in-Diff	14.3%	19.4%	1.9%	1.8%	3.3%	4.6%	3.4%	4.4%	1.9%	3.0%	27.3%	40.3%	3.6%	5.8%

Table 2.10: Robustness Checks (Continued)

Panel E: Excluding High-Technology Industries

In Panel E, high-technology industries (Fama and French industries 12, 35, 37 and 38) are excluded from the sample. We repeat the first two regressions from tables 3-9.

	Equity Issuance		Turnover (Sales)		Variation in Growth (Sales)		Entrance		Herfindahl (Sales)		R&D / Sales		Growth (Sales)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		
Eq. Dep.* Fin. Dev.	0.005***		0.154***		0.011***		0.040***		-0.001***		0.012***		0.005***	
	(5.18)		(3.22)		(8.21)		(9.03)		(10.90)		(12.35)		(6.95)	
Fin.Dep.* Fin. Dev.		0.005***		0.102**		0.009***		0.034***		-0.0004***		0.010***		0.006***
		(6.52)		(2.52)		(7.94)		(10.63)		(5.07)		(13.08)		(10.79)
Ind. Share (Sales)	-0.959***	-0.885***	-34.602***	-31.373***	0.153	0.343	11.175***	11.809***	-1.398***	-1.445***	-0.305**	-0.122	-5.417***	-5.375***
	(3.37)	(3.10)	(3.13)	(2.94)	(0.43)	(1.01)	(4.48)	(4.63)	(7.71)	(7.82)	(2.52)	(0.98)	(8.09)	(8.00)
Observations	1496	1496	1501	1501	1598	1598	1598	1598	1598	1598	1598	1598	1598	1598
R-squared	0.098	0.099	0.087	0.084	0.339	0.331	0.551	0.548	0.112	0.106	0.528	0.488	0.454	0.456
Diff-in-Diff	12.7%	20.7%	3.4%	3.7%	4.5%	6.0%	4.2%	5.8%	1.9%	1.2%	44.0%	59.5%	3.6%	7.1%

Figure 1.1: Timeline

Quarter *t*: The period for which earnings surprise (*Surprise(t)*) is measured
Quarter *t+1* (the announcement quarter): The period during which investors learn about *Surprise(t)*
Quarter *t+2* (the post-announcement quarter or the drift quarter): the period during which stock returns, i.e. PEAD, are measured against *Surprise(t)*

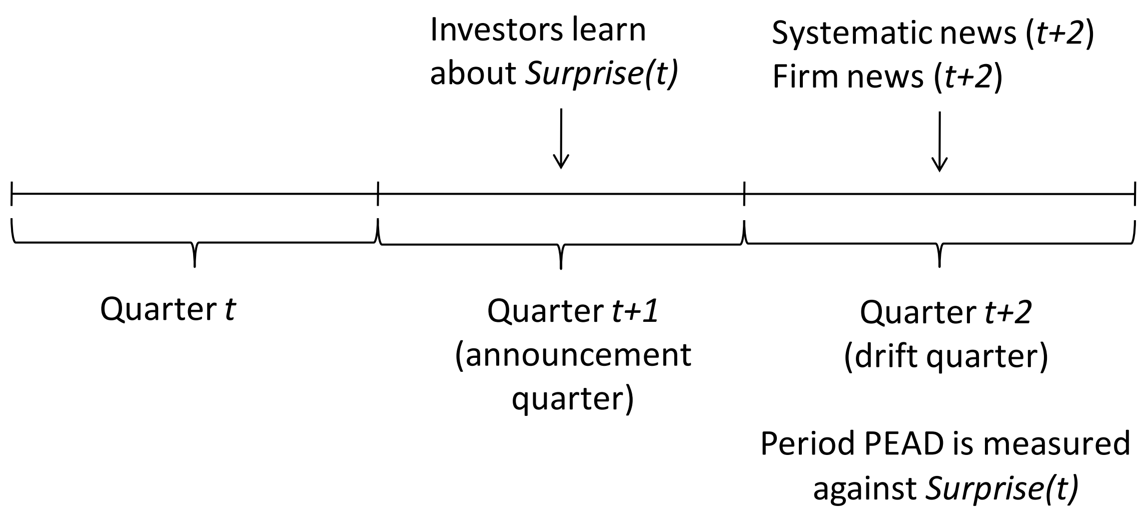


Figure 1.2: Price Responses to Firm and Systematic News in the Drift Period

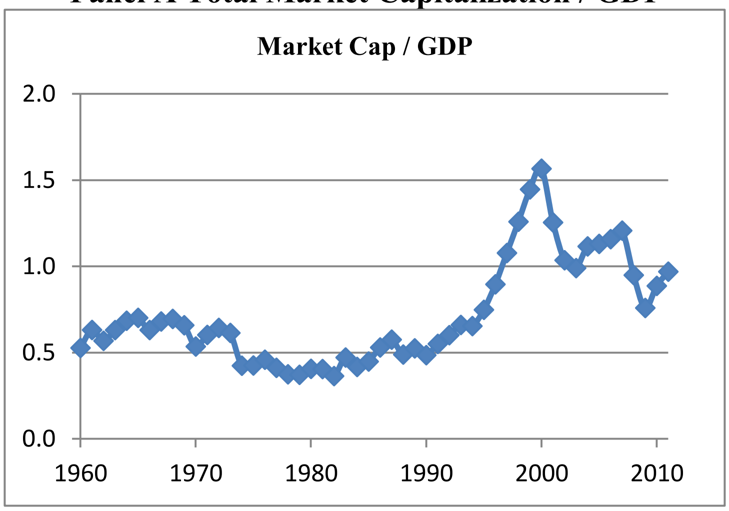
Quarter *t*: The period for which earnings surprise (*Surprise(t)*) is measured
Quarter *t+1* (the announcement quarter): The period during which investors learn about *Surprise(t)*
Quarter *t+2* (the post-announcement quarter or the drift quarter): the period during which stock returns, i.e. PEAD, are measured against *Surprise(t)*

Positive Surprise(t)	Drift-period news: *s(t+2)*	Price response to *s(t+2)*: *R(t+2)*	Combined price response: *R(t+2)*	
↑	Firm ↑ Systematic ↑	Firm ↑ Systematic ↑	↑↑	**Same direction:** Stronger PEAD (**"drift with a lift"**)
↑	Firm ↑ Systematic ↓	Firm ↑ Systematic ↓	↑↓	**Different direction:** Weaker or reversed PEAD (**"drift with a drag"**)

Figure 2.1: Equity Market Development Measures (1960 - 2011)

The three panels in Figure 2.1 show the three yearly equity market development measures for the period 1
960-2011 in the U.S. Panel A plots the first measure: total market capitalization, scaled by GDP. Yearly market capitalization is estimated by the mean of monthly aggregate market capitalizations of the 12 months in a year. Panel B plots the second measure: dollar value of shares traded scaled by GDP. Dollar value of shares traded is simply the annual aggregate dollar trading volume, scaled by GDP. Panel C plots the third measure: total turnover. We first calculate each firm's monthly share turnover as shares traded in the month scaled by total shares outstanding, and then average the monthly share turnover values across firms to obtain the cross-sectional mean of monthly turnover. The yearly turnover shown in Panel C is calculated as the average of the 12 monthly turnover values in a year multiplied by 12. Data source: CRSP.

Panel A Total Market Capitalization / GDP



Panel B Total Dollar Value of Shares Traded / GDP

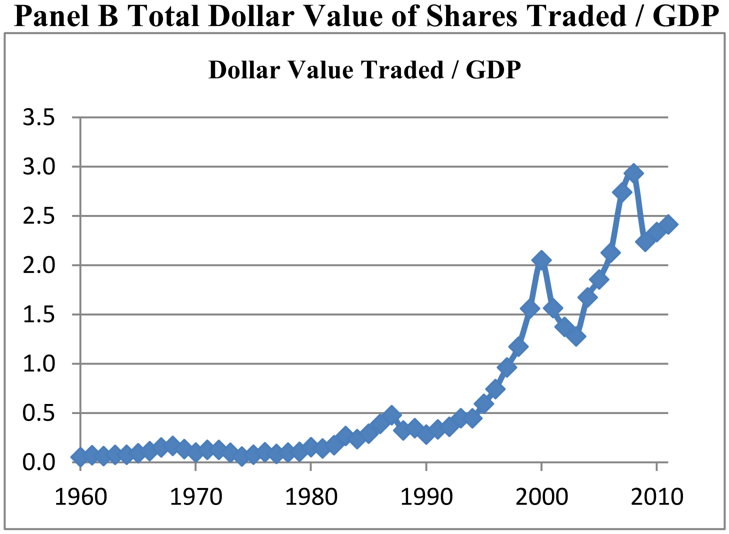


Figure 2.1 (Continued)

Panel C Total Turnover

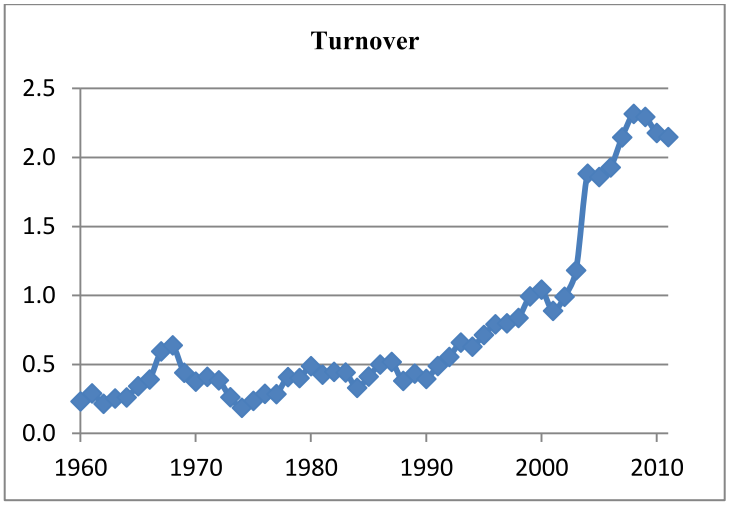
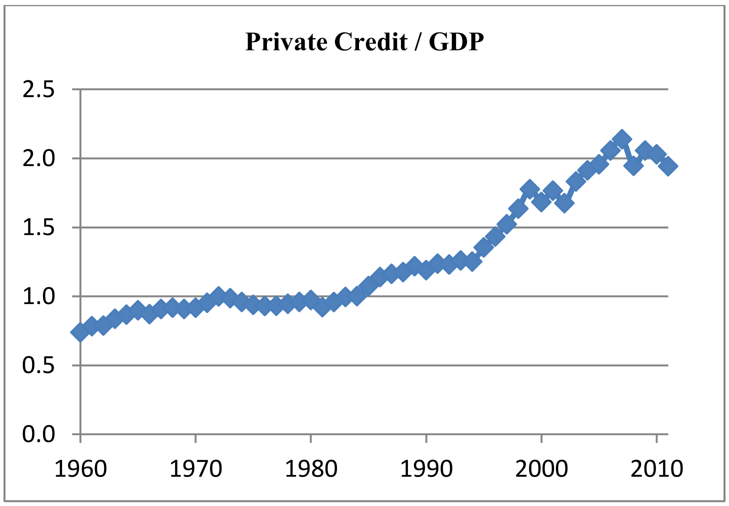


Figure 2.2: Credit Market Development Measures (1960 - 2011)

The two panels in Figure 2.2 show the two yearly credit market development measures for the period 1960-2011 in the U.S. Panel A plots the first measure: total amount of private credit in the economy, scaled by GDP. Private credit refers to domestic credit provided to the private sector through loans, purchase of nonequity securities, trade credits and other accounts receivable. Panel B plots the second measure: the total amount of bank credit in the economy, scaled by GDP. Bank credit refers to domestic credit provided by the banking sector, which includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. Data source: World Bank Development Index Database.

Panel A Total Private Credit / GDP



Panel B Total Bank Credit / GDP

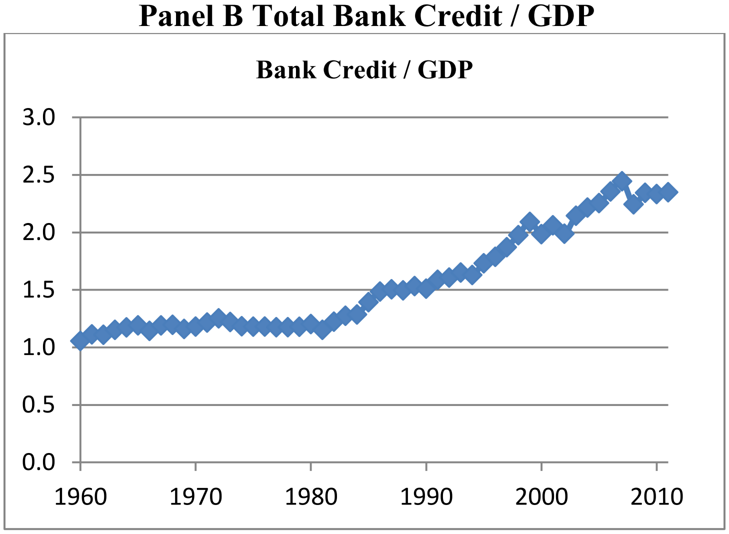


Figure 2.3: Overall Financial Development Index (1960 - 2011)

Figure 2.3 plots the overall financial development index for the period 1960-2011 in the U.S. The financial development index is the first principal component of the five indices shown in Figures 1 and 2.

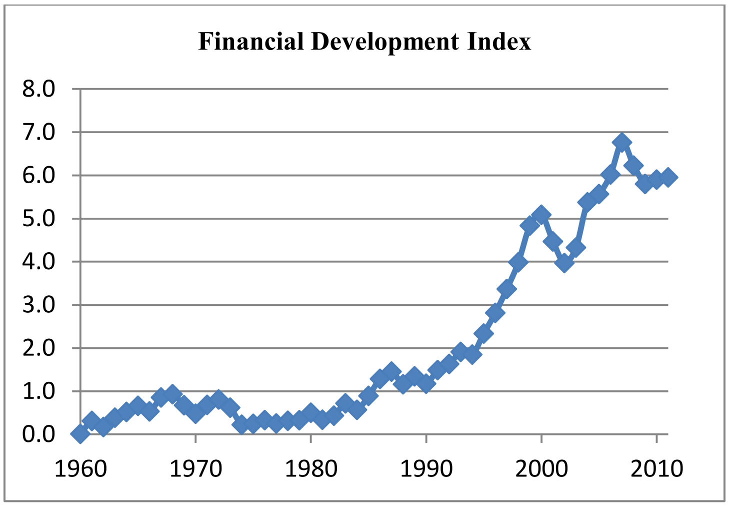
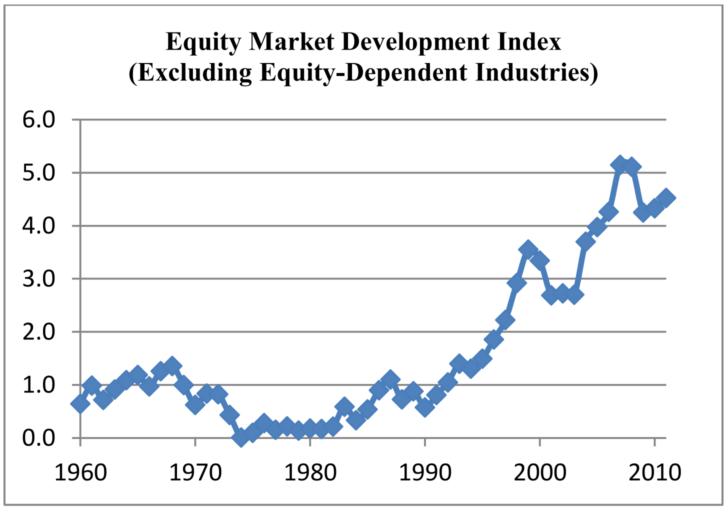


Figure 2.4: Equity Market Development Index that Excludes Equity-Dependent Industries (1960-2011)

This alternative equity market development index is constructed using only firms from the 19 industries (half of the 38 industries included in the study) with equity dependence values below the sample median (less equity-dependent industries). We first obtain the three equity market development measures shown in Figure 2.1 based on firms in less equity-dependent industries and then extract the first principal component of these three indices to obtain the alternative equity market development index.



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