THREE ESSAYS IN CORPORATE FINANCE

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This dissertation explores three different aspects in corporate finance. My first essay explores governance from the side of blockholders. My second essay explores governance from the side of the Securities and Exchange Commission (SEC). And my third essay overview and summarizes recent literature in the IPO field.

In Chapter 1, "Blockholder Diversity: Effect of Polyphony on the Power of Monitoring", I investigate how the differences in skill, incentives and preferences between large shareholders in the company affect the power of their monitoring. My findings suggest that diversity between blockholder creates disagreement that have strong negative influence of the power of their governance. Such adverse influence is also reflected in the future dynamics of company value and performance.

In Chapter 2 (joint with Michelle Lowry and Roni Michaely) "Information Revelation Through Regulatory Process: Interactions Between the SEC and Companies Ahead of the IPO", we explore the main determinants of extensiveness and focus of SEC review of companies before they go public. In the second part of this chapter we explore what investors could learn from the information disclosed during this review process.

In Chapter 3 (joint with Michelle Lowry and Roni Michaely) "Initial Public Offerings: a Synthesis of the Literature and Direction for Future Research" we provide a literature review of recent papers in the IPO field. In addition, we also explore how the main stylized facts behave of the large sample of IPOs between 1972 and 2015.

BIOGRAPHICAL SKETCH

Ekaterina Volkova was born Moscow just before the crash of USSR in the family of Ludmila and Fedor Volkov both of whom were finishing their undergraduate studies in Moscow State University. Since the early childhood Ekaterina showed high level of curiosity toward the exact sciences and attended a math-oriented school. Due to her achievements of math Olympiads she was accepted to a very selective boarding school that was founded by Andrey Kolmogorov, one of the most influential mathematicians and statisticians of the XX century.

She graduated from Kolmogorov's high school in 2006 and was accepted without exams on the full scholarship to the Department of Mechanics and Mathematics of Moscow State University (MSU), the older university in the country. In her undergraduate studies Ekaterina mostly focused in operation research, statistics and stochastic analysis. Game and Choice theory courses, which Ekaterina was taking in her later years in MSU developed her interest in economics and finance, and she decided to study these subjects in more details.

Simultaneously with her last year of MSU Ekaterina started a master degree in New Economic School (NES), young graduate school in modern economics. Education in NES developed her interest in finance and the atmosphere in the school encouraged her apply for Ph.D. program abroad. Following this desire, Ekaterina started her Ph.D. in SC Johnson College of Business, Cornell University in 2012.

This dissertation is dedicated to my parents, Ludmila and Fedor Volkov.

ACKNOWLEDGMENTS

First, I want to thank my advisor, Roni Michaely for the unlimited research and emotional support during the years in the graduate school. He always encouraged me during the moments of desperation and challenged my research on all stages of its development. I am very grateful for his ability to always find time for a conversation in his busy schedule and to all the trust he put in me during the program.

Second, I want to thank Michelle Lowry with whom I was lucky to work for several years. Professor Lowry gave me a role-model example on how a researcher should know all the minute details of the data and should be able to place her the results in the context of latest finding in the literature. Aside from the joint work, I am very grateful for

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CHAPTER 1

BLOCKHOLDER DIVERSITY:
EFFECT OF POLYPHONY ON THE POWER OF MONITORING

Abstract

According to my new and extensive data on all US public companies, the majority of them have multiple blockholders. These blockholders could differ along several characteristics even within one company. Diversity between blockholders within one firm could have a positive and synergistic impact on its value. Alternatively, conflicting objectives and interests may cause diversity to adversely impact company operations. To investigate the resulting impact of blockholders diversity on the company value, I construct diversity measures reflecting their heterogeneity in identity, portfolio size an investment horizon. Using shocks from blockholder acquisitions of financial firms and unexpected increases in payouts they receive from other positions to identify the causality channel, I find that block diversity has a strong negative influence on company value and operations. This result is robust to a variety of specification and to exclusion of different groups of blockholders. Additionally, I use simulated placebo tests to reject alternative explanations of the results with other observed and unobserved characteristics of block ownership.

Introduction

"Perhaps the most important evidence about blockholders is their wide prevalence" (Edmans and Holderness (2016), p. 42). Indeed, according to a new and

extensive dataset, a typical US public company has four blocks on average.[1] These blocks are held by different types of owners. Block owners may differ in whether they are the agent or the owner, and they may also vary in the size of their portfolio and investment horizon. The theoretical and empirical literature covers the impact of the level of block ownership on company characteristics.[2] And while some evidence suggests variation in the influence between certain groups of blockholders, there is no research on how the simultaneous presence of different blockholders affects company value.[3] This paper investigates the causal effect of blockholders' diversity on company value and performance.

This work has four main contributions to the literature. First, I show that diversity among blockholders has a negative impact on form value and investigate potential mechanism behind it. Second, the paper constructs a comprehensive and unique dataset that covers every block position in all US public companies between 1998 and 2013. Block ownership information is extracted with a sequence of custom parser scripts from the disclosures under Section 13 of The Securities and Exchange Act of 1934 ("SEA"). In total, the constructed dataset contains details of 179,120 block

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1 Throughout the paper, I use the term "blockholder" to refer to an entity that owns more than 5% of firm's shares outstanding, and thus files Schedule 13D or Schedule 13G forms. Share ownership is defined in Rule 13d-3(a) (§ 240.13d-3(a)) of the Securities Exchange Act of 1934.

2 Kahn and Winton (1998), Shleifer and Vishny (1986), Admati, Pfleiderer, and Zechner (1994) theoretically explore the ability of a single large blockholders to influence the company. Laeven and Levine (2008), Konijn, Kraussl, and Lucas (2011), Maury and Pajuste (2005) empirically investigate how block ownership and block concentration are relate to company value.

3 Cronqvist and Fahlenbrach (2009) detect a significant heterogeneity in between the impact of blockholders on company value. Brav et al. (2008) explore the special role of hedge funds in monitoring, Faccio, Marchica, and Mura (2011) show how influence of a blockholder depends on his level of diversification, Fich, Harford, and Tran (2015) suggest that a blockholder's incentives to monitor a company is determined by the relative weight of the company in his portfolio.

positions and 35,024 blockholders in 15,157 companies. Third, I build three measures of block diversity that capture differences in preferences between company blockholders. Lastly, this paper constructs two instrumental variables for the level of block ownership and block diversity. One instrumental variable exploits time variation in the payouts that blockholders receive on their other block positions. The second instrument captures the creation of new blocks and the increase in existing block positions from the acquisition of financial firms. Both instruments are valid for a set of block ownership characteristics and could be used in other studies.

Diversity between blockholders could have a two-sided effect on company governance and value. On the one hand, interactions between blockholders that possess different information and skills might have a synergistic effect. Having variety in their expertise might help them detect and implement policies that would maximize company value. For instance, Appel, Gormley, and Keim (2016) show that passive institutional ownership increases the chances of activists gaining board representation. Also, the presence of one type of blockholder could discipline the behavior of other types of blockholders. For example, the model in Dhillon and Rossetto (2015) suggests that entrance of a diversified blockholder could offset the value-destructive influence of a non-diversified blockholder.

Alternatively, diversity among a company's blockholders could adversely impact their influence on company value. While all shareholders prefer higher returns on their investment, differences in their beliefs, horizons, and risk attitudes could create discrepancies in their views on the desired policies. For instance, long-term investors

favor investment in R&D, while investors with short horizons prefer acquisition from external sources (Hoskisson et al. (2002)). Blockholders with higher heterogeneity in characteristics are more likely to vary in their objectives, and consequently prefer different corporate policies. Disparity and potential contradictions in blockholders' agendas may lower each blockholder's chances to achieve their desired changes.

Building on the previous literature, I measure diversity across three components: blockholder type, portfolio size, and investment horizon.

The first measure, diversity in identity, divides blockholders into four groups: financial institutions, individuals, activists investors, and other corporations. This division of blockholders originates in the work of Barclay and Holderness (1989). Blockholders in these groups differ in their regulatory constraints, fiduciary responsibilities and agency problems (Diamond (1984)). And according to Cronqvist and Fahlenbrach (2009) these groups have a pronounced difference in their impact on the corporate policies. More than two-thirds of US companies have blockholders from two of the groups described above, and around one-fifth of companies have blockholders from three groups.

The second diversity component accounts for differences in portfolio size among company blockholders. The size of a blockholder’s portfolio influences his preferences over the desired level of company diversification (Faccio, Marchica, and Mura (2011)), and affects the intensity and power of his monitoring. Blockholders with larger portfolios could be less involved in the monitoring of a particular company because their portfolio returns are less sensitive to the performance of any particular

company (Fich, Harford, and Tran (2015)) or because they shift attention to other stocks in his portfolio (Kempf, Manconi, and Spalt (2016)). The power of monitoring, on the other hand, might increase with the number of blocks in the portfolio (Edmans, Levit, and Reilly (2016)). Thus, blockholders with different portfolio sizes vary in both whether they prefer a company to take additional risk and in their monitoring approach.

The third measure of diversity divides blockholders into groups by their investment horizon. Investors with different horizons vary in their preferences over investment and payout policies (Derrien, Kecskes, and Thesmar (2013)), opinions about company acquisition (Gaspar, Massa, and Matos (2005)) and monitoring styles (Gallagher and Gardner (2013) and Chen, Harford, and Li (2007)). To capture described heterogeneity in preferences, I separate blockholders into four groups based on their investment horizons, and measure the diversity among these groups.

Each diversity component represents the variation in skills and preferences between investors. Described heterogeneity between blockholders could either enhance or impair impact of their monitoring. In the initial predictions, I am agnostic about the resulting effect of diversity. For each source of diversity, I construct a variable that captures differences in the control rights between blockholders of various types.

I establish the causal effect of diversity with the use of instrumental variables. Ideal instruments should provide identification for two variables: level of block ownership and diversity between blocks. These two variables change when either a

new block enters a company or some of the existing blocks change in size. I capture the described changes with two instruments that are built on the payouts blockholders receive from cross-held companies and their acquisitions of financial firms.

The first instrument captures exogenous variation from payouts blockholders receive on their positions in other companies. Received payouts would predict changes in block positions under the following two conditions: 1) at least a part of a payout is allocated back into the blockholder's portfolio, and 2) larger payouts result in more reinvestment. Reinvestment of payouts could result either in the creation of new blocks in different companies or in a change of the size of existing blocks. And both of these changes would affect the level of block ownership and diversity between blocks.

The construction of the instrument relies only on payouts from other companies and does not include payouts from the company itself; thus, the instrument is unlikely to be affected by any characteristics of the company of interest. To further ensure that the exclusion restriction holds and that the instrument is not related to unobserved characteristics of blockholders, I measure the instrument based only on payouts received by blockholders whot are less prone to affect corporate policies.

The idea for the second instrumental variable originates from the work of Hong and Kacperczyk (2010). This instrument indicates whether one of the company's blockholders acquired a financial firm during the previous year. After the acquisition, the portfolio of the target company would be combined with the portfolio of the acquirer. If a target firm has any holdings in the companies where the acquirer had a block, then the size of his block position would increase. Additionally, combining both

portfolios might result in new blocks. My analysis shows that company block ownership increases by almost 3% when one of its blockholders acquires a financial firm. An increase in the position of one of the company's blockholders would impact measures of block diversity. Statistical tests also support the intuition for the relevance condition for both instruments.

Acquisition is a long, complex, and costly process, and it is implausible that a blockholder would initiate it mainly to increase one of his portfolio positions. Therefore, this instrument is unlikely to be correlated with any characteristics of the company. I limit the instrument construction to a subset of blockholders that are less prone to have a distinctive impact on corporate policies. The independence of the instrument from both companies' and blockholders' characteristics suggests that the exclusion restriction should hold.

My analysis finds that diversity among company blockholders negatively affects its value. This effect has a strong statistical significance across all diversity measures. Economic magnitude of the predicted causal impact is similar for all three measures: one-standard-deviation increment in diversity lowers company value by 0.27 standard deviations. The difference between observed partial correlation and estimated causal effect of diversity on company value indicates a presence of strong selection bias in blockholder's decision to enter the company. My paper predicts that blockholder would decide to enter a company where other large shareholder differ from him in preferences only when he has expectations that the company value would increase in

the future. Also I find a similar negative effect of blockholder diversity on return on assets and free cash flow of the company.

In addition to establishing of the aggregate effect of block ownership on the company value and performance I investigate a potential mechanism behind this effect. My results suggest propose that the negative influence of diversity comes from the difference in views between blockholders. First, I show that the level of disagreement between blockholders rises after the increase of diversity. Also, I document that increase in diversity leads to more shareholder proposals in a company, but each of this proposals receive lower support. These findings suggest that heterogenous group of shareholders tend to pull company in different directions, but each direction receives lower support. My results also indicate that such disintegration in monitoring lowers level of company investment.

To ensure that the results are not driven by the presence of one particular type of blockholder, I repeat the entire analysis excluding certain groups of blocks. The first test estimates diversity measures, block ownership, and instrumental variables for a subsample of non-institutional blockholders only, and repeats my paper's analysis for this new set of variables. This test detects that even diversity between non-institutional blockholders lowers the value of the company. The second test investigates the impact of diversity when blockholders from the top quantile (by the size of their portfolio) are excluded. And the third test omits blockholders in the top quantile of their investment horizon from the analysis. Furthermore, the second and third tests also show that

diversity between selected subsamples of blocks has a negative impact on company value.

Additionally, I verify that my results are not driven by other components of block ownership, such as block concentration or unobserved characteristics of the blocks. To reject this set of alternative explanations, I use 100,000 simulations of placebo diversity; in each simulation, I randomly divide company blocks into four groups and calculate the placebo diversity measure based on these groups. For every generated placebo diversity I estimate its influences on company value. Comparing the main results of my paper with the results of simulations, I find that the effects of three "real" diversity variables are stronger than 98% of simulations. These simulations address concerns that my results could be explained by omitted variables that are related to company block ownership.

Another contribution of my paper is a collection of detailed information about block ownership in every US public company between 1998 and 2013. To the best of my knowledge, this is the first study of block ownership that includes all publicly listed US companies. To construct this dataset, I download and process 579,249 forms filed under Sections 13(d) and 13(g) of SEA using a set of custom parser scripts. My dataset extends the conclusions in Holderness (2009): not only are blocks present in the majority US companies, but more than 80% of companies have multiple blocks. And both the average number of blocks and the level of block ownership in US companies has risen over time. Surprisingly, blocks are more common in medium-size companies than in small or large companies. And only half of all blocks belongs to

institutional investors. Compared to the European data on block ownership, US blocks are relatively small in size and rarely held by both inside and outside individuals.

Hypotheses

Blockholders can influence the value of the company and affect its policies. They can exert the governance through intervention (Shleifer and Vishny (1986) and Admati, Pfleiderer, and Zechner (1994)) and discipline the management with the threat of exit (Admati and Pfleiderer (2009); Edmans (2009); Bharath, Jayaraman, and Nagar (2013)). Several models suggest that the power of a single large shareholder to improve the value of the company rises with the size of his stake (Shleifer and Vishny (1986); and Admati, Pfleiderer, and Zechner (1994); and Kahn and Winton (1998)). But cases of sole large blockholders are relatively rare: less than 10% of US companies in the recent years have just one block.[4] The majority of US companies have several blockholders, and interactions between them could also affect the ability of this group to control the management (Crane, Koch, and Michenaud (2015)).

A number of previous studies have documented a correlation between the value of the company and the characteristics of its block ownership in multiple countries. The value of the company is positively related to block ownership concentration in US companies (Konijn, Kraussl, and Lucas (2011)), the presence of the second large blockholder in European companies (Laeven and Levine (2008)) and a more equal distribution of cash flow rights between two largest block sizes in Finnish companies

4 This estimate is based on the data in my sample; see Figure 1.1.

(Maury and Pajuste (2005)). In addition to company value, the presence of the multiple blockholders has been linked to changes in dividend payouts (Faccio, Lang, and Young (2001)), an increase in corporate risk taking (Mishra (2011)) and a higher level of shareholders protection (Barroso Casado et al. (2015)). Bharath, Jayaraman, and Nagar (2013) show that the power of the "threat of exit" monitoring increases with the number of blocks.

The previously cited papers have mostly focused their analysis on the characteristics of the block position, and rarely account for the characteristics of the block owner. However, large investors vary in the their beliefs, expertise, preferences, and also in the way they influence the company. This is supported by Cronqvist and Fahlenbrach (2009), who discovered that there is significant heterogeneity in the investment and governance styles between different types of blockholders. To the best of my knowledge, this is the first paper that estimates the effect of block diversity on the value of the company.

The idea that shareholders are heterogeneous is not new to the finance literature. For instance, shareholders vary in their valuation of a company (Bagwell (1992)) and in their reaction to corporate news (Hotchkiss and Strickland (2003)). This idea also finds reflection in other business disciplines. Paper in the strategy literature indicate the variety of the effects different investors have on the innovations (Hoskisson et al. (2002)), international diversification (Tihanyi et al. (2003)), and firm strategy (Connelly et al. (2010)).

What should the direction of diversity impact on the outcome? Review paper by Williams and O'Reilly (1998) suggests that diversity in a group could have a dual impact on the outcome: it can either improve it through the synergy between the group members, or worsen it because of communication difficulties. Similar predictions hold in the application of diversity influence to a group of blockholders. On the one hand, a more diverse group of stakeholders posses a wider set of potentially relevant information, and they could employ multiple methods to influence the company. On the other hand, a diverse group of blockholders could have the opposite views on the company's optimal growth and development strategy. Additionally, the more diverse the group is, the higher are the coordination difficulties between agents. And, consequently, the aggregate power of governance could be lower with a diverse group of blockholders.

Hypothesis I (Benefits of Diversity)

Diversity between blockholders could have a synergistic impact on their effectiveness. Studies in the organization behavior find that more heterogeneous groups of agents have an advantage in problem solving. The studies originated from Hoffman and Maier (1961) experiment, in which a more heterogeneous group of agents outperformed a homogenous group. Theoretical model by Hong and Page (2004) shows that a heterogeneous group of agents even outperforms a homogeneous group of agents that have better problem-solving abilities. This conclusion suggests that diversity in a group of blockholders could enhance their abilities to resolve potential problems in the company, such as extraction of private benefits by

management. Heterogeneous blockholders could also cross-monitor each other's actions and diminish potential negative influence (Dhillon and Rossetto (2015)).

Additionally, blockholders in a more heterogeneous groups tend to have greater variance in their levels of expertise. For instance, passive mutual funds could impact the management through private communication, and an individual blockholder could expert in the gathering of information about the company. As a result, a group of diverse blockholders in the company could possess more information and have more potential expertise in monitoring the management, which could enhance the power of their governance. For instance, Appel, Gormley, and Keim (2016) find that the presence of passive investors increases the chances of activist investors to improve governance of the company.

Lastly, heterogeneous blockholders could also vary in their valuation of the company. Miller (1977) model states that higher heterogeneity of in the beliefs about the company value makes short positions more expensive, and thus increases the price of the stock. Studies by Chen, Hong, and Stein (2002) and Diether, Malloy, and Scherbina (2002) find empirical support for this model the based on breadth of mutual fund positions in the company and analysts disagreements.

Hypothesis I. Higher heterogeneity among large investors has a positive impact on the value of the company

Hypothesis II (Costs of Diversity)

Alternatively, diversity between blockholders could adversely impact value of the company. An adverse effect of heterogeneity could come through two main channels: conflict of interests between blockholders and coordination/communication difficulties between them.

Diversity between large shareholders signals that they are heterogeneous in their beliefs, skills, and preferences. Their views on whether a company should take a project or adopt a new policy could vary as well. For instance, Hoskisson et al. (2002) find that in respect to innovation policies, public pension funds favor investments in R&D, while professional investment fund managers support the acquisition of innovations from external sources. Such a range of opinions creates a conflict of interests between the blockholders, and could decrease their governance.

Coordination difficulties between the different type of blockholders could also potentially decrease their ability to monitor the company. Laeven and Levine (2008) study suggests that large shareholders are less likely to cooperate when they vary in type. Crane, Koch, and Michenaud (2015) find that closely connected groups of investors have greater chances of improving the governance of the company. Coordination problems could appear even within the same class of investors: Huang (2016) finds that institutional investors' monitoring power increases as communication between them becomes easier. Communications difficulties for blockholders could play an even larger role because these agents do not have special meetings or other discussion platforms.

The homogeneity of blockholders' preferences could also lead to a more uniform exit decision. This similarity in the exit decisions could also improve the "threat of exit" governance of the group (Edmans and Manso (2011)).

This hypothesis is also consistent with the findings of Kandel, Massa, and Simonov (2011). They find that Swedish companies whose small investors are more similar in terms of age, wealth, and location have higher profitability and returns.

Hypothesis II. Heterogeneity between the blocks in the company lowers its value

Data

My sample is pulled from CRSP-Compustat Merged database over the period from 1998 through 2013. The start of the sample coincides with the earliest availability of reliable information about block purchases. The blockholders' information was collected using the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) of the U.S. Securities and Exchange Commission (SEC). Institutional and insider ownership is obtained from Thompson Reuters database. Information about M&A deals is taken from SDC Platinum database.

I collect block ownership information from the disclosures under Sections 13(d) and 13(g) of SEA. These sections obligate shareholders to file a Schedule 13 when their position in a public company rises above 5%. In case of material changes, they have also to file amendements to the schedules. There are two types of Schedule 13 filings: the more extensive Schedule 13D and the short-form Schedule 13G. The type of form and reporting rules depend on multiple factors, such as identity of investor,

size of his stake, and the intentions of his purchase. Despite the variation in the disclosure rules, all forms include detailed information about the investor, block size, date of the event, name, and CUSIP code of the company. Amendments to both types of forms have to be filed at least once a year if substantial changes occur.

I download all Schedules 13 and their amendments filed between 1995 and 2014 from the EDGAR system and remove duplicated filings and filings triggered by stock buybacks.[5] The described parameters limit the dataset of raw filings to 579,249 forms. All filings follow SEC guidance and have a similar structure; however, the exact wording of the form may vary across blockholders. I develop a set of custom parser scripts that accounts for the variation in the form templates. My scripts are adjusted for more than 200 different templates in the Schedule 13 filings. With the use of these parser scripts, I extract details about the company, blockholder, and size of the block position. On the next step, I construct a dataset that indicates the position of every blockholder at the end of each calendar year.[6]

In total, the extracted data includes information about 35,024 blockholders in 15,157 different companies. Most of these blocks have medium size: 96% of blockholders hold less than 20% of shares outstanding.

5 Most of the filings appear in the EDGAR server at least twice: in the directory of the investor and the directory of the company.

6 A more detailed description of the data collection and git hub directory with the code is available on my website www.evolkova.info

I append block ownership information to the dataset pulled from CRSP-Compustat Merged Database between 1998 and 2013. I use the following criteria to construct my sample:

1. Shares of the company are traded on NYSE, NASDAQ, and AMEX exchanges.

2. I use following variables in my analysis: price and number of shares at the year end, sales, total assets, fixed assets, capital expenditures, Tobin's Q, ROA and FCF. I exclude observations in which this information is missing.

3. Every company in my sample should disclose their information with the SEC. I exclude companies that do not have annual reports in their SEC directory.

4. I exclude companies in the finance (SIC between 6000 and 6999) and utilities (SIC between 4900 and 4999) industries.

My sample contains 51,708 observations between 1998 and 2013 for 6,316 unique firms. Figure 1.1 provides the distribution of the number of the blocks per company by year. Panel (A) suggests that the average number of blocks in US public companies increases over the years. The portion of companies without a block drops from 14% in 1998 to 5% in 2013. At the start of my sample less than one third of companies had

four or more blocks, and this number rises to 59% by the sample's end.[7] Panel (B) shows similar dynamics in the constant sample of 1,865 companies.

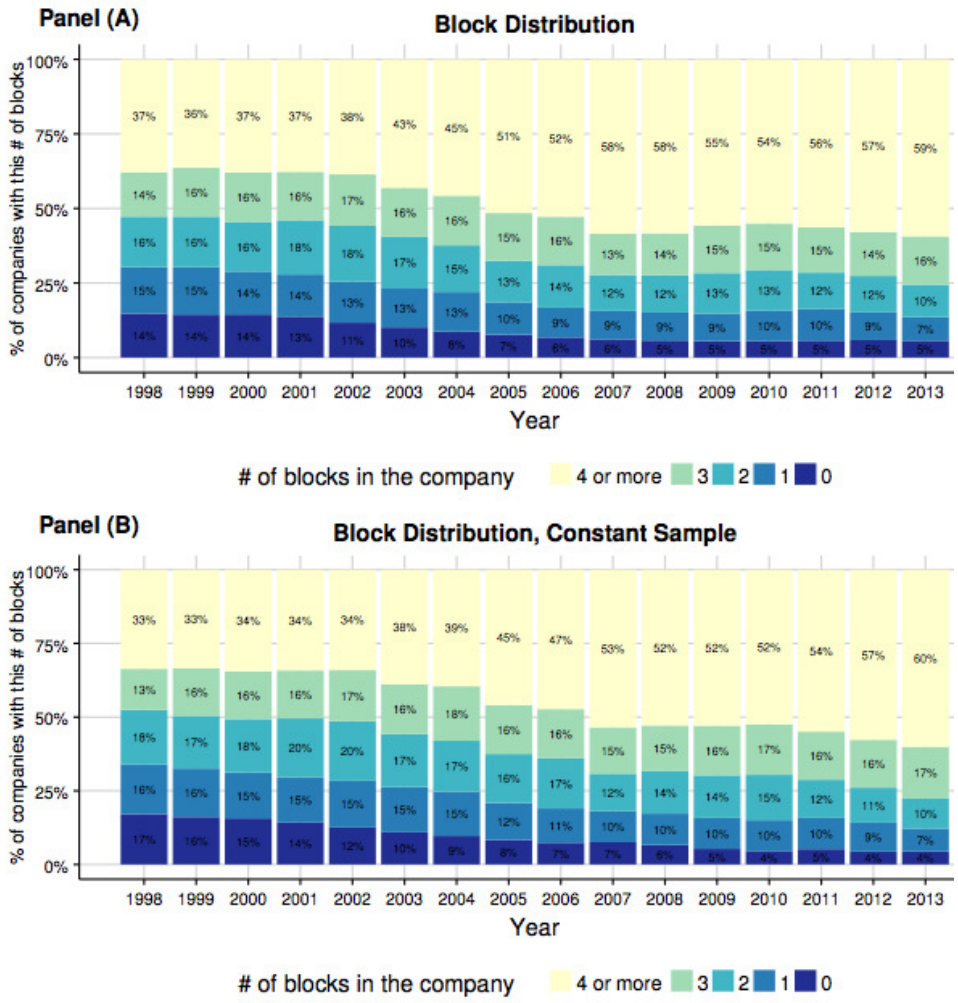

Figure 1.1 Block Distribution.

7 This result is similar to Holderness (2009) who explored the proxy statements of 376 US public companies and documented that 96% of them have at least one blockholder. Potential disparity with regarding the portion of companies without any blocks could be related to the matching SEC and Compustat information for these companies. As for the companies with at least one block I use CUSIP information from Schedule 13, but for the companies with 0 blocks I rely on the WRDS link database between Compustat and SEC EDGAR.

According to Panel (A) of Figure 1.2, the average number of blocks in a US public company rises from 2.9 in 1998 to 4.1 in 2013. Institutional investors hold around half of the blocks on average. Panel (B) shows that the average block ownership increases from 24% in 1998 to 31% in 2013. Institutional block ownership increases form 10% to 17% and non-institutional block ownership varies between 12% and 14% during the sample years.

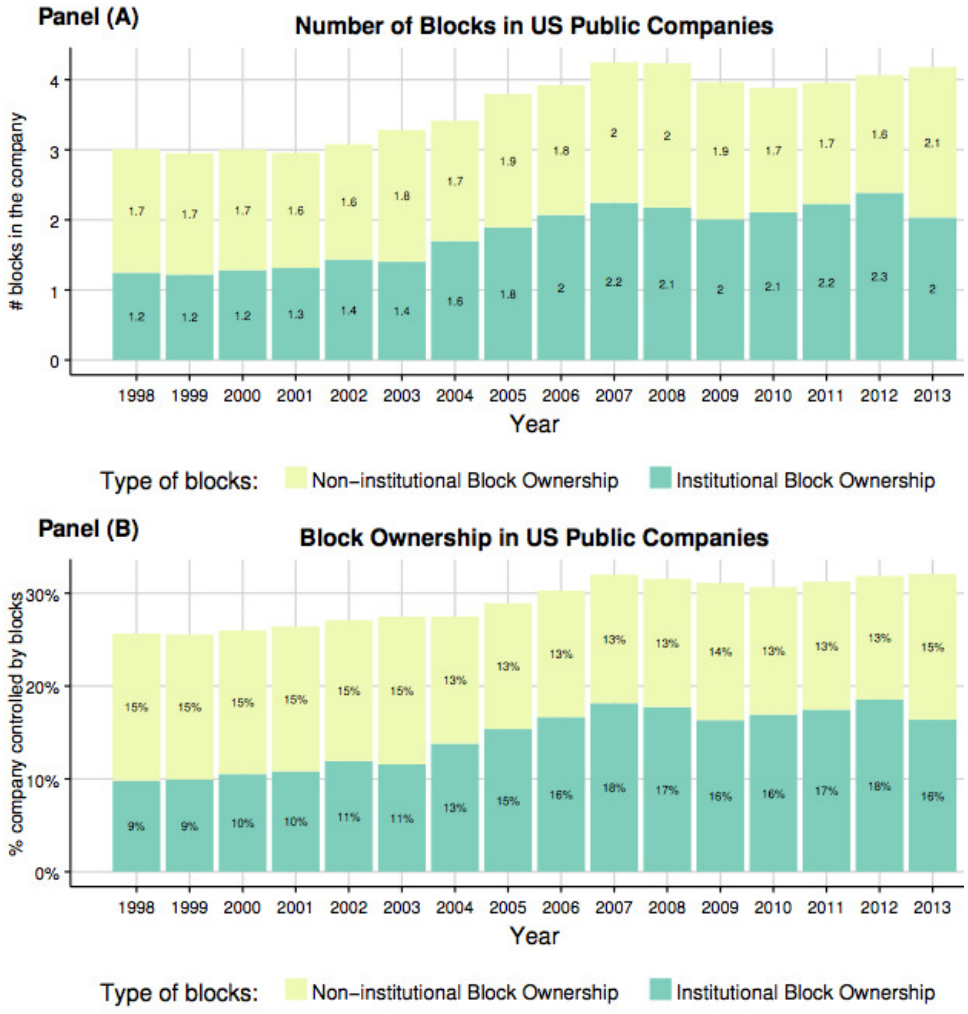

Figure 1.2 Institutional and non-Institutional Block Ownership.

Figure 1.3 presents the average number of blocks and the level of block ownership for twenty size quantiles of 4,090 companies in the last year of my sample. Median-size companies have the highest number of blocks and the highest level of block ownership on average. Both of the characteristics follow an inverse U-shape pattern along the size quantiles.

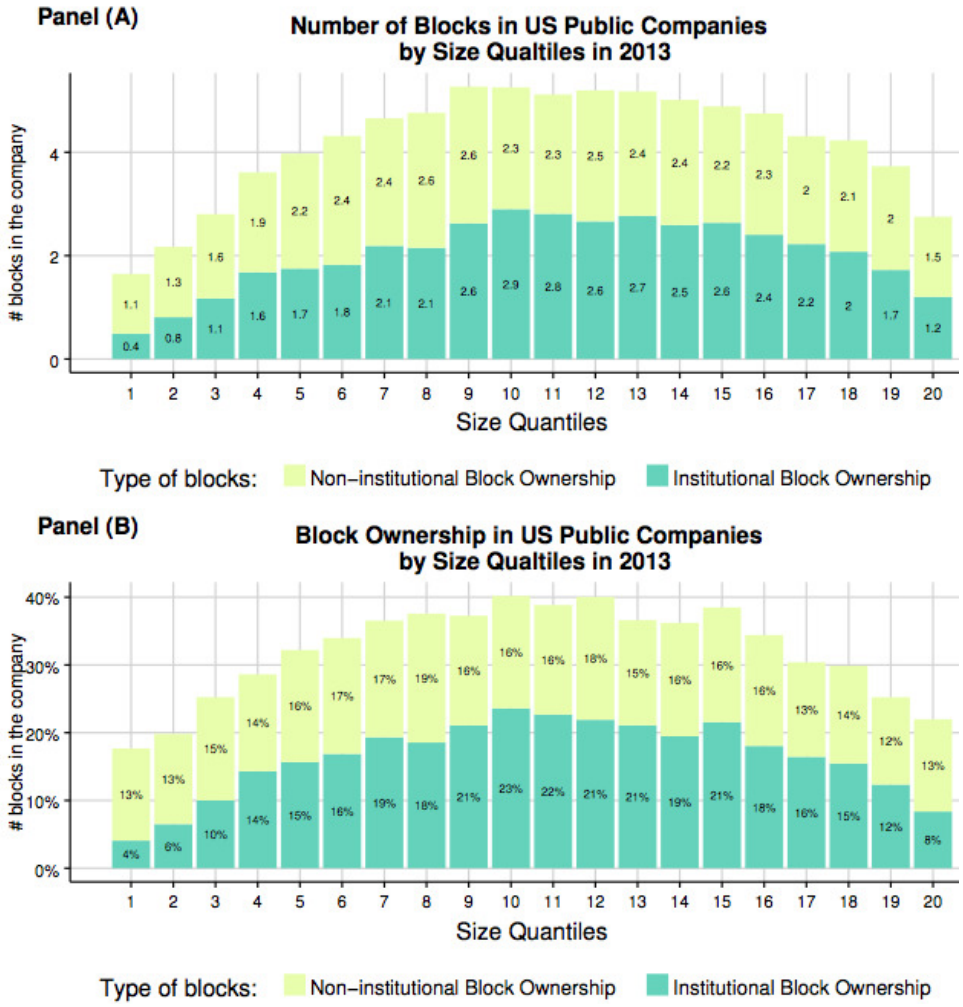

Figure 1.3 Block Ownership and Company Size.

Dimensions of Diversity

To test my hypothesis, I derive three measures of blockholder diversity. The first measure focuses on the heterogeneity in blockholders' identities, the second measure captures differences in their portfolio sizes, and the last measure examines variation in the blockholders' horizons. Heterogeneity across these dimensions represent the potential differences in skills and preferences between blockholders in a company.

In the first dimension, I divide blockholders into four groups based on their identity: individual investors, financial institutions, activists, and all other blockholders. Blockholders in these groups differ in the type of their ownership type, regulations, fiduciary responsibilities, and potential agency problems. Study by Cronqvist and Fahlenbrach (2009) finds that investors in these groups differ significantly in the impact they have on the company policies.

The first group, individual blockholders, hold the position for their own account. Unlike institutions, individuals are not concerned with the potential fund outflow, and they face fewer agency problems (Diamond (1984)). Also, individual blockholders face less regulation constraints and are not subject to fiduciary responsibilities. Study by Becker, Cronqvist, and Fahlenbrach (2011) finds that individual blockholders significantly impact a range of company characteristics, including payouts, investments, return on assets, and leverage.

The second group of blockholders includes institutional investors, defined as financial intermediaries that are regulated under Section 13(f) of SEA. A body of academic literature stresses the involvement of institutions in monitoring and their

influence on a company. Institutional investors have an advantage in information gathering (Michaely and Shaw (1994)) and are viewed as better monitors (Grinstein and Michaely (2005)). The presence of institutional investors has an impact on the different aspects of company governance (shareholders proposals Gillan and Starks (2000), executive compensation Hartzell and Starks (2003), board independence Appel, Gormley, and Keim (2014), private communications with the management McCahery, Sautner, and Starks (2016)), and corporate policies (R&D Bushee (1998), payouts Grinstein and Michaely (2005), and leverage Michaely, Vincent, and Popadak (2015)).

Third group of investors include active shareholders. Unlike blockholder from other identity groups activists could impose governance through direct interventions (" voice"). I define activists as blockholders who file Schedule 13D that gives them on option to oppose the management. My definition of activists investor is broader than Brav et al. (2008) who focus only on activists hedge funds, but even this conservative estimate suggests that active blockholders constitute only a small portion of all blockholders (Panel (A) Figure 1.4).

The fourth group includes all other blockholders. This group did not receive any focused attention in the academic literature, and we do not have any knowledge about its influence on the company policies.

These four groups differ in their incentives and preferences. They also vary in their investment and governance styles (Cronqvist and Fahlenbrach (2009)). Panel (A) of Figure 1.4 show the dynamics of the average holdings of each group over the years.

In the first diversity measure, I capture the difference in the control rights between the described identity groups.

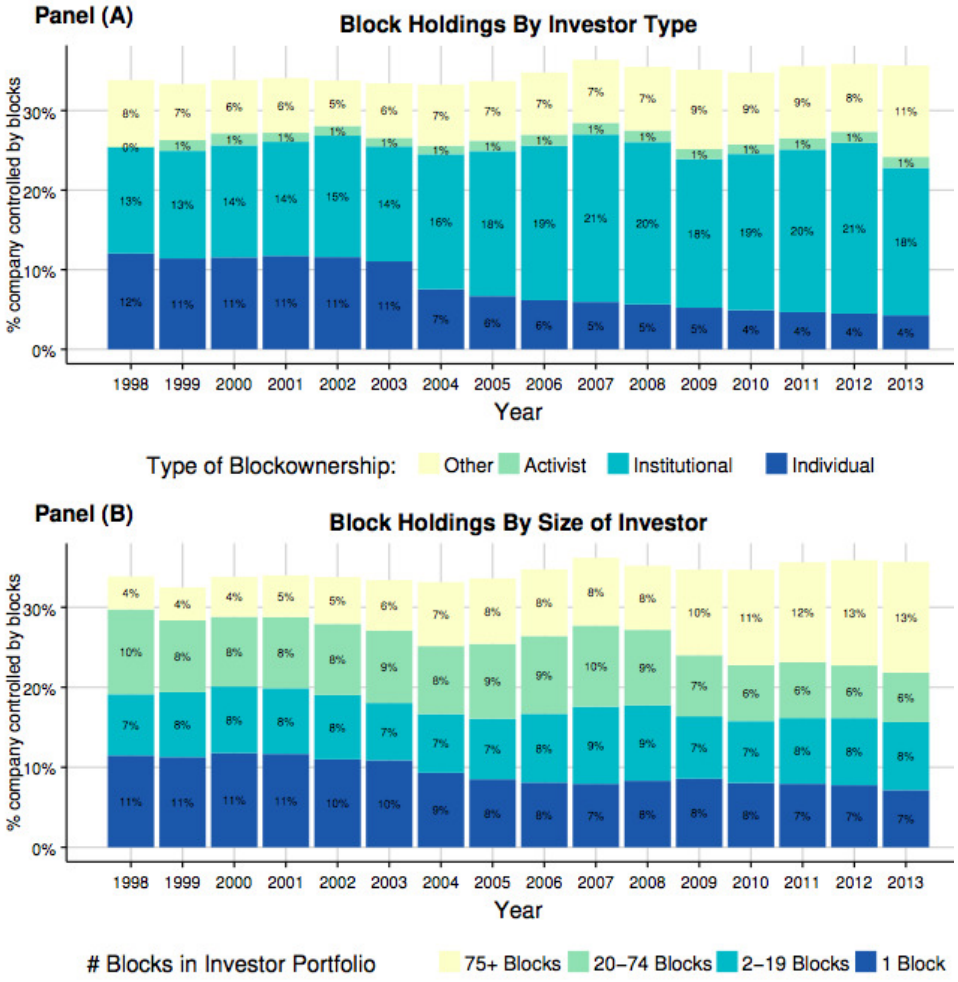

Figure 1.4 Block ownership and Investor Type.

In the second diversity measure, blockholders are divided into groups based on the size of their portfolio. The size of their portfolio reflects blockholders' preferences regarding company's risk taking behavior and their involvement in monitoring. I proxy the size of a blockholder's portfolio with the number of blocks that he holds.

The number of blocks in a portfolio is a crude proxy for the level of a blockholder's diversification. Faccio, Marchica, and Mura (2011) show that the diversification of large shareholders influences company's risk taking. They find that companies with more diversified blockholders undertake riskier investments than companies with less diversified blockholders.

The number of blocks contained in his portfolio influences the monitoring approach of a blockholder. Edmans, Levit, and Reilly (2016) model suggests that governance impact increases with the number of blocks in a portfolio. They show that decision to sell one particular block sends a signal to the market about the future performance of a company. The more blocks an investor holds, the less likely it is for him to exit the position due to a liquidity shock. On the other hand, investors with fewer blocks have more incentives to monitor, because they can focus their attention (Kempf, Manconi, and Spalt (2016)), and the overall performance of their portfolio is more sensitive to the returns of each stock (Fich, Harford, and Tran (2015)). Kang, Luo, and Na (2017) find that large number of blocks held within one industry gives blockholder an informational advantage and improve efficiency of their governance.

I divide blockholders into four quantiles based on the number of blocks in their portfolio. The first group includes investors that have a single block, the second those that have 2-20 blocks, the third those that have 21-220 blocks, and the last group those that have more than 220 blocks. Panel (B) of Figure 1.4 presents the dynamics of the average ownership by each group over the years. I use these four groups to construct the second diversity measure.

The third measure of diversity divides blockholders into groups based on their investment horizon. The finance literature suggests that short-term and long-term investors vary in their preferences regarding company payouts and monitoring styles.

In terms of corporate policies, long-term blockholders prefer higher investments and lower payouts (Derrien, Kecskes, and Thesmar (2013)), while short-term blockholders favor company acquisitions, even when the premium is lower (Gaspar, Massa, and Matos (2005)). Short-term blockholders tend to discipline management through trading (Gallagher and Gardner (2013)), while long-term blockholders are more involved in monitoring (Chen, Harford, and Li (2007)).

I use portfolio turnover as a proxy for a blockholder's investment horizon. Portfolio turnover is defined as a weighted average of absolute changes in all blockholders' positions.

$$Turnover_{i,t} = \frac{\sum_{i=1}^{N} M_{j,t} \cdot |B_{i,j,t} - B_{i,j,t-1}|}{0.5 \cdot \sum_{i=1}^{N} (M_{j,t} \cdot B_{i,j,t} + M_{j,t-1} \cdot B_{i,j,t-1})}$$

Where $Turnover_{i,t}$ is a turnover measure of blockholder i in the year t, that holds N blocks, $M_{j,t}$ is a market capitalization of company j in the year t and $B_{i,j,t}$ represents the percent of shares outstanding controlled by blockholder i in the company j at the end of the year t. Variable $B_{i,j,t}$ is set to zero in the years before the enter or after the exit. Thus, when a blockholder enter or exit one of the companies, turnover of his portfolio increases.

I divide blockholders into four groups based on the quantiles of the portfolio turnover. Panel (C) of Figure 1.5 shows the dynamics of the average ownership of each group over the years. I estimate the third measure of diversity based on these groups.

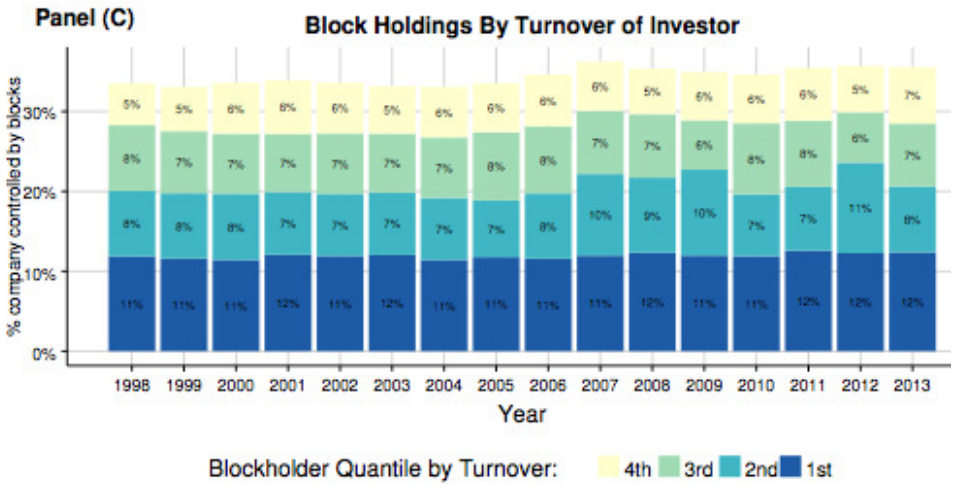

Figure 1.5 Block Ownership and Investor Turnover.

This paper explores the effect of diversity between blockholders. However, any definition of diversity is reasonable only for companies with at least two blocks. Thus, I limit my dataset to the companies with multiple blocks. This restriction decreases my sample from 51,708 to 40,935 company-year observations. For each observation, I construct three measures of diversity based on the described groups using the formula:

$$Diversity_c = 1 - \sum_{k=1}^{N_c} \left(\frac{H_{k,c}}{BH} \right)^2$$

Where $Diversity_c$ is one of three diversity measures ($c \in$ {identity, size, horizon}), N_c is the number of groups in the component c, $H_{k,c}$ is a percent of shares

outstanding controlled by the group k, and BH is a percent of shares outstanding controlled by all blockholders in a company.

Diversity variables are based on Herfindahl-Hirschman Index (HHI) between diversity groups. HHI is taken with a negative sign in the formula for a more intuitive interpretation of the measures: the higher value of the diversity variable corresponds to higher heterogeneity between blocks. If all blocks in a company are homogeneous, then the diversity variable equals zero. Diversity in the company is the highest when all the groups have the same size.

Figure 1.6 illustrates the construction of diversity in identity for a company with four blocks. When a company has three blockholders – individual, institution, activist and corporation – and each of them holds a block of 6%, diversity in identity equals to 0.75 (Panel (A)). Diversity measure is affected by the changes in the types of its blockholders and by the changes in the sizes of their positions. For instance, if two blockholders with the stake of 6% each would be individual and two other blockholders with 6% each would be activists investors then diversity would 0.5, lower than in a previous case (Panel (B)). Diversity measure would also change after changes in the block sizes. If instead of having three different blocks of 6% (as in Panel (A)), a company would has three blocks with sizes of 5%, 5%, 15%, and 15% (Panel (C)), diversity in identity would decrease from 0.75 to 0.6875.

I calculate three diversity variables: $Diversity\_identity$, $Diversity\_size$, and $Diversity\_horizon$ using the same principal. FigureMatrix presents a histogram for all constructed variables.

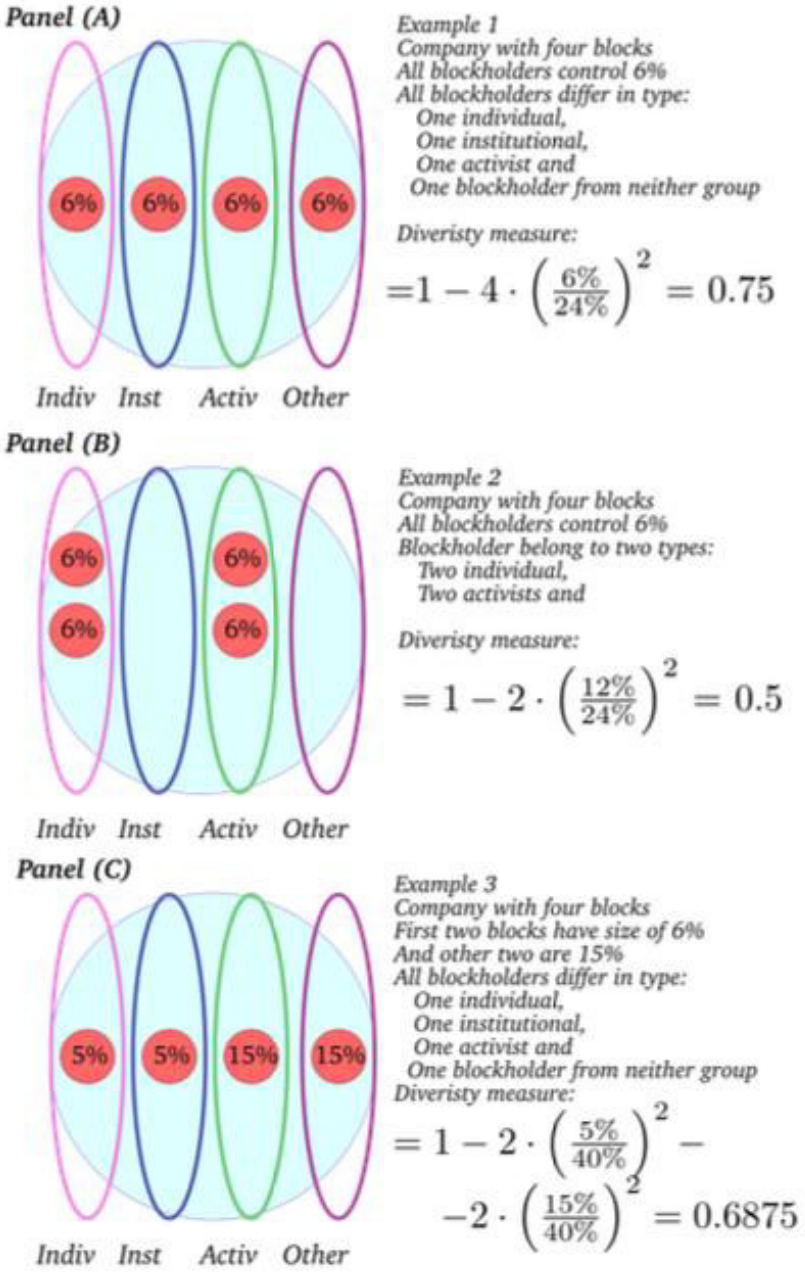

Figure 1.6 Construction of Diversity Variable.

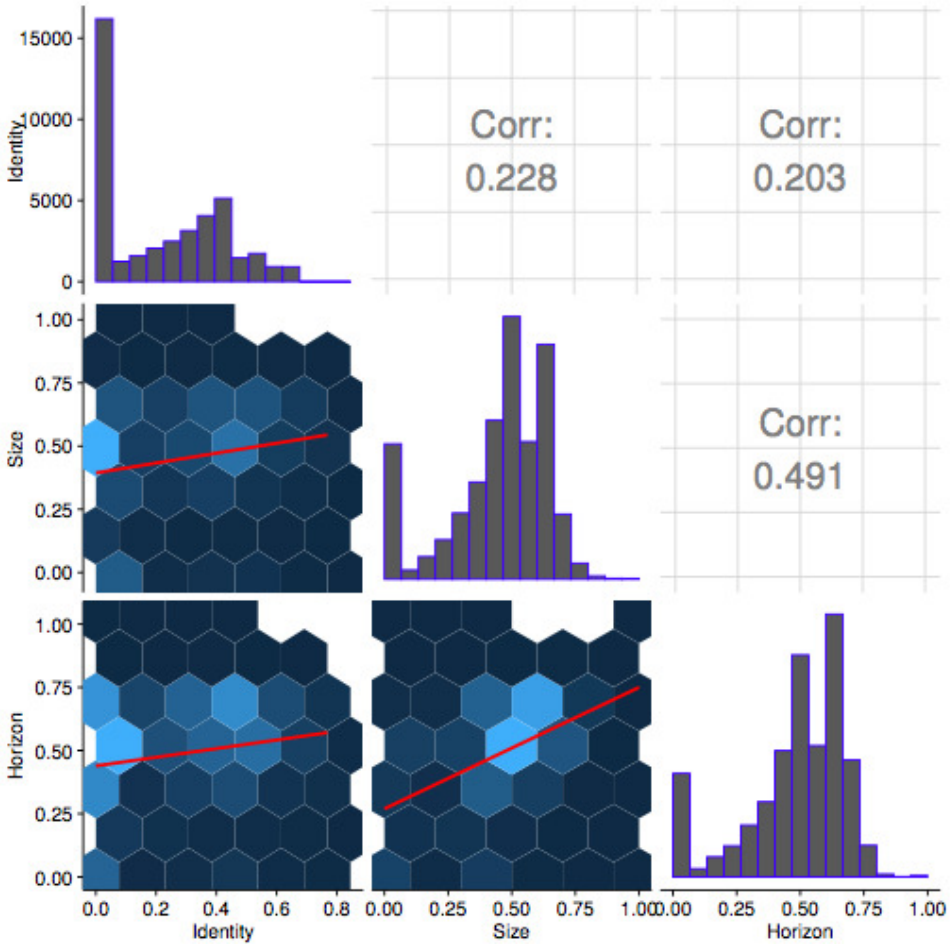

Figure 1.7 Correlation between Diversity Measures.

Each of the three diversity dimensions captures a different aspect of heterogeneity between blockholders. Figure 1.7 shows correlations and heat map of the distributions of the three diversity variables. Correlation of $Diversity\_identity$ variable with $Diversite\_size$ and $Diversity\_horizon$ is 0.23 and 0.20 respectively. Correlation between $Diversite\_size$ and $Diversity\_horizon$ is 0.49. Relatively low level of correlation between the variables suggests that these variables captures different characteristics of the block diversity. Additionally, I construct an aggregate diversity

index, using these three variables. This index is constructed as a first principal component of three previously defined variables.[8]

$$Diversity\_Index = PCA(Diversity\_identity, Diversity\_size, Diversity\_horizon)$$

The resulting variable of the principal component analysis explains the highest portion of variance of three diversity variables and allows me to control for variation in all three measures at once.

Results

Starting in this section, I focus on the analysis of diversity between blockholders. Diversity between blocks can only be measured in the companies where there are two or more blockholders. Therefore, I exclude companies without a block or with only one block from my analysis. This restriction cuts my sample to 40,935 company-year observations. Panel (A) of Table 1.1 provides summary statistics of all companies in my initial sample and Panel (B) describes the summary information after the exclusion companies with less than two blocks. All variables in my sample are winsorized at the 1% level from the top and the bottom.

8 I select the direction of the main principal component such, that it has a positive correlation with at least two diversity measures. If correlation is positive with less than two measures, diversity index is multiplied by -1.

Table 1.1. Summary Statistics.

This table reports summary statistics for number of firm-specific characteristics from 1998 through 2013. Sample in Panel (A) consists of firm-year observations for all US public firms between 1998 and 2013 after exclusion of 1) firms in financial and utilities industries, 2) firms without annual reports in SEC EDGAR, 3) observations with negative or zero value of market capitalization and total assets or missing value of any the listed variables. Panel (B) restricts the sample to firms with at least two blockholders. Accounting information is obtained from CRSP-Compustat Merged database, institutional ownership is obtained from Thompson Reuters, and blockholders data is collected from Schedule 13D and Schedule 13G filings obtained from SEC EDGAR.

Statistic	N	Pctl(25)	Mean	Median	Pctl(75)	St. Dev.
Block Holdings	51,708	12.990	28.991	26.390	41.750	20.708
Number of Blocks	51,708	2	3.604	3	5	2.355
Institutional Holdings	51,708	13.506	47.122	50.362	76.762	33.685
Number of Institutional Blocks	51,708	0	1.782	1	3	1.702
Sales Growth	51,708	0.978	1.178	1.082	1.224	0.551
Firm Size	51,708	4.713	6.189	6.102	7.539	2.011
Fixed Assets	51,708	0.168	0.483	0.373	0.724	0.393
Capital Expenditure	51,708	0.015	0.051	0.033	0.064	0.058
Leverage	51,708	0.012	0.210	0.165	0.336	0.211
Amihud Illiquidity	51,708	0.001	0.769	0.013	0.171	2.281
Tobin's Q	51,708	1.095	2.046	1.487	2.242	1.711
ROA	51,708	−0.016	−0.012	0.035	0.077	0.197
FCF	51,708	0.014	0.021	0.065	0.108	0.200

Statistic	N	Pctl(25)	Mean	Median	Pctl(75)	St. Dev.
Block Holdings	40,935	20.480	34.589	31.472	45.302	18.239
Number of Blocks	40,935	3	4.404	4	6	1.968
Institutional Holdings	40,935	27.746	53.727	59.938	80.652	32.445
Number of Institutional Blocks	40,935	1	2.158	2	3	1.697
Sales Growth	40,935	0.980	1.180	1.083	1.223	0.549
Firm Size	40,935	4.965	6.300	6.206	7.532	1.851
Fixed Assets	40,935	0.166	0.473	0.365	0.703	0.384
Capital Expenditure	40,935	0.016	0.051	0.033	0.063	0.057
Leverage	40,935	0.012	0.210	0.165	0.334	0.211
Amihud Illiquidity	40,935	0.001	0.517	0.009	0.097	1.792
Tobin's Q	40,935	1.101	2.025	1.494	2.232	1.645
ROA	40,935	−0.015	−0.010	0.035	0.076	0.191
FCF	40,935	0.016	0.024	0.065	0.108	0.192
Acquisition Instrument	40,935	0	0.032	0	0	0.175
Payouts Instrument	40,935	0.000	0.007	0.001	0.006	0.016
Diversity, identity	40,935	0.137	0.344	0.409	0.497	0.226
Diversity, size	40,935	0.355	0.443	0.488	0.602	0.206
Diversity, horizon	40,935	0.405	0.483	0.500	0.635	0.201
Diversity, index	40,935	1.394	1.748	1.887	2.236	0.657

Table 1.2. Firm Value and Diversity of Block Ownership. Partial Correlations.

This table reports non-causal relations between company value and diversity among company block-holders. The dependent variable in all models is Tobin's Q. The sample consists of firm-year observations for all U. S. public firms with at least two blocks after exclusion of 1) firms in financial and utilities industries, 2) firms without annual reports in SEC EDGAR, 3) observations with negative or zero value of market capitalization and total assets or missing value of any other listed the variables. The vector of firm controls includes institutional holdings, sales growth, firm size, fixed assets, capital expenditures, leverage, Amihud illiquidity measure, firm fixed effects, and industry-year fixed effects. Standard errors are robust and double-clustered on firm and year level.

	Tobin's Q				
	(1)	(2)	(3)	(4)	(5)
Institutional Holdings	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sales Growth	0.394***	0.394***	0.393***	0.393***	0.393***
	(0.095)	(0.095)	(0.095)	(0.095)	(0.095)
Firm Size	−0.151**	−0.151**	−0.151**	−0.150**	−0.151**
	(0.073)	(0.073)	(0.073)	(0.073)	(0.073)
Fixed Assets	−0.823***	−0.824***	−0.822***	−0.822***	−0.822***
	(0.099)	(0.099)	(0.099)	(0.099)	(0.099)
Capital Expenditure	3.739***	3.739***	3.743***	3.740***	3.741***
	(0.398)	(0.398)	(0.397)	(0.398)	(0.397)
Leverage	−0.425***	−0.424***	−0.422***	−0.423***	−0.421***
	(0.127)	(0.127)	(0.127)	(0.127)	(0.127)
Amihud Illiquidity	−0.073***	−0.073***	−0.074***	−0.073***	−0.074***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Block Holdings	−0.001	−0.001	−0.0003	−0.0003	−0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Diversity, identity		−0.021			
		(0.038)			
Diversity, size			−0.077*		
			(0.045)		
Diversity, horizon				−0.081**	
				(0.040)	
Diversity, index					−0.018*
					(0.010)
Firm and Industry-Year FE	YES	YES	YES	YES	YES
Observations	40,935	40,935	40,935	40,935	40,935
R^2	0.642	0.642	0.642	0.642	0.642
Adjusted R^2	0.576	0.576	0.576	0.576	0.576
Note:					*p<0.1; **p<0.05; ***p<0.01

As a first step, I estimate a non-causal relationship between company value and block diversity. In this step, I use a multivariable regression defined by the following equation:

$$Tobin_{i,t+1} = \beta_1 \cdot Diveristy_{i,t} + \beta_2 \cdot block\_hold_{i,t} + B \cdot X_{i,t} + f_i + h_{ind,t} + \varepsilon_{i,t}$$

Where $Tobin_{i,t}$ is a Tobin's Q of firm i in a year t, $Diversity_{i,t}$ corresponds to one out of four diversity measures described in the previous section (three dimensions and the aggregate index) and $block\_hold_{i,t}$ is the percent of shares outstanding controlled by all blockholders. $X_{i,t}$ is a set of firm specific controls, and variables f_i and $h_{ind,t}$ corresponds to firm and industry-year fixed effects. I control for the aggregate level of institutional ownership to separate its influence from effect of block ownership. Other firm specific controls include growth, size, fixed assets, capital expenditures, leverage and Amihud illiquidity measure. The Appendix provides detailed definitions of the variables. All errors in all regressions are robust and double clustered on the company and year level.

Model (1) of Table 1.2 shows the relationship between firm value and the level of block ownership. This model does not control for any measures of diversity. The results of this model do not detect any significance of correlation between the overall level of block ownership and firm value. This lack or relation is consistent with McConnell and Servaes (1990) and Mehran (1995) findings.

Model (2) shows the results of the regression of firm value on the level of block ownership and diversity in the blockholders identity. In this specification, measure of diversity in identity does not have a significant predictive power toward the value of

the company. Model (3) and Model (4) show a significant negative link between the value of the company and diversity in the size of the blockholder's portfolio and in his investment horizon. Model (5) consistently suggests a negative relationship between firm value and aggregate diversity index. Overall, partial correlations suggest a weak negative link between block diversity and company value.

The results of multivariate regressions detect a negative relationship between some measures of block ownership diversity and the value of the company. In this section I explore a causal relationship between these variables using identification with instrumental variables. My goal is to instrument two endogenous variables: level of block ownership and diversity between holders of these blocks. I identify exogenous variation in these variables with two instruments: payouts from cross-held companies and acquisitions of financial firms.

The first stage regressions are described by the following system of equations:

$$\begin{aligned} block\_hold_{i,t} &= \kappa_1 \cdot payouts_{i,t} + \kappa_2 \cdot acquisitions_{i,t} + K \cdot X_{i,t} + f_i + h_{ind,t} + \xi_{i,t} \\ Diversity_{i,t} &= \lambda_1 \cdot payouts_{i,t} + \lambda_2 \cdot acquisitions_{i,t} + L \cdot X_{i,t} + f_i + h_{ind,t} + \zeta_{i,t} \end{aligned}$$

Where $block\_hold_{i,t}$ is the percent of shares outstanding controlled by all blockholders in the company, and $Diversity_{i,t}$ corresponds to one out of four diversity measures described in the previous section. Variables $payouts_{i,t}$ and $acquisitions_{i,t}$ are the constructed instruments. Variables represent company specific controls, and variables and corresponds to firm and industry-year fixed effects.

The first instrument reflects how much blockholders receive in payouts from their positions in other companies. To construct this instrument, I obtain the list of all blockholders in a company. I estimate how much each blockholder receive in payouts

from all other companies in his portfolio. After I normalize this amount to the number of stocks in blockholder's portfolio and the market capitalization of the company and sum all this amount across all blockholders. Formally, the first instrument is defined with the following formula:

$$payouts_{i,t} = \sum_{k=1}^{K} \frac{1}{M_{i,t} \cdot N_k} \cdot \sum_{j=1, j \neq i}^{N_K} (DVC_{j,t} + PRSTKC_{j,t}) \cdot B_{j,t}$$

Where $M_{i,t}$ is the market capitalization of the company i which has K blockholders in a year t. Blockholder k has blocks in N_k companies, $B_{j,t}$ is a size of his position in the company j; $DVC_{j,t}$ and $PRSTKC_{j,t}$ is the dollar amount of dividends and repurchases paid by the company j.

To verify the use of this instrumental variable I have to show that it satisfies the relevance condition and the exclusion restriction. The first condition requires the payout instrument to have a predictive power toward the level of block ownership and diversity measures.

The payout instrument would predict the level of block ownership if two conditions are satisfied: 1) a blockholder reinvests at least part of the payouts back into the companies in his portfolio, and 2) reinvestment into each company is monotonic in the amount of payouts. Consistent with the described assumptions, the results of the first stage regression in the Model (1) of Table 1.3 show that the payouts variable has a strong positive correlation with the level of block ownership in the company. T-statistics of the instrument coefficient is 16.0, and this value is significant

at the 1% level. One standard deviation increase in the level of payouts corresponds to approximately 3% of an increase in the level of company block ownership.

The size of the blocks tend to increase if a blockholder receives more payouts during the year. I find, that the marginal propensity to increase a block position decreases with the size of a block. A blockholder is more likely to increase a 8% size block by 10% (i.e. increase it to 8.8%), than increase a 10% size block by 10% (i.e. increase it to 11%). Due to such properties of a blockholder's preferences, a payout instrument could also identify exogenous variation in the level of block diversity.

Indeed, if the relative size of a diversity group changes, the level of diversity would change as well. For instance, block diversity would increase, if the relative size of the smallest diversity group rises. Empirically I find, that the smallest block in a company tend to belong to a smaller diversity group. This fact, in conjunction with the decreasing marginal propensity to reinvest into a block, predicts a positive correlation between block diversity and payout instrument. Decreasing marginal propensity to reinvest leads to higher relative increase in smaller blocks in response to payouts. And if smaller blocks tend to be in smaller diversity groups, then smaller diversity group would increase relatively more after payouts. Thus, diversity measure would rise. First stage analysis shows high correlation between diversity measures and the instrument. T-statistics of the instrument coefficient in the first stage varies between 8.0 and 11.8 and is significant at 1% level.

The exclusion restriction requires the instrument to influence the dependent variable of the analysis only through the level of block ownership or block diversity,

conditional on the controlled variables. This condition could not be tested statistically, and I can only argue that the instrumental variable is unlikely to influence the value of the company through other channels.

The payout instrument is constructed based on the actions of other companies. Thus, it is less likely to be affected by any anticipated changes in the company of interest. Controlling for firm level fixed effects in the regression analysis additionally accounts for impact of initial characteristics of the company. In sum, the constructed instrument is unlikely to be correlated with any company-specific omitted variables. All 2SLS regressions also control for the industry-year fixed effects, and thus account for the potential dependence of company value and payout instrument on the market conditions.

Another concern is that the payout instrument could be affected by unobserved characteristics of blockholders. For instance, a blockholder who is a strong monitor could be more successful in the demand for dividends in one company and improvement of the value of another company at the same time. To address this issue I scale received payouts by the number of blocks in the portfolio, and thus penalize more companies with large portfolio. Also, according to Kempf, Manconi, and Spalt (2016) findings shareholders have a limited attention in monitoring, and thus it is less likely that one blockholder would be highly involved into the monitoring of several companies at the same time.

The second instrument is constructed based on the acquisition of financial firms by blockholders. The initial idea of this instrument comes from Hong and Kacperczyk

(2010), who used the mergers of brokerage houses as a shock to the competition between stock analysts. I adopt their design, and construct an instrument that indicates whether one of the blockholders in a company acquired a financial firm during the previous year.

Information about mergers and acquisitions (M&A) is taken from the SDC Platinum database. I download all M&A deals between 1996 and 2013 where the target company is in the finance industry (meaning that two digit SIC code is 60, 61, 62, 63, 64 or 67) and the value of the deal is above $1 million. There are 6,655 deals completed by 3,313 different acquirers that satisfy the described conditions. I manually match SDC acquirers with blockholders in my sample and check that the matched investor is a blockholder in my sample the year after the deal. These two conditions restrict the selection to 550 acquisitions. Similar to the previous instrument, I omit the events where a blockholder-acquirer controls more than 100 blocks in a year.

For the next step, I construct a variable that equals to one when one blockholder in a company was involved in the selected acquisitions and zero otherwise. In total, this instrument equals to one in 1472 company-year observations.[9]

Why acquisition of financial firms would be relevant for the level of block ownership or block diversity? First, in case of acquisition, assets of acquired firm would be added to blockholder's portfolio. And if the firm had any positions in the

9 As an alternative investment, I use a target size instead of a dummy variable. This selection does not change my results.

company where acquirer has a block, then the size of this block will increase. Also, combined position of the blockholder and the target firm could result in new blocks in other companies. Table 1.3 indicates that the level of block ownership rises by 2.9% on average in the response to described acquisitions.

The constructed instrument affects the diversity measure through the relative change in the size of one group of blocks in the company. Empirically, I detect that smaller blocks tend to have a higher relative increase than larger blocks in response to acquisitions. Because smaller blocks tend to be in the smaller diversity groups, smaller diversity groups would increase more in response to acquisitions. And a relative increase in a smaller diversity group leads to an increase in the level of diversity. Therefore, diversity in a company, on average, would increase after an acquisition. Results in the Table 1.3 support the proposed relation between the instrument and diversity measures.

Relevancy of the instrument could also be established using the statistical tests in the first stage regressions. Table 1.3 presents the results of the first stage regressions. Model (1) shows a strong positive correlation of the level of block ownership in the company with both payout and acquisition instruments. Both of the instruments are significant at the one percent level, with t-statistics of 16.0 for payout instrument and 5.0 for acquisitions instrument. Both of these statistics indicate the presence of a strong link between the block ownership variable and two instruments. The value of F-test for the joint significance of two instruments is 262.8, which also supports the relevancy of the instruments for the level of block ownership.

Table 1.3. Validity of Instruments. First-stage Regression.

This table reports results from a linear regression of the level of block ownership and four measures of diversity among firm blockholders on instrumental variables. The first instrumental variable, payouts, estimates the total value of payouts received by firm blockholders from their positions in other companies relative to firm market capitalization. The second instrument is a dummy variable that equals to one when one of firm blockholders acquires a financial firm. The sample consists of firm-year observations for all U. S. public firms with at least two blocks after exclusion of 1) firms in financial and utilities industries, 2) firms without annual reports in SEC EDGAR, 3) observations with negative or zero value of market capitalization and total assets or missing value of any other listed the variables.

	Endogenous Variable				
	Block Hold	Div Ident	Div Size	Div Hor	Div Index
	(1)	(2)	(3)	(4)	(5)
Payouts Instrument	188.512***	0.698***	0.892***	0.898***	5.348***
	(11.812)	(0.087)	(0.090)	(0.088)	(0.455)
Acquisition Instrument	2.905***	0.041***	0.038***	0.038***	0.250***
	(0.580)	(0.009)	(0.007)	(0.004)	(0.032)
Institutional Holdings	0.073***	0.0001	0.001***	0.001***	0.005***
	(0.008)	(0.0001)	(0.0001)	(0.0001)	(0.0005)
Sales Growth	0.363	0.001	−0.00002	−0.001	0.001
	(0.288)	(0.003)	(0.002)	(0.002)	(0.010)
Firm Size	−1.825***	−0.015***	0.001	0.006	−0.017
	(0.444)	(0.004)	(0.004)	(0.005)	(0.022)
Fixed Assets	−2.547**	−0.024*	0.011	0.013	−0.001
	(1.109)	(0.014)	(0.013)	(0.012)	(0.062)
Capital Expenditure	−11.778***	−0.047	0.004	−0.025	−0.141
	(3.012)	(0.037)	(0.041)	(0.035)	(0.180)
Leverage	7.953***	0.047***	0.057***	0.047***	0.326***
	(1.302)	(0.014)	(0.014)	(0.013)	(0.069)
Amihud Illiquidity	0.240***	−0.004**	−0.004***	−0.002*	−0.022***
	(0.090)	(0.002)	(0.001)	(0.001)	(0.007)
Firm and Industry-Year FE	YES	YES	YES	YES	YES
Observations	40,935	40,935	40,935	40,935	40,935
R^2	0.564	0.350	0.402	0.371	0.413
Adjusted R^2	0.484	0.230	0.292	0.255	0.305

Note: *p<0.1; **p<0.05; ***p<0.01

Models (2) - (5) in the Table 1.3 also suggest relevancy of the constructed instruments in the explanations of the diversity measures. T-statistics of the instrument for first stage regressions of diversity measures range between 4.5 and 8.5, and are significant at the 1% level for all measures.

The value of F-test for the joint significance of the instruments for diversity measures varies between 66.2 and 146.7 and also suggests a high correlation between the instruments and diversity measures.

Acquisition of a financial firm is a long, regulated and complex process. If a shareholder wants to increase one of his block positions or obtain a new block, then direct purchase of the shares would be an easier option than a firm acquisition. Therefore, acquisition variable should be independent from the blockholder's expectations of the future performance of the company.

As in the previous instrument, I exclude the acquisition activity of investors with more than 100 blocks for the instrument. Large blockholders are more prone to acquire financial firms, also might have a stronger impact on a company. To avoid the effect of these blockholders on my instrumental variables, I omit their activity in the construction of the instrument.

Table 1.4: Firm Value and Diversity of Block Ownership. 2SLS Analysis.

This table explores the influence of diversity among blockholders on company value using two stage analysis. Block ownership and diversity measures are instrumented with payouts from other companies and acquisition of financial firms.

	Tobin's Q			
	(1)	(2)	(3)	(4)
Institutional Holdings	0.002**	0.007***	0.007***	0.005***
	(0.001)	(0.002)	(0.002)	(0.001)
Sales Growth	0.392***	0.382***	0.376***	0.384***
	(0.086)	(0.093)	(0.087)	(0.088)
Firm Size	−0.166**	−0.073	−0.038	−0.098
	(0.083)	(0.071)	(0.066)	(0.072)
Fixed Assets	−0.867***	−0.664***	−0.648***	−0.738***
	(0.120)	(0.130)	(0.140)	(0.116)
Capital Expenditure	3.850***	4.208***	4.050***	4.026***
	(0.385)	(0.360)	(0.399)	(0.356)
Leverage	−0.437***	−0.409**	−0.465***	−0.435***
	(0.165)	(0.168)	(0.142)	(0.152)
Amihud Illiquidity	−0.100***	−0.106***	−0.094***	−0.100***
	(0.018)	(0.020)	(0.016)	(0.016)
Block Holdings	0.028***	0.038***	0.039***	0.035***
	(0.009)	(0.012)	(0.011)	(0.009)
Diversity, identity	−4.630***			
	(1.694)			
Diversity, size		−5.714***		
		(2.197)		
Diversity, horizon			−5.868***	
			(1.757)	
Diversity, index				−0.831***
				(0.247)
Firm and Industry-Year FE	YES	YES	YES	YES
Block Hold, F-stat	262.78	262.78	262.78	262.78
Diversity, F-stat	69.24	106.61	106.67	146.68
Observations	40,935	40,935	40,935	40,935
R^2	0.375	0.337	0.315	0.491
Adjusted R^2	0.260	0.215	0.188	0.397

I estimate the causal effects of block diversity on company value with the following equation:

$$Tobin_{i,t+1} = \beta_1 \cdot \hat{Diveristy}_{i,t} + \beta_2 \cdot \hat{block\_hold}_{i,t} + B \cdot X_{i,t} + f_i + h_{ind,t} + \varepsilon_{i,t}$$

Where $Tobin_{i,t+1}$ is a Tobin's Q of firm i in a year t, $\hat{Diversity}_{i,t}$ corresponds to one out of four diversity measures (instrumented on the first stage), and $\hat{block\_hold}_{i,t}$ is the portion of shares outstanding controlled by all blockholders (instrumented on the first stage). $X_{i,t}$ is a set of firm specific controls, and variables f_i and $h_{ind,t}$ corresponds to firm and industry-year fixed effects. I control for the aggregate level of institutional ownership to separate its influence from effect of block ownership. Other firm specific controls include growth, size, fixed assets, capital expenditures, leverage and Amihud illiquidity measure. All errors in all regressions are robust and double clustered on the company and year level.

The level of block ownership and block diversity are treated as endogenous and instrumented with payouts and acquisitions variables constructed in the previous section. Model (1) of Table 1.4 shows that diversity in the identity of block owners lowers the value of the company. The coefficient of the variable equals to -4.630 and is statistically significant at the 1% level. According to the results, one-standard-deviation increase in the level of this diversity measure leads to a 0.64 standard deviation drop in the value of the company ($-0.64 = -4.63 \cdot 0.23/1.65$). The magnitude of the effect of the block diversity is large in comparison to the standard deviation. However, the second stage coefficients reflect predicted *causal* effect of the

diversity. The difference between two-stage and one-stage coefficients suggest a strong sample selection bias in block ownership and block diversity. Indeed, the estimated value of the selection bias is 4.60.[10] Large positive value of the selection bias suggests that a new blockholder would enter a company with blockholders who different from him mostly in the cases when he believes that the company is overvalued or would outperform in the future.

Model (2) shows the relationship between heterogeneity in the size of blockholders' portfolios and company value. The coefficient of this diversity dimension is -5.714 and it is significant at the 1% level. The economic effect of diversity in size is very similar to the effect of the diversity in identity: one-standard-deviation increase in the size diversity corresponds to a drop of 0.73 standard deviations in the value of the company ($-0.73 = -5.71 \cdot 0.21/1.65$). Model (3) presents a negative relation between the diversity of blockholders in investment horizon and value of the company. This relation is statistically significant at the 1% level and the economic magnitude of the effect is very similar to estimates from the previous models: one-standard-deviation rise in the diversity in investment horizon corresponds to a 0.73 ($-0.73 = -5.87 \cdot 0.21/1.65$) standard deviation drop in the value of the company. While economic magnitude seems to be very high it does not mean that every increase in diversity would result in a dramatic drop in company value.

10 4.60 is a difference between -0.02 (the coefficient on Diversity in identity in Model (1), Table 1.2) and -4.62 (the coefficient on Diversity in identity in Model (1) Table 1.4).

Table 1.5: Return on Assets and Diversity of Block Ownership. 2SLS Analysis.

This table explores the influence of diversity among blockholders on company ROA using two stage analysis. Block ownership and diversity measures are instrumented with payouts from other companies and acquisition of financial firms.

	ROA			
	(1)	(2)	(3)	(4)
Institutional Holdings	0.0001	0.001**	0.001**	0.0004**
	(0.0001)	(0.0003)	(0.0003)	(0.0002)
Sales Growth	−0.034***	−0.035***	−0.035***	−0.034***
	(0.006)	(0.006)	(0.005)	(0.005)
Firm Size	0.062***	0.071***	0.074***	0.068***
	(0.008)	(0.009)	(0.009)	(0.008)
Fixed Assets	−0.107***	−0.087***	−0.085***	−0.094***
	(0.015)	(0.017)	(0.020)	(0.015)
Capital Expenditure	0.434***	0.469***	0.454***	0.451***
	(0.039)	(0.047)	(0.042)	(0.039)
Leverage	−0.178***	−0.175***	−0.180***	−0.178***
	(0.018)	(0.019)	(0.019)	(0.018)
Amihud Illiquidity	−0.012***	−0.012***	−0.011***	−0.012***
	(0.003)	(0.003)	(0.002)	(0.002)
Block Holdings	0.005***	0.006***	0.006***	0.006***
	(0.001)	(0.002)	(0.002)	(0.002)
Diversity, identity	−0.458			
	(0.281)			
Diversity, size		−0.565*		
		(0.317)		
Diversity, horizon			−0.580*	
			(0.342)	
Diversity, index				−0.082*
				(0.046)
Firm and Industry-Year FE	YES	YES	YES	YES
Block Hold, F-stat	262.78	262.78	262.78	262.78
Diversity, F-stat	69.24	106.61	106.67	146.68
Observations	40,935	40,935	40,935	40,935
R^2	0.390	0.343	0.327	0.463
Adjusted R^2	0.278	0.222	0.203	0.363

Table 1.6: Free Cash Flow and Diversity of Block Ownership. 2SLS Analysis.

This table explores the influence of diversity among blockholders on free cash flows of the company using two stage analysis. Block ownership and diversity measures are instrumented with payouts from other companies and acquisition of financial firms.

	FCF			
	(1)	(2)	(3)	(4)
Institutional Holdings	0.00003	0.001**	0.001**	0.0004**
	(0.0001)	(0.0003)	(0.0003)	(0.0002)
Sales Growth	−0.024***	−0.025***	−0.026***	−0.025***
	(0.006)	(0.006)	(0.005)	(0.005)
Firm Size	0.068***	0.079***	0.083***	0.076***
	(0.010)	(0.010)	(0.010)	(0.009)
Fixed Assets	−0.072***	−0.049**	−0.047*	−0.057***
	(0.019)	(0.022)	(0.025)	(0.020)
Capital Expenditure	0.315***	0.356***	0.338***	0.335***
	(0.038)	(0.052)	(0.049)	(0.042)
Leverage	−0.212***	−0.209***	−0.215***	−0.212***
	(0.020)	(0.022)	(0.021)	(0.020)
Amihud Illiquidity	−0.013***	−0.014***	−0.012***	−0.013***
	(0.003)	(0.003)	(0.002)	(0.003)
Block Holdings	0.006***	0.007***	0.007***	0.007***
	(0.001)	(0.002)	(0.002)	(0.002)
Diversity, identity	−0.539*			
	(0.315)			
Diversity, size		−0.666*		
		(0.356)		
Diversity, horizon			−0.684*	
			(0.365)	
Diversity, index				−0.097*
				(0.050)
Firm and Industry-Year FE	YES	YES	YES	YES
Block Hold, F-stat	262.78	262.78	262.78	262.78
Diversity, F-stat	69.24	106.61	106.67	146.68
Observations	40,935	40,935	40,935	40,935
R^2	0.288	0.225	0.202	0.388
Adjusted R^2	0.157	0.082	0.055	0.276

Model (4) suggests that the aggregate level of diversity also has a negative impact on the value of the company. The described effects is statistically significant at the 1% level and is economically meaningful: one standard deviation increase in the diversity index leads to 0.51 ($-0.51 = 0.83 \cdot 0.66/1.65$) drop in company value. The value of the economic effect of the aggregate index is lower than the value of the effect of three previous measures of diversity, suggesting that diversity within the group has stronger impact on company value than diversity between the groups. Similar to the Table 1.2, Table 1.4 suggests that the level of block ownership does not have a statistically significant predictive power towards the future value of the company.

Table 1.5 explores the relationship between block ownership diversity and return on company assets. Model (1) of Table 1.5 shows that diversity in the identity dimension leads to lower returns on company assets. One-standard-deviation decrease in this component of diversity leads to 0.55 ($-0.55 = -0.46 \cdot 0.23/0.19$) of a standard deviation drop in the ROA of the company. This effect is statistically significant at 10% level. Model (2) and Model (3) detect the similar impact of diversity in the size of a blockholder's portfolio and his investment horizons and ROA. Consistently, Model (4) suggests a negative impact of the aggregate diversity index and ROA. In the last three models diversity variables is statistically significant at 5% level. The level of block ownership, on other hand, has a strong positive effect on company value. One standard deviation increase in the level of block ownership leads to 0.60 to 0.44 standard deviation rise in the ROA of the company. Similarly, to the previous analysis, large magnitude of the economic significance suggests a high positive value of the sample selection bias between the first stage and second stage.

Table 1.6 shows the impact of block ownership and diversity between blocks on free cash flows of the company. Model (1) suggests that block ownership in the company has a positive impact on company performance. One-standard-deviation increase in block ownership leads to a 0.72 standard deviation rise in the company free cash flows. Diversity in identity, on the other hand, lower free cash flows: one standard deviation increase in this diversity measure lowers company free cash flows by 0.64 of a standard deviation. The scale of the economic impact of diversity on company performance is almost identical to estimates of its effects on ROA of the company. Model (2) - Model (4) similarly present a negative impact of other diversity estimate on free cash flows.

In the previous sections, I've explored how diversity affects company value and performance. In this part of the paper, I investigate one potential channel through which diversity between blockholders affects the company. As mentioned in the hypotheses section, higher diversity between blockholders could lead to a disagreement among them on the optimal policies which the company should take. Although, it is hard to measure a disagreement on each policy decision, I can measure a general level of disagreement between company blockholders about its future performance. As one measure of disagreement, I use a dummy variable which indicates whether blockholders trade in the opposite direction in the following year. Panel (A) in Table 1.7 shows how diversity between blockholders impacts a future level of disagreement among them. This table indicates, that blockholders tend to trade in different directions after diversity between blocks increases. One-standard-deviation rise in diversity increases the chances of blockholders of making opposite trades by

6.0%-8.6%. Panel (B) of Table 1.7 explores how an increase in diversity influences the level of disagreement among all shareholders in the company. I proxy the aggregate level of disagreement using the stock volatility in the following year. Model(1) to Model (3) of Panel (B) shows that one standard deviation rise in the level of block diversity increases stock volatility by 0.34-0.44 of standard deviations.

Table 1.7. Blockholder's Disagreement and Block Diversity

This table explores the influence of diversity on the disagreement between blockholders in the next year. Panel (A) shows the likelihood that blockholders will trade in different directions next year. Panel (B) shows the influence of diversity on stock volatility in the next year. Block ownership and diversity measures are instrumented with payouts from other companies and acquisition of financial firms.

Panel (A), Disagreement Between Blockholders	(1)	(2)	(3)	(4)
Block Holdings	−0.001	−0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Diversity in identity	0.332*			
	(0.183)			
Diversity in size		0.409*		
		(0.241)		
Diversity in horizon			0.420*	
			(0.216)	
Diversity index				0.060*
				(0.031)
Observations	40,935	40,935	40,935	40,935
R^2	0.201	0.201	0.189	0.262
Panel (B), Stock Volatility	**(1)**	**(2)**	**(3)**	**(4)**
Block Holdings	−0.007***	−0.009***	−0.009***	−0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
Diversity in identity	0.577*			
	(0.350)			
Diversity in size		0.712*		
		(0.418)		
Diversity in horizon			0.731*	
			(0.392)	
Diversity index				0.103*
				(0.057)
Observations	40,935	40,935	40,935	40,935
R^2	0.546	0.503	0.494	0.589

In the Table 1.8 I explore how increase in the blockholder diversity is related to the number and support for shareholder proposals. Model (1) suggest that shareholders are more likely to file an additional proposals after an increase in blockholder diversity. Model (2) additionally suggests that support for each proposal is lower when

diversity increases. These results indicates that a company with more diversity set of blockholders receives more suggestions about the potential change in strategy, but each of the proposals receives less support.

Table 1.8. Shareholders Proposals and Block Diversity

This table explores the influence on diversity between blockholders on shareholder's voting. Model (1) explores the relation between the number of shareholder proposals each year and blockholder characteristics, Model (2) shows the link between the support for each proposal and blockholder diversity. Block ownership and diversity measures are instrumented with payouts from other companies and acquisition of financial firms.

	Sheholders Proposals (SP)	
	Number of of SP	Portion of Votes for SP
	(1)	(2)
Institutional Holdings	−0.0003	−0.0001
	(0.0003)	(0.0002)
Sales Growth	−0.020***	0.033***
	(0.007)	(0.011)
Firm Size	0.077***	−0.010
	(0.013)	(0.007)
Fixed Assets	0.140***	0.013
	(0.047)	(0.023)
Capital Expenditure	−0.281**	−0.133
	(0.134)	(0.108)
Leverage	0.011	0.038
	(0.033)	(0.028)
Amihud Illiquidity	0.002	−0.009
	(0.005)	(0.012)
Block Holdings	0.0004	0.001**
	(0.0003)	(0.0003)
Diversity, index	0.010**	−0.008***
	(0.005)	(0.002)
Firm and Industry-Year FE	YES	YES
Observations	20,262	2,185
R^2	0.594	0.710
Adjusted R^2	0.510	0.547

Table 1.9: Investment Policies and Block Diversity

This table explores the influence of diversity on investment policies in the company in the next year. Panel (A) shows the influence of the diversity on the level of investment. Panel (B) shows the influence of diversity on the number of acquisitions next year. Panel (C) shows the influence of diversity on the number of diversified acquisitions next year.

Panel (A), Capital Expenditures	(1)	(2)	(3)	(4)
Diversity in identity	−0.060*			
	(0.035)			
Diversity in size		−0.074		
		(0.050)		
Diversity in horizon			−0.076*	
			(0.043)	
Diversity index				−0.011*
				(0.006)
Observations	40,935	40,935	40,935	40,935
R^2	0.682	0.675	0.669	0.698
Panel (B), Number of Acquisitions	(1)	(2)	(3)	(4)
Diversity in identity	−2.371*			
	(1.289)			
Diversity in size		−2.925*		
		(1.618)		
Diversity in horizon			−3.004**	
			(1.264)	
Diversity index				−0.425**
				(0.203)
Observations	40,935	40,935	40,935	40,935
R^2	0.316	0.302	0.292	0.389
Panel (C), Number of Diversified Acquisitions	(1)	(2)	(3)	(4)
Diversity in identity	−1.020*			
	(0.536)			
Diversity in size		−1.259**		
		(0.631)		
Diversity in horizon			−1.293**	
			(0.592)	
Diversity index				−0.183**
				(0.084)
Observations	40,935	40,935	40,935	40,935
R^2	0.259	0.253	0.239	0.326

Lastly, I check how diversity between blocks influences investment policies in the company. I investigate how increase in diversity impacts capital expenditures and acquisition activity of the company in the future. Heterogeneity could have a two-sided effect of the level of innovations. For instance, Bernile, Bhagwat, and Yonker (2017) find that increase in diversity in the board of directors leads to higher level of

R&D. Garlappi, Giammarino, and Lazrak (2017), on other hard, predict that higher disparity in beliefs between decision-makers would lower investment in innovations.

According to the results in the Table 1.9, an increase in diversity has a weak negative influence on the capital expenditures and a strong negative influence on the number of all acquisitions and the number of diversified acquisitions.

Robustness Checks

In this section, I want to ensure that the results of the analysis reflect the influence of block diversity and are not driven by the presence of one particular type of blockholders. Indeed, if one group of blockholders would have a pronounced positive or negative impact, then diversity measures would capture it, and the results could be significant merely due to the impact of one group alone.

To account for this concern, I repeat my analysis excluding several groups of blocks. First, I exclude all institutional blockholders from my analysis. I reestimate the level of block ownership, four diversity measures, and two instrumental variables for all non-institutional blockholders and repeat the analysis from Table 1.4. Panel (A) of Table 1.10 investigates how diversity between non-institutional blockholders is related to company value. Consistently, I find that diversity across all measures has a negative effect on the company value.

Table 1.10. Firm Value and Diversity of Block Ownership. Exclusion of Specific Groups of Blocks.

This table explores the influence of diversity in the subgroups of blockholders on company value using two stage analysis. Panel (A) shows the influence of the diversity among non-institutional blockholders on company value. Panel (B) presents the impact of the diversity among blockholders that hold less than 220 blocks in a year on company value. Panel (C) estimates changes in company value caused by diversity in the subsample of blocks that excludes blockholders in the top quarter by investment horizon. All panels control for the aggregate ownership of a subgroup of blockholders.

Panel (A), excl. institutional investors	(1)	(2)	(3)	(4)
Diversity in identity	−6.588***			
	(1.771)			
Diversity in size		−11.284***		
		(3.077)		
Diversity in horizon			−12.309***	
			(3.573)	
Diversity index				−5.176***
				(1.405)
Observations	40,935	40,935	40,935	40,935
R^2	0.563	0.555	0.525	0.562
Panel (B), excl. investors > 220 blocks	(1)	(2)	(3)	(4)
Diversity in identity	−8.607***			
	(2.547)			
Diversity in size		−20.357***		
		(7.272)		
Diversity in horizon			−18.484***	
			(6.425)	
Diversity index				−7.345***
				(2.196)
Observations	40,935	40,935	40,935	40,935
R^2	0.480	0.309	0.494	0.493
Panel (C), excl. long-term blockholders	(1)	(2)	(3)	(4)
Diversity in identity	−12.294***			
	(3.268)			
Diversity in size		−27.870**		
		(10.979)		
Diversity in horizon			−19.687***	
			(5.246)	
Diversity index				−9.837***
				(2.467)
Observations	40,935	40,935	40,935	40,935
R^2	0.364	0.131	0.459	0.414

Model (1) on Panel (A) investigates the impact of diversity between individual and non-institutional corporate blocks. According to the results, diversity between these two groups has a statistically significant negative impact on company value. Model (2) measures diversity in portfolio size between non-institutional blocks. I

divide blockholders into size groups using the same threshold as in original analysis. Model (2) shows that diversity in portfolio size between non-institutional blocks negatively affects company value and this effect is significant at the 1% level. For analysis in Model (3), I divide non-institutional blockholders into groups by their portfolio turnover. According to Model (3), diversity in investment horizon negatively impacts company value. Lastly, I construct a new diversity index as a first principal component of three redefined diversity variables. Model (4) suggests that the new aggregate diversity index also negatively impact company value. While all new diversity variables have a strong statistical significance on company value, but their economic impact is lower: one-standard-deviation increase in these variables leads to a 0.07 to 0.15 standard deviation drop in company value.

In the second robustness check, I perform the same analysis excluding blockholders in the largest group by portfolio size (this group includes blockholders with more than 220 blocks per year). Similarly, I reestimate the level of block ownership, three diversity measures and aggregate diversity index without the excluded investors. I did not use any of these large blockholders in the construction of instrumental variables, and thus they are not affected. Panel (B) of Table 1.10 presents the effect of diversity between selected blockholders on company value. According to the panel, all diversity variables in the subgroup of blockholders have a negative impact of company value and this effect is at least 5% significant. One-standard-deviation increase in reconstructed diversity variables leads to a 0.1-0.15 standard deviation drop in company value.

Lastly, I repeat the analysis excluding long-term blockholders. In this test, I estimate block ownership, diversity variables and instrumental variables without blockholders in the lowest turnover quantile. Panel (C) suggests that all reconstructed diversity variables have a negative impact on the company value. Diversity in the size of blockholders' portfolios is significant at 10% level and other diversity measures have statistical significance of 5%. One-standard-deviation increase in diversity variables leads to a 0.13 - 0.17 standard deviation drop in company value. Thus, the analysis in the Table 1.10 suggests that diversity in at all levels lowers the value of the company.

I check the robustness of the results using a placebo test. Preferably, the placebo diversity measure should not be related to heterogeneity between blockholders. I create placebo diversity measure between blockholders based on their position in the alphabetically ordered list. This construction relies on the assumption that any potential source of heterogeneity between blockholders is not correlated with the position of their name in the list. In the placebo diversity measure, blockholders with names in the first quarter of the alphabetically ordered list are assigned to placebo group 1. Blockholders in the second, third, and fourth quarter of the list are assigned to groups 2, 3 and 4 respectively. Similar to the previous cases, placebo diversity is constructed using **Equation 2**. Table 1.11 compares the effect of diversity in the size of the portfolio between investors and the constructed placebo measure on company value, return on assets and free cash flows. I use two stage analysis in all models to establish the causal references. According to the Table 1.11, instrumental variables have strong predictive power towards generated placebo diversity. First-stage t-

statistics of the payouts instrument and acquisitions instrument equals to 3.92 and 3.46 respectively, and are significant at 1% level. F-statistics value of 23.76 also suggests relevancy of the instrument for placebo diversity.

Table 1.11: Placebo Test of Block Diversity Impact on Company Value and Performance.

This table explores the impact of diversity on company value and performance with a placebo test. We create a placebo diversity measure based dividing investors into diversity groups based on an alphabetic order of their names. Lower significance of falsified block diversity in conjunction with a negative value of R-squared suggests absence of its impact on the company.

	Placebo Tests					
	Tobin's Q	Tobin's Q	ROA	ROA	FCF	FCF
	(1)	(2)	(3)	(4)	(5)	(6)
Institutional Holdings	0.007***	0.001*	0.001**	0.008***	0.001**	0.001**
	(0.002)	(0.0003)	(0.0003)	(0.003)	(0.0003)	(0.0004)
Sales Growth	0.382***	−0.034***	−0.025***	0.391***	−0.035***	−0.024***
	(0.093)	(0.006)	(0.006)	(0.092)	(0.006)	(0.006)
Firm Size	−0.073	0.071***	0.079***	−0.066	0.071***	0.080***
	(0.071)	(0.009)	(0.010)	(0.080)	(0.009)	(0.009)
Fixed Assets	−0.664***	−0.092***	−0.049**	−0.718***	−0.087***	−0.055**
	(0.130)	(0.019)	(0.022)	(0.165)	(0.017)	(0.024)
Capital Expenditure	4.208***	0.510***	0.356***	4.615***	0.469***	0.404***
	(0.360)	(0.067)	(0.052)	(0.622)	(0.047)	(0.079)
Leverage	−0.409**	−0.177***	−0.209***	−0.426**	−0.175***	−0.211***
	(0.168)	(0.022)	(0.022)	(0.206)	(0.019)	(0.023)
Amihud Illiquidity	−0.106***	−0.012***	−0.014***	−0.106***	−0.012***	−0.014***
	(0.020)	(0.003)	(0.003)	(0.022)	(0.003)	(0.003)
Block Holdings	0.038***	0.007***	0.007***	0.047**	0.006***	0.008***
	(0.012)	(0.003)	(0.002)	(0.022)	(0.002)	(0.003)
Diversity, size	−5.714***		−0.666*		−0.565*	
	(2.197)		(0.356)		(0.317)	
Diveristy, placebo		−0.985		−9.967*		−1.161
		(0.663)		(5.464)		(0.720)
Firm and Industry-Year FE	YES	YES	YES	YES	YES	YES
Block Hold, F-stat	262.78	262.78	262.78	262.78	262.78	262.78
Diversity, F-stat	106.61	85.35	106.61	85.35	106.61	85.35
Observations	40,935	40,935	40,935	40,935	40,935	40,935
R^2	0.337	−0.068	0.225	−0.220	0.343	−0.333
Adjusted R^2	0.215	−0.265	0.082	−0.445	0.222	−0.578

Model (1) and Model (2) shows the impact of diversity in size and placebo diversity on company value. As discussed previously, diversity in size has a strong negative impact on company value. The value of R-squared in Model (1) suggests, that diversity in size, together with other variables, can explain 49.5% of variation in company value. However, the negative values of R-squared in the Model (2) implies that a combination of placebo diversity and other controls explains less variation in company value, than a constant prediction. The decrease in R-squared from Model (1) to Model (2) indicates, that diversity in size has a more explanatory power towards company value, than generated placebo measure of diversity. Drop in R-squared from Model (3) to Model (4) and from Model (5) and Model (6) also suggests, that diversity in size explains more variation in return on assets and free cash flows than the placebo variable. Table 1.11 also suggests a lower impact of the placebo variable on company value, return on assets, and free cash flows.

One challenge of this paper is the construction of a proxy variables for blockholders' diversity. The diversity variables proposed in this work by no means captures all aspects of heterogeneity between blocks in the company. Study by Cronqvist and Fahlenbrach (2009) suggests that the effect on corporate policies varies from a blockholder to a blockholder. My analysis aims to captures part of blockholders heterogeneity associated with their identity, size of portfolio, or investment horizon. But if what the main variation between block types arises from characteristics that are not related to their identity, size of portfolio, or horizon? For instance, in the identity dimension, I measure the diversity between individuals, institutions, and corporations, assuming that a pair of individuals on average is more

similar to each other than a pair of an individual and an institution. But if this assumption does not hold, then constructed diversity in identity would not be a reasonable proxy for blockholders' heterogeneity. In sum, my analysis relies on the assumption, that on average, a pair of blocks from the same group is more homogeneous than a pair of blocks from different groups. This assumption could not be tested directly, but I can support it with indirect evidences. The analysis in this part implies, that diversity between selected groups of blocks has a stronger impact on company value than diversity between randomly created groups of blocks.

In this exercise, all blocks are assigned to one out of four simulated groups with a one-fourth chance of being in each group. Consistently with the previous analysis, I create a simulated diversity measure between generated groups of blocks using **Equation 2**. I estimate the impact of simulated diversity on the company value using two stage analysis from Table 1.4. If statistical significance of both instrumental variables in the first stage is greater than 2%, I record the results of this simulation. If at least of the instrumental variables is not significant at the 2% level, I drop the results in this simulation and proceed to the next one. Simulations are repeated until I reach 100,000 results. The impact of simulated diversity measures has a lower statistical significance in the majority of cases. Only 1,982 out of 100,000 simulated variables have stronger statistical significance than any of the original diversity variables. Formally I compare t-statistics of simulated variables coefficient with the t-statistical of the least significant diversity variable. In my case, diversity in identity has the lowest absolute value of t-statitics, and thus I compare significance of simulation with it. Figure 1.8 illustrates the comparison of “real” diversity measure

with the generated placebo variables. The hypothesis that the simulated results have a stronger statistical significance than diversity in identity is rejected at the 2% level.

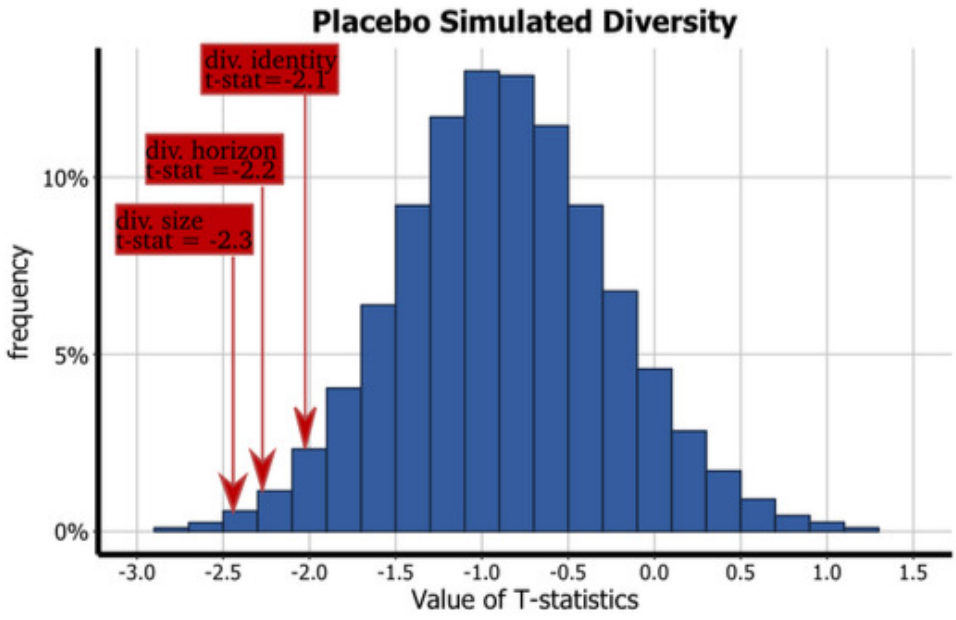

Figure 1.8 Placebo Simulated Diversity.

The simulated results also allow us to rule out a set of alternative explanations. For instance, if the results shown in this paper were driven by other characteristics of blockholders, such as the concentration of block ownership or the maximum size of a company's blocks, then the results of simulations would be similar to results of the original analysis. Importantly, simulated tests suggest that my results are not driven by unobserved characteristics of company block ownership.

Conclusion

According to my new and comprehensive data on block ownership, the majority of US public companies in recent year have several blockholders. These blockholders may differ from each other in multiple ways. I explore the impact of diversity among

blockholders on company value. Using shocks to block ownership from the acquisitions of financial firms and unexpected increase payouts in other companies to identify the causality channel, I find that block diversity has a strong negative influence on company value and performance. These results are consistent for all diversity measures: diversity in blockholders identity, diversity in the size of a blockholder's portfolio, and diversity in investment horizon of a blockholder.

My analysis separates the impact of the level of block ownership and block diversity. The results of my paper suggest that the potential positive effect of the level of block ownership could be offset by the negative influence of diversity among the blocks. Block diversity has a negative impact, even when diversity is measured after the exclusion of institutional blockholders, long-term blockholders and large blockholders. The analysis of the placebo simulations, implies that negative influence of blockholders comes mainly from diversity in their characteristics, rather than the size of block position or block concentration, or other unobserved parameters.

My results highlight the limitations of theoretical and empirical research, that focuses primarily on the aggregate level of block ownership or on the presence of one particular type of the investor. A promising avenue for the future research includes the theoretical predictions of block diversity, together with the investigation of potential mechanism behind its influence.

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CHAPTER 2

INFORMATION REVELATION THROUGH REGULATORY PROCESS: INTERACTIONS BETWEEN THE SEC AND COMPANIES AHEAD OF THE IPO.

Abstract

We investigate the SEC's role in the critical period of just before firms go public. Our findings provide strong evidence that regulators play an active role around this time, with more complex companies undergoing more rounds of SEC review, and companies with a higher likelihood of fraud receiving more accounting-related questions. Companies with more extensive SEC reviews tend to have lower offer prices than previously expected and also more uncertain outcomes after the IPO. However, underwriters don't initially fully incorporate this information into expected prices, potentially due to framing biases that cause them to only partially respond to external signals.

Introduction

Regulations are costly. However, the costs associated with insufficient regulations can be equally severe. The balancing act between increased competition, fairness and transparency on the one hand versus the costs associated with regulatory requirements has been on center stage throughout the past two decades. As recent changes in regulations (e.g., the JOBS Act) and public debates suggest, the tension between these forces is paramount, especially around the time a company goes public. This paper focuses on one regulatory body--the SEC--and investigates how it interacts with firms in the critical period of just before they go public.

Because investors do not have the ability to request additional information from a company, regulators play a unique role (Samuelson (1954), Leftwich (1980), Watts and Zimmerman (1986), and Beaver (1998)). Regulators such as the SEC influence the information that a broad spectrum of companies provides to investors. The SEC's role is particularly acute when public information is limited. For example, when a firm prepares to raise public equity for the first time, the SEC only gives the company permission to go public after ensuring that the company's disclosures are adequate. Throughout the filing period preceding a company's IPO, the SEC expresses its concerns about the validity and completeness of information provided in each company's prospectus. Typically, this is an interactive process of multiple rounds, where the SEC expresses its concerns and asks for more information in letters to the company, and the company adjusts its prospectus accordingly.

The benefits of SEC reviews can be substantial: the regulatory process serves as a monitoring device and ensures efficient and fair information revelation practices. However, the costs can be substantial as well. A prolonged process with the SEC is costly to firms for three reasons. First, requests for additional disclosures may reveal private information the company would rather not publicly disclose, especially to its competitors. Second, the substantial requirements on management time distract from the running of the company. Third, for firms striving to go public, SEC demands for further disclosure and/or clarification delay the IPO process, and such delays are risky because of the possibility of a deterioration in market conditions. Dunbar and Foerster (2008) show that more firms tend to withdraw their IPOs when market conditions deteriorate. Moreover, less than 20% of firms that withdraw their IPOs ever go

public. In light of these costs, management has strong incentives to write an initial prospectus that will raise the least possible objections at the SEC, and thus result in the least number of rounds of SEC review.

Our decision to focus on the IPO setting is driven by several factors. First, the SEC's directive to protect financially unsophisticated investors heightens the importance of regulators monitoring disclosures around the time of the IPO. Prior to the IPO, there exists limited information about the firm in the public domain, resulting in a tendency of uninformed investors to disproportionately receive allocations of 'lemons' (see, e.g., Rock (1986)). Second, the IPO setting offers a unique advantage toward understanding the influence of regulators. The SEC conducts an in-depth review of the prospectus of every firm that files to go public in the United States, and it details its concerns in comment letters that are publicly available on EDGAR. This contrasts with settings such as 10-Ks, where the SEC reviews only a subset of filings.

The first objective of the paper is to empirically examine the role played by the regulator. Theoretical literature such as Baron and Myerson (1982) and Laffont and Tirole (1986) assumes an active role for the regulator, yet empirical evidence on regulator involvement in the IPO process is limited. Within the context of IPOs, while we have gained some knowledge about firms' initial disclosures through the prospectus, our knowledge regarding the extent to which the SEC affects this process is partial. Thus, we empirically analyze the SEC review of IPO prospectuses, examining both the extent of review and the topics on which the SEC focuses. To assess the topics of concern in each letter, we use a machine-learning technique (Latent Dirichlet Allocation, LDA) that enables us to extract the main subjects of the

SEC review and also to quantify the extent of each issue in each letter. As described more fully in the paper, this technique is both objective in the sense that every firm letter is classified in exactly the same fashion, and flexible in the sense that it does not require any initial prior belief about the content of the documents or the appropriate construction of word lists. We then employ three different approaches to infer the economic meaning of each LDA topic.

Our findings provide strong evidence that regulators play an active role around the time of the IPO. Companies receive between one and thirteen letters, with each letter having between two hundred and over seven thousand words. Results from the LDA analysis indicate that the greatest number of SEC questions relate to requests for clarification on the business model and about the uncertainties associated with it, which we refer to as the Business Description topic cloud. For the average company, 44% of the first letter from the SEC relates to these issues. In addition, we find that the SEC also focuses on issues related to: accounting, compensation, and valuation. Throughout the paper we focus on these four topic clouds. An examination of the content of the LDA topic clouds indicates that they map very closely into the components of disclosure required to register securities sold in the U.S.: "(i) a description of the company's business; (ii) a description of the security to be offered for sale, (iii) information about the management of the company; and, (iv) financial statements certified by independent accountants." Several of the topics map almost one for one to these general SEC requirements. This is consistent with the SEC

concentrating to a large extent on its mandate when it comes to the IPO review process, and with our topic modeling capturing this process. [11]

Our second objective is motivated by theory such as Jovanovic (1982) and Verrecchia (1983), which highlights variation in companies' disclosures that stem from differences in firm type, and regulators' directive to protect investors, for example by lowering information asymmetry between companies and investors.[12] The implication is that certain types of companies will have less complete and less precise disclosures, and regulators will pressure them to provide additional information. Our empirical analysis focuses on four attributes: company complexity, which relates to the costs of satisfying (with a higher probability) SEC reviewers; advisor quality, which relates to the value added by a financial intermediary in mitigating information asymmetry (see, e.g., Leland and Pyle (1977)); the likelihood of the company committing financial fraud; and, the extent and precision of companies' disclosures in the first preliminary prospectus, which represents an indirect measure of the net costs of disclosure. Results are consistent with all of these factors playing a role.

Our third objective is to examine the relation between SEC concerns and the valuation of the company. A broad body of literature, stemming from Rock (1986), Beatty and Ritter (1986), and Benveniste and Spindt (1989), considers the ways in which uncertainty and information asymmetry between the company and investors affect the valuation of the offerings. Our ability to observe the regulator's concerns enables us to provide insight into the ways in which the information produced by the regulator influences this process. If concerns raised by regulators are positively correlated with

[11] https://www.sec.gov/answers/regis33.htm
[12] See Beyer et al (2010) for a review of the disclosure literature.

investors' concerns, e.g., if more extensive regulator demands for additional disclosures suggest a greater information asymmetry between investors and the company, then the underwriter should consider the SEC's concerns when valuing the company.

Importantly, the majority of the SEC's concerns precede the setting of the price range. Thus, if underwriters correctly assess the relevance of the SEC's concerns, then they should incorporate all information contained in the SEC review into the price range. Information learned by the underwriter during bookbuilding would be orthogonal to anything uncovered through the SEC review process, and we would observe no relation between the extent of SEC review and the price revision from the price range to the final offer price. In contrast, psychology literature, for example Kahneman and Lovallo (1993), suggests that framing and perhaps confirmation biases can cause the firm and its underwriter to not fully incorporate the information contained in the SEC letters. Simply put, they are positively biased about the firm's value and only partially adjust to external, objective assessments that might suggest otherwise. We indeed observe a significant negative relation between the extent of SEC review and the price revision, consistent with firms and their underwriters only partially adjusting their expectations in response to information learned through the interactions with the SEC.

In addition, we observe no relation between the extent of SEC review and the initial return, providing further evidence that the setting of a lower offer price was justified. In sum, our results suggest that concerns raised by the SEC are correlated with concerns raised by institutional investors during the roadshow, but behavioral

biases cause underwriters to not fully appreciate the implications of these concerns when they are first raised by the SEC.

To the extent that both institutional investors during the roadshow and the SEC have concerns about the same set of issues and companies (as suggested by the above results), one would expect these companies to be characterized by greater uncertainty. This greater uncertainty may reflect an inability of the SEC review process to completely resolve the uncertainty surrounding the firm, or it may reflect more uncertainty regarding the quality of management. In either case, we expect these companies would have more volatile returns, that they would have a higher probability of either very good or very poor performance over the first year as a public company, and that the greater probability of very poor performance would be reflected in higher insider sales. Results provide strong support for all three predictions.

Finally, our last empirical analysis exploits an important institutional detail particular to SEC comment letters to investigate the extent of regulator information production in more depth. In particular, IPO investors can estimate the total extent of SEC review prior to the IPO, but the precise concerns raised by the regulator are difficult to ascertain at that point. Each letter necessitates a prospectus revision, meaning that investors can estimate the number of SEC letters and the first market price should incorporate this information. However, SEC letters are not made public until at least 45 days after the IPO, and as a result investors are unable to observe the SEC's concerns at the time of the IPO.

Findings from the returns analysis are consistent with different types of information being incorporated into prices at different points. First, we find no

significant relation between the total amount of SEC review, as proxied by the number of letters, and post-IPO returns. This is consistent with investors being able to estimate this prior to the offering. Second, we find significant negative relations between several of the key topics and post-IPO returns. For example, a one standard deviation increase in concerns related to the description of the business is associated with a statistically significant four percent lower returns over the following year. To understand why certain topics are more strongly related to post-IPO returns, we estimate the incremental information content of SEC letters relative to information previously disclosed in the prospectus. To achieve this, we develop a new method that builds on the properties of LDA topics and on the concept of KL-divergence.[13] We find that the topics that are most significantly related to post-IPO performance represent those topics that are least closely related material in the prospectus, and thus least anticipated by investors.

Several influential papers, including Hanley (1993), Hanley and Hoberg (2011, 2012), and Loughran and McDonald (2013) examine how the quality of information firms share with investors in the pre-IPO process affects key post-IPO outcomes. Our paper extends and complements these earlier efforts, by highlighting the influence of the regulator throughout this disclosure process. While companies expend considerable time and effort deciding how to portray their company to prospective investors through the prospectus, the regulator frequently requires information beyond what the company initially chose to disclose. Importantly, this intervention contains incremental information beyond that contained in the prospectus itself.

[13] LDA topic can be viewed as a probability distribution. A measure of KL-divergence could be used to measure the informational gain from one distribution to another one.

Our findings on the relation between concerns expressed by the SEC and post-IPO performance suggest that the regulator produces new information, which is consistent with regulators playing a unique role (Samuelson (1954), Leftwich (1980), Watts and Zimmerman (1986), and Beaver (1998)). Consistent with Simon's (1989) analysis of companies around the time of the 1933 Securities Act and with LaPorta et al's (2006) international analysis, our results suggest that investors can benefit from the regulator's intervention, in our case through increased transparency as a result of prospectus revisions. However, the benefit is limited by the fact that investors do not observe until after the IPO the underlying SEC concerns, which potentially signal aspects of firm and management quality.

Finally, our paper introduces a novel methodology to analyze text similarity across different types of documents, or more precisely, the marginal information contained in one document relative to another. The methodology, which is a combination of two sets of LDA analysis and KL-divergence, enables us to examine the incremental information contained in SEC letters that are issued in response to company IPO prospectuses. Importantly, this methodology could similarly apply to any case where two documents have overlapping content, but different formats, e.g., company 10Ks and analyst reports, or company news releases and journalist reports. The ability to analyze incremental information and to analyze information in different formats makes this approach more flexible than earlier methods used in the literature, thus contributing to the body of literature that uses methods such as cosine similarity.

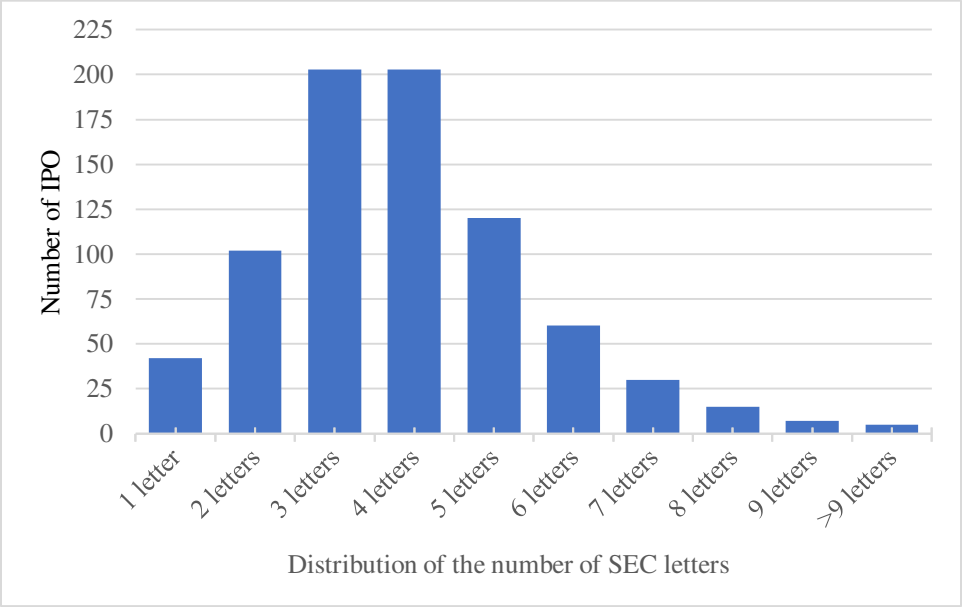
Data and Descriptive Statistics

The SEC began disclosing all comment letters starting May 12, 2005, which dictates the beginning of our sample period. We obtain a sample of firms that went public between May 2005 and December 2013 from Thomson Financial SDC Platinum. To keep the sample relatively consistent, we omit REITs, ADRs, closed-end funds, unit offerings, and IPOs with an offer price of less than five dollars. We require all firms to have CRSP data, in particular a CRSP price within the first ten trading days after the IPO, and Compustat data. We collect data from Thomson on the characteristics of the offer, for example the identity of the underwriter(s), the identity of the law firm(s), and whether it is venture backed.We obtain the year of founding from Jay Ritter's website and from IPO prospectuses, and we use this to calculate firm age.[14]

From EDGAR, we download the initial prospectus of each of these IPO firms. We also download all of the comment letters issued by the SEC, which were related to the IPOs of these firms. Our final sample consists of the 766 companies that filed their IPO on or after May 12, 2005 and which went public by December 31, 2013. Table 2.1 and Figure 2.1 provide descriptive statistics related to the SEC review process, across our sample of 766 companies.

[14] These data come from the Field – Ritter dataset of company founding dates, as used in Field and Karpoff (2002) and Loughran and Ritter (2004). We thank Jay Ritter for making these data publicly available: https://site.warrington.ufl.edu/ritter/ipo-data/. In cases where firm age was not available from this source, we hand-collected it from IPO prospectuses.

Panel A: Distribution of Number of SEC letters, across IPO firms



Panel B: Distribution of Number of Words in First SEC letter, across IPO firms

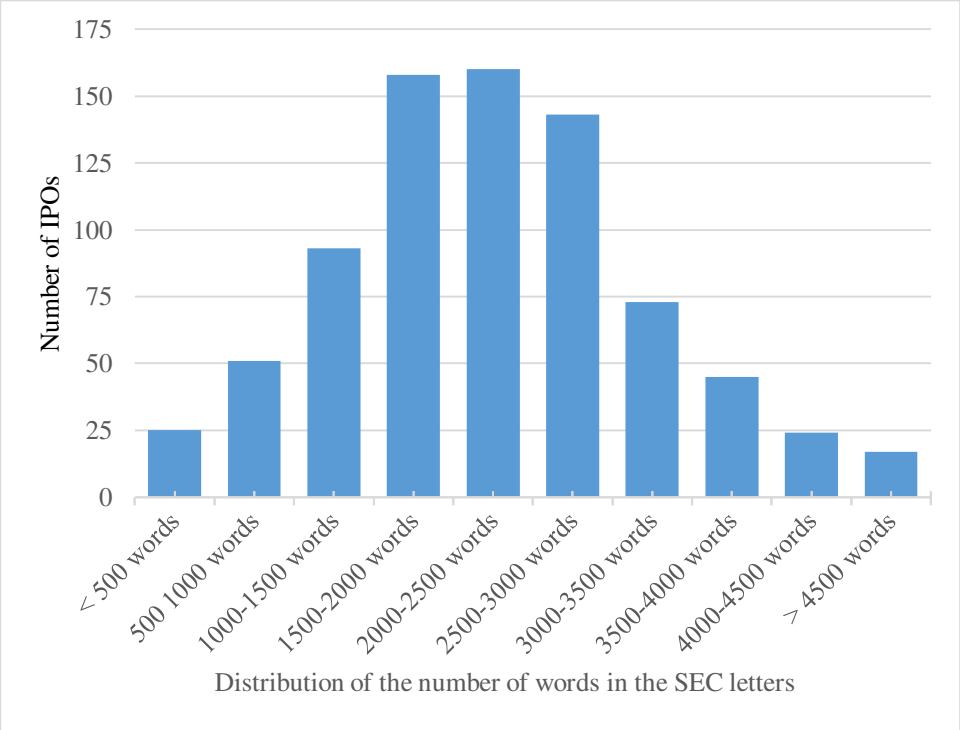


Figure 2.1: Histograms depicting SEC Review Process
The sample consists of IPOs between 2005 and 2013, for which we download SEC letters from EDGAR. Panel A tabulates the total number of letters each company receives from the SEC in response to its IPO prospectus, and Panel B tabulates the number of words in the first letter each company receives from the SEC in response to its IPO prospectus.

Table 2.1 Descriptive Statistics

The sample consists of 765 IPOs between 2005 and 2013. Panel A shows descriptive statistics on firm characteristics just before going public, and Panel B shows descriptive statistics on the SEC letters that relate to each firm's preliminary prospectus. Appendix 1 provides variable descriptions.

Panel A: Firm Characteristics

Variable	Mean	Q1	Median	Q3	Obs
Sales	824.5	44.0	125.5	427.3	766
Proceeds Raised	244.3	65.0	108.6	220.0	766
Number Segments	2.9	1.0	1.0	4.0	766
Firm Age	19.7	6.0	10.0	20.0	766
Underwriter Rank	5.9	0.0	8.0	9.0	766
Law Firm Rank	3.6	1.0	3.0	4.0	766
S1 Length	164.7	94.5	148.2	215.7	766
S1 Uncertainty	3.25	3.01	3.22	3.46	766
F score	1.3	0.6	1.0	1.8	532
VC	0.7	0.0	1.0	1.0	766
JOBS Act	0.2	0.0	0.0	0.0	766

Panel B: Characteristics of SEC Letters

Variable	Mean	Q1	Median	Q3	Obs
Number of Letters	3.9	3.0	4.0	5.0	766
Number of Words	2300	1610	2230	2850	766
					766
%Accounting, letter	10.21%	0.03%	1.02%	21.09%	766
%Valuation, letter	8.31%	2.82%	7.82%	12.16%	766
%Compensation, letter	5.69%	0.01%	0.02%	0.46%	766
% BusinessDesc, letter	45.88%	39.74%	47.45%	54.36%	766
					766
# Accounting words, letter	244.02	0.54	19.32	433.04	766
# Valuation words, letter	183.88	32.69	143.02	271.71	766
# Compenation words, letter	129.85	0.30	0.32	9.38	766
# BusinessDesc words, letter	1040.00	542.01	999.71	1440.00	766

Looking first at Panel A of Table 2.1, the average firm had sales of $825 million and 2.9 segments, raised $244 million in proceeds, and was 20 years old at the time of the IPO. However, each of these distributions is skewed, and the median firm is smaller (sales of $126 million, proceeds of $109 million, and one segment) and younger (10 years old). The mean (median) underwriter rank is 5.9 (8.0) on a one to

nine scale, where underwriter rank is calculated following the methods of Carter and Manaster (1990), as updated by Carter, Dark, and Singh (1998) and Loughran and Ritter (2004).[15] To calculate law firm rank, we place law firms into deciles based on the number of equity offerings over our sample period on which the law firm worked. The mean (median) law firm rank for our sample is 3.6 (3.0) on this one to ten scale, indicating that most IPO firms are advised by a law firm that works on relatively few deals, but a small number of law firms advise many firms. For example, Latham & Watkins and Vinson & Elkins each worked on over 50 deals within our sample. Finally, sixty-eight percent of our IPOs are venture backed.

In an effort to characterize the disclosures of a firm prior to SEC intervention, we also compute two measures related to the firm's preliminary prospectus: the total length of the document and a measure of its uncertainty. Total length represents a simple count of the number of words in the prospectus. To calculate uncertainty, we follow Loughran and McDonald (2011, 2013) and calculate the proportion of words in the preliminary prospectus that capture an uncertain tone, as measured by the uncertain and negative word list categories, where these word lists are developed based on their likely usage in financial documents.[16] Within our sample, the mean prospectus length is 164,700 words and 3.2% of the words in the average firm's prospectus have an uncertain or negative tone.[17] Moreover, there is substantial

[15] We thank Jay Ritter for making these data available on his website.
[16] As discussed in more detail in Loughran and McDonald (2011, 2013), uncertain words include approximately, risk, and believe, while negative words include loss, failure, and decline.
[17] Our measure of prospectus length is longer than that reported in Loughran and McDonald (2013) because it is based on the complete submission text file, including all attachments.

variation in both, with the interquartile range of prospectus length being 94,500 – 215,700 words, of uncertain/negative tone being 3.01 – 3.46.

The F-score, as developed by DeChow, Ge, Larson, and Sloan (2010), captures the likelihood of a financial restatement. DeChow et al predict Accounting and Auditing Enforcemenet Releases (AAERs) for a sample of firms based on six accounting items: accruals, change in receivables, change in inventory, percent of soft assets, change in cash sales, change in return on assets, and actual issuance. Using their adjusted coefficients and the accounting values for our sample firms, we calculate the F-score for each of our firms.[18] Because this variable requires two years of pre-IPO data, is it only available for 532 of our 766 observations. An F-score of 1.00 indicates that the likelihood of a restatement is equal to the unconditional probability, and higher values represent higher likelihoods. Within our sample, the median F-score is 1.0, the mean is 1.3, and the interquartile range is 0.6 – 1.8. Figure 2.1 describes the characteristics of the SEC letters, related to each firm's IPO prospectus. Across all years, the average firm received 3.9 letters, but as shown in the histogram in Panel A, there exists substantial cross-sectional variation in this number. The most common outcome is for a company to receive 3 or 4 letters, and slightly more than 200 companies fall into each of these categories. However, a nontrivial number of companies, approximately 100, receive only two letters or five letters. Approximately 50 companies receive one or six letters, and fewer companies receive seven or more letters. The average number of letters per firm varies over time, but exhibits no strong time trend (not tabulated).

[18] DeChow et al adjust coefficients such that an F-score of one equals the unconditional probability of a restatement.

This variation in the extent of SEC review is of great import to companies, as each additional letter potentially delays the offering. While we examine the relation between the number of letters and the registration period in more depth later, a univariate analysis is highly suggestive. On average, companies with one to two letters go public 88 days after the initial filing, compared to 123 days for companies with three to four letters and 206 days for companies with five or more letters. Panel B shows a histogram of the number of words in the first letter each company receives from the SEC. We see similar evidence of common outcomes, with the greatest number of companies having between 1,500 and 3,000 words in their letter.[19] Perhaps not surprisingly, the number of words in the first letter is strongly positively correlated to the total number of letters that a company receives. This potentially reflects one of two factors. First, a management that writes a poorer quality initial prospectus is likely to both receive more SEC comments in the first round to less thoroughly address this set of concerns, resulting in more subsequent rounds of review. Second, if the SEC had a larger number of concerns with the initial prospectus, then the extent of the prospectus revision will be greater and it is more likely that additional concerns will surface.

Clearly, the content of the SEC review and the extent of the review cannot be solely characterized by the number of letters each company receives and the number of words per letter. In addition to variation in these measures, there exists potentially meaningful variation in the topics raised by the SEC and in their relative importance;

[19] The majority of SEC letters are organized into a series of numbered points. Among the subset organized in this fashion, the average company had 44 points raised in the first letter. However, because not all letters have this format, we do not concentrate on this metric.

for example, the SEC may raise significant concerns about accounting practices for some firms, but ask more detailed questions about valuation-related issues for another. The topics of the letters are interesting in their own right and they also may be related to the severity of the SEC concerns. To this end, we employ textual analysis techniques to evaluate the specific topics.

The use of textual analysis in finance has grown in recent years, and there exist several alternative techniques.[20] First, one can manually read the document and make classifications. Used by Ertimur and Nondorf (2006) in their analysis of the SEC comment letters of 95 IPOs, this has the disadvantage of not being replicable and possibly being less precise, and it generally restricts the researcher to relatively small samples. Second, one can manually define word lists, and rely on the computer to count the frequency of each word. As used by Loughran and McDonald (2011, 2013) to analyze the tone of 10Ks and prospectuses, this is more replicable than the first approach, and it is also simple to implement. However, a disadvantage is that it requires that the researcher define the word lists, which necessitates specifying the topics rather than 'learning' what topics are most important from the document. The researcher's choices regarding word lists can affect classifications, which can be a disadvantage since one does not know what the important topics are in terms of their relative weight in the document. The third approach, Latent Dirichlet Allocation (LDA), is based on machine-learning and can overcome the limitations of both these prior techniques: it lets the classifications be determined by the content of the document, and it is objective and replicable. Moreover, Chang et al (2009) show that

[20] See Loughran and McDonald (2015) for a review of textual techniques in finance, accounting, and economics.

results from LDA analysis correspond to human ability to detect topics. While the computer science literature highlights the advantages of this method, up until this point relatively few papers within the finance literature employ it.

LDA, developed by Blei, Ng, and Jordan (2003), extracts thematic structures (" topics") from textual documents.[21] This algorithm does not require any prior knowledge about the content of the documents; rather, the algorithm identifies the topics. A topic is defined as a group of words that tend to appear in the same context. Words that are used in conjunction with or in the neighborhood with each other will tend to be categorized together. It is a more sophisticated structure than the dictionary "bag of words" approach because the same word, when used in different contexts, can be classified into different topics. For instance, the meaning of the word "cash" is found within different categories, but it tends to be associated with different words in different cases. The phrase "cash flow" is more likely to refer to financial statements and thus pertain to accounting issues, whereas the phrase "cash bonus" tends to refer to compensation.

The desired outcome is to both determine the important topics across all documents, and to determine the relative importance of each topic within each document. To provide an analogy, suppose a person reads through each document with the objective of highlighting each word according to its topic. On the first iteration the person reads through each SEC comment letter of each company and randomly highlights each word therein in one of ten different colors (where the exact number of different colors is chosen by the researcher, as discussed below). After

[21] Blei (2012) and Blei and Lafferty (2009) provide more in-depth overviews of this methodology, with the former representing a more intuitive explanation and the latter focusing on the technical aspects.

completing the initial process, the person would return to the beginning of the documents and decide whether to re-color some of the words. She looks at the output from the previous step and makes a decision about whether to recolor each word depending on the color of the words around it. She tries to highlight the words that appear in the same neighborhood (i.e., words that are likely referring to the same topic) in the same color. She repeats this entire process until it converges, updating the colors each time in a Bayesian process.[22]

At the conclusion of the process, one has two informative pieces of output. First, one has the lists of words and phrases that fall into each topic (e.g., we can refer to all of the red-colored words/phrases as topic 1, all of the yellow-colored words/phrases as topic 2, etc.). Related to this, the researcher now also knows the frequency of each word within each topic, for example the frequency of the word ' cash' within the red-colored words might by 0.005, while the frequency of the word ' leverage' within the red-colored words might be 0.0001, etc. Second, for each document the researcher obtains the percent that discusses each topic, i.e., the percent that is colored red, yellow, etc.

As mentioned above, the exact number of topics (or highlighter colors) into which the documents are classified is chosen by the researcher. Reported results are based on a method where we specify ten topics. While we experimented with different numbers of topics, we found that fewer topics (e.g., five) resulted in classifications that were overly broad, with multiple concepts combined together. In

[22] We find the 3000 iterations is sufficient for the method to converge on our data.

contrast, a greater number of topics (e.g., twenty) produced many lists with words referring to the same underlying concept.

For our purposes, it is important to also infer the economic meaning of each topic. The inference is based on three criteria: an analysis of the most common words, an analysis of the context (i.e., sentences) in which these words tend to occur, and an analysis of the ten companies with the highest portion of the SEC letter related to the topic. As described in more detail below, based on these criteria we conclude that there are topic clouds relating to accounting issues, to valuation issues, to compensation issues, and to requests for clarification regarding the business model and underlying risk factors. In addition, there are four topic clouds that relate to specific industries and two that relate to boilerplate-type items.

A key feature of our methodology is that we both let the machine learning algorithm determine the topics completely independently, and use various methods to extract the economic meaning of the topics. This potentially improves over approaches in prior literature that either define the topics of interest and specify the classification accordingly (e.g., positive vs negative tone, as in Loughran and McDonald (2011, 2013)) or use machine learning approaches such as LDA independent from economic meaning (e.g., Ball, Hoberg and Maksimovic (2015), Hoberg and Lewis (2015)). Most similar to us in approach are contemporaneous papers by Israelson (2014), Gupta and Israelson (2015), and Hanley and Hoberg (2016) who also use LDA analysis to extract risk factors.[23] We develop economically-based predictions regarding the

[23] Gupta and Israelson (2015) investigate firms' disclosures, with a focus on the optimal amount of soft versus hard information to reveal. They find that the JOBS Act resulted in significant changes regarding the mix of hard versus soft information in both firm disclosures and associated SEC letters.

relevance of each topic, where topics that correspond to subjects of SEC focus (as published by the SEC) are predicted be more significant than topics that correspond to boilerplate-type items.

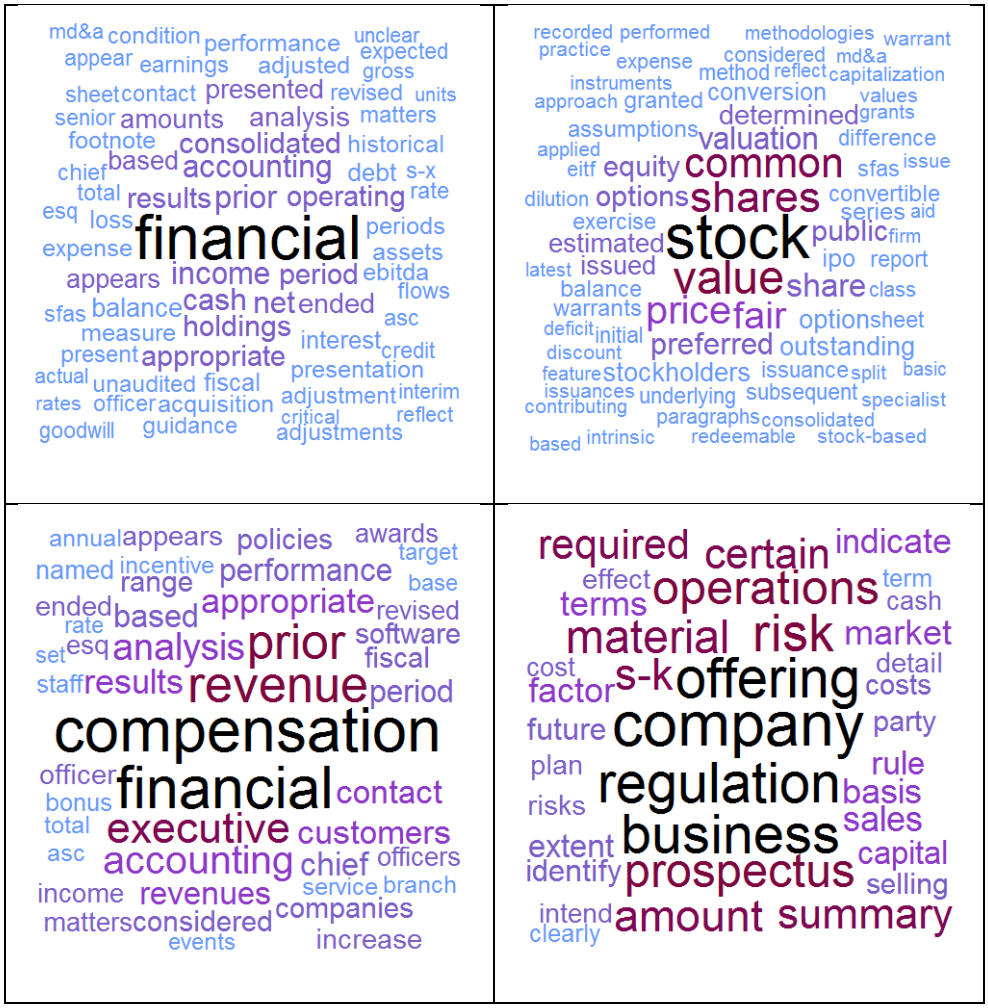


Figure 2.2: Topic Clouds

The sample consists of IPOs between 2005 and 2013, for which we download SEC letters from EDGAR. We obtain the first letter that each company receives from the SEC in response to its IPO prospectus. We employ LDA Analysis (LDA) across this set of letters to identify ten topics. Panels A through D illustrate the words contained in each of the four topics of focus.

Israelson (2014) focuses on explaining patterns in stock returns, and Hanley and Hoberg (2016) investigate banks' emerging risks.

Panels A – D of Figure 2.2 show four topic clouds, each of which relates to a key disclosure issue for companies going public.[24] In each panel, the size of the word is indicative of its frequency. For example, looking first at Panel A, we see that the most frequently occurring word is financial, followed by consolidated, accounting, income, prior, net, and cash holdings. Other frequently occurring words include operating, EBITDA, results, debt, fiscal, etc. Clearly, these words pertain to accounting-related topics, and thus we classify this word list as accounting-related.

Panel B depicts the valuation topic cloud, where stock, value, common, shares, and price are the most frequently-occurring words. Looking at Panel C, compensation, financial, and executive are among the most frequently occurring words, and thus we label this the compensation topic cloud.

The topic cloud shown in Panel in D is most heavily populated by words such as company, business, operations, offering, regulation, discuss, describe, discuss, summary, prospectus, etc. An analysis of both the words in this topic cloud as well as the sentences in which they are used suggests that this topic cloud captures questions and requests for clarification regarding the business model and underlying risk factors of the firm. We refer to this as the business description topic cloud.

For other topic clouds, the word lists suggest a strong industry concentration: the energy industry (keywords include energy, partners, partnership, and petroleum), the services industry (words include services, security, wireless, and networks), and the pharmaceutical industry (keywords include license, trials, milestone, and FDA). An additional cloud that we ultimately define as being related to one industry has a

[24] All topic clouds are available on request.

less clear grouping of words, but we find that the ten companies with the highest proportion of the prospectus discussing this topic are all in the financial services industry.

Finally, the remaining two topic clouds include more boilerplate-type issues. They have a concentration of words such as cover, furnish, requested, effective, accuracy, and adequacy. We find that these nuisance issues are almost always found in the last letter that a company receives, immediately prior to going public. As such, it contains standard language pertaining to issues related to the now imminent offering. To confirm that we are not missing anything important with respect to these boilerplate topic clouds, we read through letters where these issues are mentioned. We find the discussion to be predominantly related to what we classify as nuisance issues (e.g., "Please avoid use of the term "solution" as it is jargon."), and standard, almost universal requirements (e.g., "Please amend your registration statement in response to these comments.").

Examination of the ten companies with the greatest portion of the SEC letter deriving from each topic cloud provides further support for our classifications. For the accounting, governance, and business description topic clouds, we find that the top firms come from a range of industries. In contrast, each of the industry topic clouds is heavily concentrated in the respective industry.

Panel B of Table 2.1 shows descriptive statistics related to the percent of the SEC comment letter that pertains to each topic. Here and in all subsequent analyses, we focus on the first SEC letter that the company receives, i.e., the letter that the SEC

writes in response to the preliminary prospectus.[25] For the median company, approximately 1% of the first letter focuses on accounting issues, 8% on valuation issues, and 47% on business description issues (means of 10%, 8%, and 46%, respectively). As an alternative metric, which we use in some empirical tests, we also compute the number of words in each SEC letter that refer to each topic, which will be a function of both the relative weight on the topic and on the letter length. For the median (mean) company there are 19 (244) words related to accounting issues, 143 (184) related to valuation issues, and 1,000 (1,040) related to business description issues.

Across both measures, the compensation topic, which the LDA analysis identified as a unique topic, appears to be important for a very small number of companies. The median company has 0.02% of the letter (0.3 words) dedicated to such issues. While means are higher, they are driven by a small number of outliers. For the firm at the 75th percentile, only 0.46% of the letter (9.4 words) pertain to the compensation topic.

One of the unique features of the information environment surrounding IPO firms is that investors receive the majority of their information regarding the firm through the prospectus. In contrast to more mature firms, which have made public filings with the SEC for multiple years, this single document captures to a large extent investors' knowledge of the IPO firm. It is therefore critical to control for the

[25] Companies that file to go public under the JOBS Act have the option to file a draft registration statement (DRS), which is not publicly available at the time of filing. In these cases, the first letter that the SEC writes is in response to this DRS rather than the S-1. We include a dummy in all regressions equal to one if the company filed under the JOBS Act, as stated in the prospectus. In addition, we re-estimate regressions excluding the 152 companies that filed under the JOBS Act.

prospectus content when evaluating the effects of the information contained in the SEC letters. As described in this section, we borrow and combine two methods from computer science (LDA and KL-divergence) to isolate the marginal information content that can be attributed to the interaction between the SEC and the IPO firm, as characterized through the SEC letters.

Specifically, we use both topic cloud analysis (on the prospectus and SEC letters separately) and a technique developed by Kullback and Leibler (1951), KL-divergence, to identify the letters' marginal information value.[26] The first step is to apply the LDA topic modeling approach to the preliminary prospectus of each company, analogous to the previously described analysis of the SEC letters. Using LDA we construct the 'prospectus' topic clouds. Because the prospectus is substantially larger in volume and likely covers many more topics than the SEC letters, we allow the LDA to construct 30 topic clouds from the prospectuses.[27] Intentionally, this process is conducted completely independently of the SEC letter classification so that we do not a priori impose any relationship between the topics discussed in the prospectus and the topics discussed in the letters. Thus, the prospectus and letter topic clouds could be completely unrelated, or they could be very closely related.

The second step is to quantify the relationship between the SEC letter topic clouds and the prospectus topic clouds. To capture the extent to which SEC questions relate to new issues that were not voluntarily disclosed in the prospectus, we measure

[26] This technique has been used widely in the information theory literature. See, e.g. Principe, Xu and Fisher (2000).
[27] All topic clouds are available on request.

the 'information added' in each SEC letter cloud, relative to each of the prospectus clouds. Specifically, we characterize each topic cloud as a vector (in our case we have 40 vectors, 10 from the letters and 30 from the prospectuses); where the length of the vector is equal to the total number of potential words (defined as words appearing in any company's prospectus and/or SEC letter). Each component of the vector represents the weight of the corresponding word in the topic cloud.[28]

For each of the topics we extracted from the SEC letters, we seek to determine the prospectus topic that includes the highest amount of similar information. We require a measure that estimates the incremental information in the SEC letter cloud relative to the prospectus topic cloud. Burham and Anderson (2004) highlight KL-divergence as a metric to capture such incremental information. Importantly, KL-divergence satisfies three key criteria: objectivity, emphasis on more frequent words, and stability to vocabulary selection. It is replicable and does not rely on human judgment, it puts a higher emphasis on more frequent words, and it is robust to the exclusion of low frequency words within the topic. In contrast, cosine similarity, which has been widely used to estimate the distance between two vectors of word frequencies, meets the first requirement, partly addresses the second, and does not satisfy the last. Replications of the topic cloud matchings illustrate these features. Specifically, we select the most frequent words in each of the SEC letter topic clouds and in each of the prospectus topic clouds, where the number of words selected varies from 1000, 1100, 1200, … 5000. Across all cases, the KL-divergence matching stays the same, whereas

[28] As such, each topic can be thought of as a probability distribution

the cosine similarity matching is sensitive to such choices. We first outline the KL-divergence approach, and then provide an example that illustrates these advantages. For each SEC letter cloud (characterized as a vector), we calculate the KL-divergence with each of the 30 prospectus clouds (similarly characterized as vectors). Thus, we end up with a 10 x 30 matrix of KL-divergence measures, where each KL metric represents a measure of the incremental information in the SEC topic cloud relative to the respective prospectus cloud.[29] The final step is to select, for each SEC letter topic cloud, the prospectus cloud that is most similar. Outputs from this process are used in subsequent analysis as a control for information that had been previously disclosed in the prospectus, and as a measure of the extent of incremental information in the SEC letters.

The following example highlights the ways in which we employ these topic cloud and KL-divergence techniques to understand the marginal information contained in SEC letters. To make the example as simple as possible but still highlight the important properties of KL-divergence, suppose that the total dictionary consists of only three words: "compensation", "financial", and "performance", and there is a total of two prospectus topic clouds. Continuing this example and as shown in Figure 2.3, assume the compensation topic cloud from the SEC letters more heavily weights the words "compensation" (42% weight) and "financial" (40% weight), with a lower emphasis on "performance" (18% weight). As shown in the last two rows of the table,

[29] Each topic vector with weights can be viewed as a probability distribution, and the KL-divergence is a standard measure of the similarity of two probability distributions. If $Q(i)$ is the frequency of word i in the selected prospectus topic and $S(i)$ is the frequency of the same word in the selected SEC letter topic, the KL-divergence of Q from S is represented by the formula $\sum S(i) \cdot \log\left(S(i)/Q(i)\right)$. This value captures the amount of information added by the distribution S (SEC letter topic) to the distribution Q (Prospectus topic).

both prospectus topic clouds discuss "performance" frequently; the first also has a substantial weight on "compensation" and "financial" (20% weight on each), while the second includes only one of the important words from the SEC letter topic cloud (" financial" has a 49% weight, but "compensation" has a negligible 1% weight). While the first likely captures compensation issues, the second is more likely related to accounting issues.

The KL-divergence metric "penalizes" heavily the fact that the second prospectus cloud rarely mentions one of the important words in the SEC letter compensation cloud. The KL-divergence between the SEC letter cloud and Prospectus Topic Cloud 2 equals 1.30, substantially higher than the 0.37 with Prospectus Topic Cloud 1, which has a more positive weight on both "compensation" and "financial". In sum, the KL-divergence indicates that SEC compensation questions most closely relate to Prospectus Topic Cloud 1. Thus, in order to isolate the incremental information content of the SEC letters, it is important to control for Prospectus Topic Cloud 1 in our analysis of the extent of SEC questions regarding compensation issues.[30]

[30] This asymmetry feature distinguishes the KL measure from cosine similarity and makes it a more appropriate approach in our context, in which we are interested in the amount of information added by the SEC letter relative to the information contained in the prospectus. The example again highlights this contrast. As shown in the last column of the table, the cosine similarity metric is similar for both prospectus topics, even though the KL-divergence metrics are substantially different. The cosine similarly approach would lead the researcher to conclude that SEC compensation questions are equally related to prospectus Topic 1 (which appears to relate to compensation) and prospectus Topic 2 (which appears to relate to accounting).

	Words in Dictionary				
	" Compensation"	" Financial"	" Performance"	KL(S|.)	Cos(S,.)
SEC Letter Topics					
Compensation Topic	42%	40%	18%	-	-
Prospectus Topics					
Topic 1	20%	20%	60%	**0.37**	0.675
Topic 2	1%	49%	50%	1.30	**0.682**

Figure 2.3: An example of KL divergence
This simplified example highlights KL divergence. In the example we construct one SEC letter topic and two prospectus topics. Each topic contains only three words: "compensation", "financial" and " performance". As shown in Columns 1 – 3, the frequencies of these words in the SEC letter topic are 42%, 40% and 18%, respectively. Based on these loadings we label this topic as "Compensation" topic. Similarly, the table also shows the weights on each of these words in each of the prospectus topics (Topic 1 and Topic 2)
KL(S|.) shows the KL divergence between the SEC letter topic and each prospectus topic. Cos(S|.) reports the cosine similarity between the SEC letter topic and each prospectus topic. The KL-divergence measure indicates that the constructed SEC letter topic is closest to Topic1, while the cosine similarity measure finds that this topic is closer to Topic 2.
KL-divergence between SEC letter topic and prospectus formula is measured with the formula $KL(S|P) = \sum_{i=1}^{3} S(i) \cdot \log(S(i)/P(i))$,
Where $S(i)$ is a frequency of word i in the SEC letter topic and $P(i)$ is a frequency of selected Prospectus topic.
Cosine similarity is measured with the following formula

$$Cos(S,P) = \frac{\sum_{i=1}^{3} S(i) \cdot P(i)}{\sqrt{\sum_{i=1}^{3} S(i)^2} \cdot \sqrt{\sum_{i=1}^{3} P(i)^2}}$$

For each of the ten SEC letter clouds, we use this KL-divergence metric to choose the prospectus cloud that has the minimum distance, i.e., the prospectus cloud that is 'closest' to the SEC letter cloud, in the sense that the SEC letter topic cloud has the smallest amount of incremental information. For each topic, Table 2.2 describes

the key features of the closest prospectus cloud: the average portion of the prospectus (columns 1 and 2), the distance between the SEC letter cloud and closest prospectus cloud (column 3), and t-tests and associated p-values from a test of whether the selected 'closest' prospectus cloud has a significantly smaller distance than the other prospectus clouds (columns 4 and 5). In addition to the verification provided by the t-tests, a reading of the words in each of the 'closest' prospectus clouds indicates that the topics correspond in a meaningful way. For example, the prospectus cloud that is closest to the SEC letter compensation cloud contains the words executive, options, and compensation, while the prospectus cloud that is closest to the SEC letter accounting cloud contains the words assets, income, and cash. Comparing the distance measures across topics, it is illustrative that the boilerplate issues in the SEC letters are least closely related to the prospectus, with a KL-divergence of nearly five. In comparison, the distance measure for compensation is 2.2, suggesting these questions are closely related to information in the prospectus, compared to 3.5 for the business description topic. These KL-distance measures provide an estimate of the extent of incremental information contained in each SEC topic.

Our objective in this analysis is twofold. First, in subsequent regressions that examine the extent to which the SEC's concerns are focused on certain topics, we control for the extent to which the company's prospectus (which serves as the basis for the SEC's comments) focuses on these same issues. For instance, referring back to the example above, in regressions that focus on the effects of compensation-related questions in the SEC letters, we include controls for the closest prospectus topic. Thus, the KL-divergence technique enables us to identify the prospectus topic cloud

Table 2.2. Topic Clouds in Prospectus

Across the 765 IPOs in our sample, we analyze both the preliminary prospectus and the first SEC letter that the company receives in response to this prospectus. We use LDA analysis to classify the words in the first SEC letter into ten topic clouds: the main topics of interest (accounting, valuation, compensation, and business description), industry topics (one of which is reported in the table, healthcare), and two boilerplate topics. Similarly, we use LDA analysis to classify the prospectus into 30 topics. For each SEC letter topic, we then determine the prospectus topic cloud that has the KL-shortest distance (as described more fully in the text of the paper). For each SEC letter topic, columns 1 and 2 provide the percent of the prospectuses that relates to this 'closest prospectus cloud', and the number of words in this 'closest prospectus cloud', respectively. Column 3 shows the KL-distance between the SEC letter topic cloud and this 'closest cloud in prospectus'. For each selected SEC letter topic cloud we compare the KL-divergence of the closest topic with KL-divergences with other 29 topic clouds in the prospectus. The last two columns show t-statistics and p-values of the minimum KL divergence in comparison to the set of other 29 prospectus topic cloud KL divergences.

Topic in Letter	% of Prospectus related to Closest Prospectus Cloud	# Words in Prospectus related to Closest Prospectus Cloud	Distance between SEC Letter Cloud and Closest Prospectus Cloud	T-statistics of the Distance between SEC Letter Cloud and Prospectus Cloud	P-value of the Distance between SEC Letter Cloud and Prospectus Cloud
Main Topic of Interest					
Accounting	3.5	5,030	2.8	-2.20	0.02
Valuation	3.5	5,030	3.1	-2.26	0.02
Compensation	10.8	17,110	2.2	-3.08	0.00
Business Risk	5.9	7,850	3.5	-1.16	0.13
Industry Topics					
Healthcare	3.1	564	2.9	-2.34	0.01
Boilerplate Topics					
Boilerplate 1	3.1	743	5.0	-1.70	0.05
Boilerplate 2	2.5	595	4.8	-1.63	0.06

that is closest to the SEC letter topic, and thus the topic that is most important to control for in the regression. Second, we contrast the ability of various topics to explain post-IPO returns with the 'closeness' of the topic to information already disclosed in the prospectus, i.e., the extent to which the SEC is requesting disclosures on additional subjects (e.g., international operations not discussed in the prospectus) versus small modifications of previous disclosures (e.g., additional detail on inventory practices).

The real consequences of lengthy SEC reviews

The SEC review process is arguably costly to companies, because of the potential delays in the going public process and because the process itself involves significant time and effort by both management and outside advisors. Delays in raising capital might delay or even thwart positive NPV projects and affect firms' liquidity significantly. Distraction of management attention from the core company business may be equally costly, especially for young firms. Moreover, the risk of a change in market conditions means that the probability of having to withdraw the offering increases with such delays.

Table 2.3 highlights the strong positive relation between the extent of SEC review and the length of time between when a company files the IPO and when it ultimately goes public, what is commonly known as the registration period. Several conclusions emerge from this table. First, registration period length is strongly positively related to the number of rounds of review with the SEC, with one additional letter from the SEC being associated with a 30-day longer registration period. Second, comparing columns 1 and 2, the explanatory power increases from 23% to 32%, when we add the number of letters, in addition to firm and offer-specific characteristics. Third, column 3 indicates that the number of words in the first letter is strongly related to registration period, consistent with a greater number of SEC concerns being associated with a longer process and time until approval. However, when both number of letters and number of words in the first letter are included (columns 4 and 5), only number of letters is significant, indicating that companies' ability to

thoroughly respond to the SEC's concerns is more important than the original number of points raised.

Table 2.3: Registration Length and Company Characteristics

Our sample consist of 765 IPO from 2005 to 2013. The registration length is measured as the number of days between the filing date of the first public version of the IPO prospectus and the IPO date. The table shows the relationship between the length of the registration period and characteristics of SEC review process (Number of Letters, Number of Words in first letter), firm characteristics (Sales, Number of Segments, Firm Age, Underwriter Rank, Law Firm Rank, VC backing), and characteristics of initial disclosure (Prospectus Length, Prospectus Uncertainty). Detailed description of all the variables is available in the Appendix I. Robust standard errors clustered by industry are shown in parentheses. Industry and year fixed effects are included in all regressions.

	Registration Length	Registration Length	Registration Length	Registration Length	Registration Length
Log(Number of Letters)		89.868***		88.131***	87.899***
		(22.119)		(25.356)	(25.468)
Log(Number of Words)			44.517***	2.919	3.059
			(8.180)	(9.955)	(10.342)
Log(Sales)	-2.402	-4.860	-4.512*	-4.951*	-4.906*
	(2.727)	(2.805)	(2.486)	(2.755)	(2.541)
Number Segments	4.230**	3.510*	3.871**	3.500*	3.487*
	(1.785)	(1.644)	(1.635)	(1.625)	(1.623)
Log(1 + Firm Age)	4.134	4.103	4.187	4.107	3.975
	(4.581)	(3.589)	(4.053)	(3.591)	(3.611)
Underwriter Rank	1.912	1.921	1.889	1.919	1.945
	(1.474)	(1.316)	(1.464)	(1.319)	(1.314)
Law Firm Rank	-1.922	-2.036	-1.654	-2.016	-2.008
	(1.187)	(1.237)	(1.094)	(1.247)	(1.247)
VC	7.180	-7.707	-0.735	-7.939	-6.286
	(11.672)	(11.389)	(11.105)	(11.265)	(11.509)
JOBS Act	-189.423***	-178.834***	-188.253***	-178.961***	-178.105***
	(45.378)	(39.797)	(45.098)	(39.802)	(40.101)
Log(Prospectus Length)					-5.076
					(5.538)
Prospectus Uncertainty					-3.328
					(16.476)
Observations	766	766	766	766	766
Adjusted R^2	0.225	0.315	0.252	0.314	0.313

Interestingly, we find that the aggregate amount of SEC concerns (as proxied by total number of words in first letter or by total number of letters) is more important than the specific topics of SEC questions, in explaining the length of the registration

period (not tabulated). This finding highlights that SEC concerns over any issue can prolong the registration period. We note that this conclusion is supported by conversations with practitioners, who comment that the characteristics of the management team have a large influence on the dynamics of the SEC review process: teams that are more amenable to making necessary revisions tend to get all issues resolved more quickly.

This strong relation between the extent of SEC review and the length of the registration period raises questions over which types of companies are more likely to suffer lengthier reviews. We turn to this issue in the next section.

Factors influencing the SEC review process

We hypothesize four factors that potentially affect the length of the SEC review process: firm complexity, the quality of the firm's advisors, the firm's disclosure choices in the preliminary prospectus, and the likelihood of underlying problems at the firm. First, more complex firms will find it more difficult and potentially prohibitively costly to pre-empt every possible concern of the SEC, suggesting that they are likely to face more questions. Second, more experienced advisors have the advantage of having multiple past interactions with the SEC on similar manners, and therefore they should be able to help advise the firm on how to write a prospectus that will be more quickly approved by the SEC. Further, such advisors are arguably better able to help companies navigate the SEC process more smoothly, for example by helping them to more quickly satisfy any SEC concerns. Third, all else equal, a company that writes a more complete prospectus and a prospectus with a less uncertain tone should experience a shorter SEC review process.

Finally, the SEC may more rigorously examine companies with a higher probability of future problems, as measured by the likelihood of a financial restatement.

Table 2.4: Determinants of SEC Review

The sample consists of IPOs between 2005 and 2013. The dependent variable in Columns 1 and 2 (Columns 3 and 4) is the natural logarithm of the total number of words in the first SEC comment letter to the IPO prospectus (number of letters from the SEC in response to the IPO prospectus). Independent variables include the proxies for complexity, advisor quality, disclosure, and probability of fraud. Complexity proxies include: Sales, Number of Segments, Firm Age, and VC backing. Advisor quality proxies include Underwriter Rank and Law Firm Rank. Disclosure proxies include Prospectus Length and Prospectus Uncertainty. F score is used as a proxy for the probability of fraud. The F-statistic and associated p-value test the joint significance of each group of variables in every specification, as reported at the bottom of the table. Appendix I provides a detailed description of all variables. Robust standard errors clustered by industry are shown in parentheses. Industry and year fixed effects are included in all regressions.

	Log(# Words)		Log(# Letters)	
Complexity				
Log(Sales)	0.051***	0.035*	0.029*	0.011
	(0.016)	(0.016)	(0.016)	(0.013)
Number Segments	0.006	0.005	0.007**	0.005
	(0.006)	(0.007)	(0.003)	(0.005)
Log(1+ Firm Age)	-0.001	-0.004	0.000	0.012
	(0.025)	(0.030)	(0.024)	(0.023)
VC	0.164***	0.152**	0.166***	0.152***
	(0.033)	(0.058)	(0.038)	(0.031)
Advisor Quality				
Underwriter Rank	0.000	-0.004	-0.000	-0.004
	(0.004)	(0.004)	(0.003)	(0.004)
Law Firm Rank	-0.004	-0.012	0.002	-0.003
	(0.011)	(0.007)	(0.010)	(0.008)
Firm Disclosure				
Log(S1 Length)	-0.063	-0.081	-0.050	-0.040
	(0.038)	(0.048)	(0.031)	(0.037)
S1 Uncertainty	0.257***	0.294***	0.106*	0.087
	(0.076)	(0.063)	(0.054)	(0.079)
Likelihood Fraud				
F score		0.014		0.016
		(0.012)		(0.016)
JOBS Act	0.001	-0.069	-0.101	-0.122
	(0.108)	(0.126)	(0.085)	(0.103)
Observations	766	532	766	532
Adjusted R^2	0.137	0.084	0.126	0.087
Complexity	0.000	0.026	0.009	0.000
Advisors	0.916	0.147	0.978	0.532
Disclosure	0.019	0.001	0.122	0.407
Fraud		0.257		0.345

Table 2.5: Determinates of the Content of the First SEC Comment Letter

The sample consists of 765 IPOs between 2005 and 2013. We use LDA to extract topics from each firm's first SEC comment letter and each firm's preliminary IPO prospectus. We classify ten topics extracted from SEC comment letters, four of which we focus on in this table: accounting, valuation, compensation, and business description. In the similar manner we extract 30 topics from the initial prospectus. For each SEC letter topic, we find the closest corresponding prospectus topic, using the KL-divergence measure. Each panel reports OLS regressions of the log amount of each topic in the first SEC letter on firm characteristics and the amount of corresponding topic in the initial prospectus. The sample in Panel A is smaller (532 observations) because F score can be calculated only for the firms with available financial information for the two year prior to the IPO. Panel B report the regression results for the broader sample after the exclusion F score variable. Panel C reports the results of similar regression for the boilerplate topic. See Appendix I for detailed definition of all variables. Robust standard errors are shown in parentheses. Industry and year fixed effects are included in all regressions.

Panel A: 4 Main topics of interest, with Proxies for Complexity, Advisor Quality, Disclosure, Likelihood Fraud

	Log of #Words in first SEC Letter related to following topics:			
	Accounting	Valuation	Compensation	BusinessDesc
Complexity				
Log(Sales)	0.368***	-0.070	-0.010	0.053**
	(5.69)	(-1.37)	(-0.17)	(2.30)
Number Segments	-0.034	0.007	-0.004	0.013
	(-1.38)	(0.40)	(-0.15)	(1.33)
Log(1 + Firm Age)	0.152	0.088	0.036	0.014
	(1.41)	(1.00)	(0.43)	(0.31)
VC	-0.141	0.709***	0.625***	0.198*
	(-0.59)	(3.41)	(3.09)	(1.91)
Advisor Quality				
Underwriter Rank	-0.032	0.007	0.016	-0.009
	(-1.39)	(0.37)	(0.67)	(-1.13)
Law Firm Rank	-0.013	-0.065**	-0.046	-0.022*
	(-0.39)	(-2.33)	(-1.51)	(-1.71)
Firm Disclosure				
Log(S1 Length)	-0.232	-0.275*	-0.085	-0.186**
	(-1.14)	(-1.76)	(-0.42)	(-2.11)
S1 Uncertainty	-0.191	0.822***	0.565*	0.458***
	(-0.56)	(3.50)	(1.95)	(3.56)
Likelihood Fraud				
F score	0.310***	0.093	-0.101	0.033
	(3.27)	(1.37)	(-1.04)	(0.90)
JOBS Act	-0.280	-0.249	0.364	-0.311**
	(-0.75)	(-0.78)	(0.96)	(-2.26)
Log(CorrespondingTopic,S1)	-114.843**	184.996***	12.257	9.966
	(-2.30)	(5.09)	(1.43)	(0.54)
Observations	532	532	532	532
Adjusted R^2	0.441	0.330	0.410	0.116
Complexity	0.000	0.007	0.027	0.009
Advisors	0.336	0.065	0.290	0.136
Disclosure	0.402	0.001	0.122	0.000
Fraud	0.001	0.170	0.301	0.369

Panel B: 4 Main Topics of Interest, with proxies for Complexity, Advisor Quality, Disclosure

	Log of #Words in first SEC Letter related to following topics:			
	Accounting	Valuation	Compensation	BusinessDesc
Complexity				
Log(Sales)	0.402***	-0.041	-0.049	0.070***
	(7.42)	(-1.06)	(-1.23)	(3.95)
Number Segments	-0.004	0.004	-0.009	0.010
	(-0.16)	(0.19)	(-0.33)	(1.24)
Log(1 + Firm Age)	0.138	0.054	0.123**	0.038
	(1.48)	(0.77)	(2.02)	(1.25)
VC	0.128	0.764***	0.580***	0.232***
	(0.67)	(4.44)	(3.76)	(3.07)
Advisor Quality				
Underwriter Rank	-0.017	0.006	0.007	-0.003
	(-0.87)	(0.41)	(0.36)	(-0.40)
Law Firm Rank	-0.009	-0.070***	-0.027	-0.016
	(-0.32)	(-2.94)	(-1.11)	(-1.56)
Firm Disclosure				
Log(S1 Length)	-0.097	-0.183	0.044	-0.196***
	(-0.58)	(-1.34)	(0.30)	(-2.92)
S1 Uncertainty	0.070	0.445**	0.235	0.331***
	(0.29)	(2.25)	(1.30)	(3.51)
JOBS Act	0.189	-0.037	0.382	-0.094
	(0.55)	(-0.13)	(1.31)	(-0.74)
Log(CorrespondingTopic,S1)	-95.573**	180.699***	5.336	39.356***
	(-2.18)	(5.76)	(0.80)	(2.72)
Observations	766	766	766	766
Adjusted R^2	0.431	0.322	0.410	0.167
Complexity	0.000	0.000	0.001	0.000
Advisors	0.628	0.013	0.535	0.283
Disclosure	0.824	0.032	0.422	0.000

Panel C: Boilerplate Topic

	Log(#Words on Boiler Plate Topic) in First SEC Letter	
Complexity		
Log(Sales)	-0.001	-0.001
	(-0.08)	(-0.05)
Number Segments	0.005	0.011*
	(0.89)	(1.66)
Log(1 + Firm Age)	-0.015	-0.007
	(-0.64)	(-0.22)
VC	-0.071	-0.142**
	(-1.21)	(-2.05)
Advisor Quality		
Underwriter Rank	0.004	0.001
	(0.65)	(0.17)
Law Firm Rank	0.006	0.009
	(0.62)	(0.80)
Firm Disclosure		
Log(S1 Length)	-0.088*	-0.096
	(-1.81)	(-1.62)
S1 Uncertainty	0.079	0.089
	(1.15)	(1.01)
Likelihood Fraud		
F score		-0.033
		(-1.23)
JOBS Act	-1.314***	-1.500***
	(-7.94)	(-8.89)
Observations	766	532
Adjusted R^2	0.528	0.543
Complexity	0.664	0.208
Advisors	0.667	0.719
Disclosure	0.114	0.199
Fraud		0.220

Tables 2.4 and 2.5 examine these effects, with Table 2.4 focusing on measures of aggregate SEC review and Table 2.5 focusing on the specific topics of SEC focus. Looking first at Table 2.4, columns 1 and 2 show regressions of the log of the number of words in the first letter on proxies for the hypothesized determinants of SEC review. Columns 3 and 4 are similar, but the dependent variable is the number of SEC letters (written in response to the company's prospectus). All regressions include year and industry fixed effects, using the Fama-French twelve industry definitions, as well

as a dummy equal to one if the firm filed under the JOBS Act. Regressions are OLS, with robust standard errors clustered at the industry level.

Our proxies for complexity include the log of firm sales, the number of firm segments, the log of firm age, and venture capital backing. We conjecture that each of these variables will be positively related to the extent of SEC review, as such firms arguably have a greater breadth of operations and/or more intricate contracts, and as a result there are more issues on which the SEC will potentially ask for clarification. For example, venture capitalists frequently enter into relatively complex contracts with firms, and most firms with VC backing are involved with multiple VCs. Also, Dambra, Field and Gustafson (2015) highlight that VCs tend to invest in industries such as biotech that are characterized by greater proprietary information. Consistent with predictions, the coefficients on three of the four variables are positive, with the only exception being firm age which has a coefficient that is close to zero. Looking at column 1, coefficients on both log(sales) and VC backing are significant at the 1% level. In economic terms, a one standard deviation increase in the logarithm of sales is associated with approximately 0.1 more letters, with each additional letter causing additional delay before the company is permitted to go public. The F-statistic reported at the bottom of column 1 indicates that the joint hypothesis that all complexity proxies equal zero can be rejected with a p-value less than 0.001. Our results on the effects of complexity are consistent with Cassell, Dreher and Myers (2013), who find firm complexity is positively related to the probability of receiving a letter from the SEC in response to the 10K.

Column 1 indicates that firms' disclosure choices in the preliminary prospectus are also significantly related to the extent of SEC review. Proxies include both prospectus uncertainty, measured as the percent of uncertain words following Loughran and McDonald (2011, 2013), and prospectus length, measured as the number of words in the prospectus. The former is positive and highly significant, indicating that more uncertain prospectuses have longer letters from the SEC, and the F-statistic for the joint significance of the two disclosure variables is highly significant. In economic terms, a one standard deviation increase in prospectus uncertainty is associated with 0.1 fewer letters.

Looking at column 3, which employs the number of letters as the dependent variable capturing the extent of SEC review, firm complexity continues to be a significant effect in the full sample, but the quality of firm disclosure is not significant in either specification. In sum, the tone of the initial prospectus appears to influence the length of the SEC letter but not the total number of SEC letters, suggesting that it perhaps relates to some types of SEC comments more than others. We examine this possibility in more depth in Table 2.5.

Regressions in columns 2 and 4 are similar to those reported in columns 1 and 3, respectively, but add a measure for the likelihood of fraud as an additional independent variable. When we limit the sample to those observations for which we can compute likelihood of fraud, results regarding complexity and firm disclosure are similar. The likelihood of fraud is not significant at conventional levels in explaining these aggregate measures of SEC review. The next section examines whether this firm characteristic is more closely related to certain types of SEC questions.

The final conclusion from Table 2.4 is that advisor quality is not related to the total amount of SEC review. To the extent that higher quality advisors such as underwriters or law firms have more influence over certain portions of the prospectus, they potentially impact only certain topics of SEC questions. Such dynamics would weaken the power of the tests in Table 2.4; Table 2.5 focuses on the specific topics of SEC concern, e.g., accounting, business description, etc.

Looking first at Panel A of Table 2.5, column 1 focuses on accounting issues, column 2 on valuation issues, column 3 on compensation issues, and column 4 on business description issues. For each column, the dependent variable represents the log of the number of words in the first SEC letter that focus on the respective issue. Explanatory variables represent the same factors on which we focused in Table 2.4, i.e., the proxies for complexity, advisor quality, firm disclosure, and likelihood of fraud. All regressions include year and industry fixed effects as well as the JOBS Act dummy, and have robust standard errors clustered by industry.

Consistent with the strong significance of firm complexity in explaining the total amount of SEC review (shown in Table 2.4), columns 1 through 4 of Table 2.5, Panel A show that greater firm complexity contributes strongly to more questions on each of the four main topics. The F-statistic has a p-value of less than 0.01 in three of the regressions and less than 0.05 in the fourth. Further, signs on the significant coefficients are all consistent with greater complexity contributing to more questions on each topic.

Other factors similarly exhibit variation in ways that are consistent with both economic intuition and anecdotal evidence. We find strong evidence that the

likelihood of fraud is related to the amount of SEC attention on accounting-related issues (Column 1). The F-statistic has a p-value less than 0.001. Because fraud generally relates to accounting items, the fact that a higher probability of fraud results in more questions on these issues from the SEC is perhaps reassuring.

As shown in column 2, higher quality advisors are associated with significantly fewer questions on valuation. This is consistent with conversations with practitioners, indicating that the ways in which the firm arrived at various valuation-related estimates, for example the valuation of options or restricted stock at various point prior to the IPO, is of concern to the SEC. Advisors spend considerable time with companies reviewing these issues, and advisors that have more experience dealing with the SEC on such manners are likely positioned to provide better advice.

Finally, the quality of firms' voluntary disclosure in the preliminary prospectus is significantly related to SEC questions concerning the description of the business, including for example the business model and the risk factors (column 4). Specifically, longer prospectuses are associated with fewer questions on business description, while prospectuses with a more uncertain tone are associated with more questions. This is consistent with this being the section of the prospectus for which SEC disclosure rules are least defined. While firms have very specific guidelines regarding the compensation information they are required to provide, disclosure requirements related to the overall description of the business are much vaguer: Section 4A of Security and Exchange of 1933 requires companies to disclose "a description of the business of the issuer and the anticipated business plan of the issuer." Firms that choose to satisfy this requirement through more complete and

longer descriptions appear to be subject to fewer SEC questions. However, it is worth noting that the explanatory power of these regressions is substantially lower. Firm characteristics explained between 30 and 40% of the extent of SEC attention on other issues, compared to only 11% for questions related to the firm's description of the business. This suggests that the latter questions are much more idiosyncratic in nature, perhaps making it more difficult for the market to predict which firms will face more of such concerns.

Panel B of Table 2.5 shows similar regressions, but excludes the F-score and thus enables us to include the broader sample. Results are broadly consistent with those reported in Panel A. Specifically, firms with higher complexity receive, on average, more questions with respect to every topic. Also, higher quality advisors are particularly valuable in lessening the extent of questions regarding valuation issues, and greater firm disclosure in the preliminary prospectus is associated with fewer SEC questions related to the description of the business.

Finally, Panel C of Table 2.5 provides a counterfactual analysis, examining the relation between each of the two boilerplate topic clouds and the same four factors: complexity, advisor quality, firm voluntary disclosure, and likelihood of fraud. To the extent that our topic cloud analysis correctly identifies these topics as boilerplate, the extent of SEC questions on these issues should not be significantly related to firm characteristics. Results support this prediction.

Findings throughout this section highlight the role of the SEC in increasing transparency. When viewed in this way, our results provide an interesting contrast to those of Boone, Floros and Johnson (2016) who examine the effects of the SEC's

permission for IPO companies to redact information from their SEC registration filings, for example proprietary information that is sensitive for competitive reasons.

Relation between SEC review process and post-IPO dynamics

The SEC's mission is to ensure that companies "disclose meaningful financial and other information to the public".[31] Our findings in the previous section suggest that the SEC review process is indeed related to the extent of uncertainty surrounding the company, for example as represented by the complexity of the firm, the quality of the advisors, the extent of firm voluntary disclosure, and the probability of a financial restatement at the company. In this section, we investigate the extent to which this information is related both to underwriters' valuation of the company and to post-IPO prices.

We focus in this subsection on the log of the number of SEC letters as a proxy for the number of SEC concerns. This choice is based on several factors. First, it is highly correlated with the number of words in the first letter and with the number of individual points raised in the first letter in the subset of cases where letters are arranged into points. Second, the number of SEC letters has the advantage of capturing aspects related to the severity of concerns and to management quality, as more serious concerns and lower quality management will likely experience more rounds of SEC review.

We begin by considering the relation between this measure of the SEC review process and underwriters' pricing of the issue. The majority of the SEC review

[31] https://www.sec.gov/about/whatwedo.shtml

process precedes the setting of the price range. In a typical scenario, a company first files to go public, second exchanges in a back-and-forth written dialog with the SEC regarding the completeness of disclosure provided in the prospectus, third has an initial price range set by the underwriter, fourth goes on the roadshow to market the issue to institutional investors and solicit their feedback regarding the proposed valuation, and finally has the final offer price set and goes public.[32] If the underwriter deems the information learned through the SEC review process to be relevant to firm value, then it should set a lower price range. Only information learned during bookbuilding should influence the price update between the initial price range and the final offer price. In sum, if underwriters incorporate all available information when setting the price range, we would not expect a significant relation between the extent of SEC review and the price update. Alternatively, if behavioral biases limit the extent to which the firm and its underwriters respond to external objective assessments, then we would predict a negative relation.

Table 2.6 tests this proposition. Specifically, we regress the price update on the log of the number of letters received from the SEC, plus control variables from earlier tables. The price update is defined as the percentage difference from the midpoint of the filing range to the offer price. Regressions are OLS, include industry and year fixed effects, and have robust standard errors clustered by industry.

Table 2.6. Is SEC review related to prices that underwriter sets?

The sample consists of IPOs between 2005 and 2013. The dependent variable, initial return, equals the change from the offer price to the closing price on the first day of trading. The number of words for each firm related to the accounting, valuation, compensation and business descriptions topics in the SEC letter and in the S1 are extracted with LDA from the first SEC letters and initial prospectus,

[32] While there are sometimes a small number of letters after the commencement of the roadshow, these tend to be relatively short, and represent the resolution of issues previously raised.

respectively. We use the KL-divergence technique to pair the LDA topics from the SEC letters and prospectus. Appendix I provides detailed definition of all variables. Year and industry fixed effects are included in all regressions, and robust standard errors are clustered by year.

	Price Update	Initial Return
Log(# Letters)	-3.570**	0.020
	(-2.86)	(1.04)
Log(Sales)	0.881***	0.004
	(4.88)	(0.68)
Number Segments	-0.137	-0.002
	(-1.36)	(-1.00)
Log(1 + Firm Age)	-1.368*	-0.008
	(-2.10)	(-0.64)
VC	0.710	0.089***
	(0.70)	(6.28)
Underwriter Rank	-0.187	-0.002
	(-1.18)	(-0.77)
Law Firm Rank	0.010	-0.000
	(0.05)	(-0.14)
Log(S1 Length)	-1.326	0.018*
	(-1.51)	(2.20)
S1 Uncertainty	-1.034	-0.003
	(-0.66)	(-0.09)
JOBS Act	3.500	0.020
	(1.29)	(0.84)
Price Update		0.005***
		(7.66)
Observations	750	750
Adjusted R^2	0.055	0.222

Contrary to predictions, column 1 of Table 2.6 shows a significant negative relation between the price update and the log of the number of letters. A company receiving two letters from the SEC has a price update that is on average 2.5% lower than a company that receives just one letter. Compared to the average price update of -1.7%, this is a substantial effect. This effect is also statistically significant, at the 5% level (t-statistic of -2.86) This finding suggests that information learned during the bookbuilding period is correlated with the extent of SEC review, i.e., companies with longer SEC review processes also receive more negative concerns from the institutional investors on the roadshow. Our findings indicating that underwriters do

not incorporate this negative information into the price range is consistent with behavioral models such as the framing bias (see, e.g., Kahneman and Lovallo, 1993). The firm and its underwriters have upward biased assessments of firm value, and they only partially respond to external signals suggesting that true value is lower than they had believed.

Column 2 of Table 2.6 provides additional evidence consistent with the lower offer price being appropriate. Lowry and Schwert (2004) and Loughran and Ritter (2002) find that underwriters fully incorporate all negative information learned during the filing period into the offer price.[33] Underwriters have strong incentives to avoid overpricing the issue, and therefore they lower the offer price to fully reflect all negative information. This suggests that longer SEC reviews, which represent negative information and which column 1 shows to be negatively related to price updates, should not be related to initial returns. Results in column 2 are consistent with this prediction. In sum, behavioral biases such as a framing effect cause underwriters to pay insufficient attention to information revealed through the SEC review process, but they are forced to listen to the market, i.e., to institutional investors who are only willing to purchase shares at lower prices.

Coefficients on other control variables across both columns are largely consistent with findings of prior literature. For example, consistent with Hanley (1993), price update is significantly positively related to initial returns. In addition, venture-backed issues also have significantly higher initial returns.

[33] The partial adjustment phenomenon (Hanley, 1989) whereby underwriters only partially incorporate information learned during the filing period only applies to positive information learned during the filing period.

In sum, results in Table 2.6 indicate that the same companies about which the SEC had the most concerns, in terms of requests for additional disclosure, also had the greatest concerns from institutional investors. The fact that both the regulator and institutional investors tend to be concerned suggests that uncertainty among these types of companies is likely to be higher. Several dynamics potentially drive this relation. For example, a longer SEC review might indicate the presence of a more vague business plan and thus greater uncertainty regarding the future direction of the company. While a more extensive SEC review might force management to more thoroughly think through and provide disclosure on certain components of the firm's business plan, it is unlikely to lead to fundamental changes in the plan. It is also possible that a longer SEC review represents a signal of management quality, for example a management that is less able to satisfy all SEC demands in a timely fashion. While the SEC review might lead management to change their behavior in certain ways, in particular with respect to what they disclose, it does not result in changes to the fundamental qualities of management.

Table 2.7 examines the relation between the extent of SEC review, again measured as the number of letters, and several measures related to post-IPO uncertainty about the firm. Column 1 focuses on volatility, measured as the annualized standard deviation of the daily stock returns during the year starting one month after the IPO date.[34] (We exclude the first month because of the various regulatory restrictions that potentially affect prices, for example price support and restrictions on information disclosures during the quiet period.). Column 2 focuses on

[34] $\sqrt{252} \cdot sd(returns)$, where $returns$ are measured between 22nd trading day (a month) after the IPO and 274th trading day (a year and a month) after the IPO.

the absolute value of the abnormal return over the first year after the IPO. Abnormal returns equal raw firm returns over one year minus returns on the corresponding Fama-French Size and Book-to-Market portfolio (using the 25 size, book-to-market portfolios, as described more fully in Fama and French (1993)).

To the extent that uncertainty is higher about these firms, we would expect higher volatility of returns and more extreme return realizations. The significantly positive coefficients on the log of the number of SEC letters in both columns 1 and 2 are consistent with these predictions. A company with two letters from the SEC has on average 3.6% higher volatility and 7.6% higher absolute value of post-IPO abnormal returns in the year after the IPO, compared to a firm receiving only one letter. Compared to mean volatility of 54% and mean absolute value of returns of 39%, these represent 7% and 20% increases, respectively.

Column 3 examines whether this higher abnormal return is concentrated in one direction, either positive or negative. Specifically, we examine the relation between abnormal returns (rather than the absolute value of these returns) and the log of the number of SEC letters. We find no significant relation. In other words, the number of SEC letters predicts uncertainty, but this simple measure of SEC review does not provide a trading strategy. This is perhaps not surprising, as it is relatively easy for investors to infer with a reasonable degree of accuracy the number of SEC letters, as each letter results in a revision of the company's prospectus that is filed with the SEC and publicly observable. As discussed in more detail later, more nuanced facets of the SEC review, for example related to the specific topics of questions, are not publicly

observable at the time of the IPO and thus more likely to be related to subsequent performance.

Together, columns 1, 2, and 3 suggest that companies about which the SEC had the most concerns tend to have the highest uncertainty, and the most extreme outcomes. A subset of these firms ultimately perform quite well and a subset perform quite poorly. These firms had difficulty explaining their business to the SEC, thus resulting in multiple requests for further disclosures, and in a similar vein the market also had difficulty understanding these businesses. The market requires both additional information (which cannot be credibly disclosed at the time of the IPO) and additional time to observe the firm, before it can more accurately assess firm value. Managers of high uncertainty firms, for example the firms with more extensive SEC reviews, arguably have a greater ability to understand the business and to forecast future performance, compared to outside investors. Consistent with this, prior literature (see, e.g., Cohen et al, 2012) concludes that insider sales predict company performance. Based on our findings suggesting that firms with more extensive SEC reviews include a disproportionate number of firms that ultimately perform quite poorly, we conjecture that companies that experienced more extensive SEC reviews will also have greater insider sales.

Column 4 examines the relation between insider sales and the extent of SEC review. Insiders are generally not permitted to sell until the expiration of the lockup period, which in most cases is 180 days after the IPO. We thus concentrate on insider sales over the 180 – 220 day period, after the IPO. We regress a dummy, equal to 1 if the company had insider sales and 0 otherwise, on the log of the number of SEC

letters. Consistent with predictions, we find a significantly positive coefficient on insider sales. Compared to a company receiving just one letter from the SEC, a company receiving two letters has a 5.5% higher probability of insider sales. Relative to the mean probability of 29%, this represents a 19% increase. While DeChow, Lawrence and Ryans (2016) find that insiders sell around the release of SEC comment letters issued in response to the 10K, the lock-up period means that insiders cannot sell at a similar time in the case of IPOs. Nevertheless, our results indicate that a full six months after the IPO insiders still have concerns about many of the same firms about which the SEC had concerns.

The finding that more extensive SEC reviews are associated with higher post-IPO uncertainty is insightful when contrasted with prior literature suggesting that SEC reviews decrease various metrics of firm uncertainty, e.g., Johnston and Petacchi (2016), Benus, Cheng and Neamtiu (2016), and Bozanic, Kietrich and Johnson (2015). Together, the findings suggest that more extensive reviews both reduce uncertainty and signal greater remaining uncertainty. This is consistent with the costs of putting all firms on an equal playing field outweighing the benefits, for example because of challenges related to fully explaining a firm's business without divulging critical secrets to competitors.

As noted previously, investors can infer with a reasonable degree of accuracy prior to the IPO the total extent of SEC review, measured as the number of SEC letters. While the letters themselves are not public, the updated versions of the prospectuses in which companies address the SEC's concerns become public immediately. Hence, at the time of the IPO, investors can estimate the number of SEC

comment letters by observing the number of S1 amendments.[35] However, as explored earlier, the SEC review process also contains many other potentially informative details, over and above these more aggregate measures. Specifically, SEC reviews tend to concentrate on certain topics, and there exists substantial variation in the topics of focus.

Several factors influence the ways in which the individual topics of SEC focus are predicted to relate to the IPO firm's pricing and post-IPO outcomes. Most importantly, because the SEC's letters are not disclosed until a minimum of 45 days after the IPO, nobody but the company and its advisors know the SEC's specific concerns at the time of the IPO.[36] While an investor could theoretically compare different versions of the prospectus to infer SEC concerns, this process would be highly imprecise (suggesting relatively low benefit) and time consuming (suggesting relatively high cost). This means that information regarding topics is arguably more

Table 2.7. Is SEC review related to post-IPO measures of market uncertainty?

The sample consists of IPOs between 2005 and 2013. The dependent variable, initial return, equals the change from the offer price to the closing price on the first day of trading. The number of words for each firm related to the accounting, valuation, compensation and business descriptions topics in the SEC letter and in the S1 are extracted with LDA from the first SEC letters and initial prospectus, respectively. We use the KL-divergence technique to pair the LDA topics from the SEC letters and prospectus. Appendix I provides detailed definition of all variables. Year and industry fixed effects are included in all regressions, and robust standard errors are clustered by year.

	Volatility	|1-yr return|	Insider Sales	1-yr Abnormal Return
Log(# Letters)	5.193*	0.110***	0.079***	0.060
	(2.12)	(3.38)	(3.38)	(0.97)

[35] Clearly, this is not a perfect measure. For example, when companies update the IPO price range they have to refile—even if it is not a response to an SEC query. Also, for companies filed under the JOBS Act a subset of letters are issued prior to the release of any prospectus. We control for filing under the JOBS Act in regressions, and we also have re-estimated all regressions omitting those companies that filed under the JOBS Act.

[36] SEC comment letters between May 12th 2005 and January 1st 2012 become publicly available "no earlier than 45 days after the review of the disclosure filing is complete". And SEC comment letters after January 1st 2012 become public "no earlier than 20 business days following the completion of a filing review" http://www.sec.gov/divisions/corpfin/cfannouncements/edgarcorrespondence.htm

Log(Sales)	-3.453***	-0.011	0.015	0.014
	(-4.52)	(-1.31)	(1.20)	(0.96)
Number Segments	0.299	-0.000	-0.004	-0.004
	(1.67)	(-0.12)	(-0.53)	(-0.61)
Log(1 + Firm Age)	0.837	-0.016	0.016	0.002
	(1.00)	(-0.95)	(1.37)	(0.06)
VC	2.695	-0.045	0.146***	-0.104**
	(1.29)	(-1.00)	(5.86)	(-2.80)
Underwriter Rank	-0.306**	-0.001	0.003	-0.003
	(-2.69)	(-0.13)	(0.49)	(-0.70)
Law Firm Rank	-0.264	-0.000	-0.002	0.005
	(-0.80)	(-0.03)	(-0.46)	(0.76)
Log(S1 Length)	1.530	-0.033	0.042	-0.006
	(1.00)	(-1.75)	(1.19)	(-0.14)
S1 Uncertainty	0.890	0.081**	0.077	0.140***
	(0.47)	(2.89)	(1.70)	(5.31)
JOBS Act	2.389	0.015	-0.023	0.177**
	(1.17)	(0.21)	(-0.25)	(2.62)
Observations	763	766	766	766
Adjusted R^2	0.370	0.046	0.105	0.008

likely to influence prices during the months after the IPO, as the market learns about these concerns (either directly through reading the SEC's letters or indirectly by independently coming to similar conclusions through other sources of information). The prediction that information related to the coarse summary measure of SEC review - # letters - should be incorporated into the prices at the time of the IPO is supported by evidence in Table 2.7; we find no evidence of a significant relation between the number of SEC letters and post-IPO abnormal returns. Table 2.8 examines the relation between the specific topics and post-IPO abnormal returns. The table contains three column, where each focuses on one SEC topic. We focus on those topics-clouds that are both economically important and that are prevalent within more than a trivial portion of companies. Thus, we focus on topics-clouds related to the description of

the business (column 1), to valuation (column 2), and to accounting (column 3).[37] The dependent variable in all regression is post-IPO performance, measured as abnormal one-year returns. The independent variable of focus is the log of the number of words in the topic. In addition, we also include controls from earlier tables (not tabulated), the log of the number of SEC letters to capture the total extent of SEC review, and the log of the number of words in the corresponding topic in the prospectus.

We find that certain topics are significantly negatively related to post-IPO performance. Specifically, we find strong evidence that companies that receive more questions about their business description exhibit significantly lower abnormal returns during the year after the IPO. A one standard deviation increase in the logarithm of the number of business-related topic words is linked to a 3.80% decline in abnormal returns in the next year.[38] Results using returns over the six-month period produce qualitatively similar results (not tabulated). We also find weak evidence that accounting-related questions are significantly negatively related to post-IPO returns, but the relation is only significant at the 10% level.

Table 2.8 Are topic clouds related to post-IPO abnormal returns?

The sample consists of IPOs between 2005 and 2013. The dependent variable is post-IPO abnormal returns, measured as raw firm returns over one year minus returns on the corresponding Fama-French Size and Book-to-Market portfolio (using the 25 size, book-to-market portfolios). The number of words for each firm related to the accounting, valuation, and business descriptions topics in the SEC letter and in the S1 are extracted with LDA from the first SEC letters and initial prospectus, respectively. We use the KL-divergence technique to pair the LDA topics from the SEC letters and prospectus. Appendix I

[37] We do not analyze the effects of compensation-related questions because the SEC focuses on this issue in so few companies. As shown in Table 1, the median company has 0.02% of the first SEC letter devoted to compensation questions, and the analogous statistic for the company at the 75th percentile is only 0.46%.

[38] The economic significance of the accounting topic (business description topic) equals the coefficient of -0.022 times the standard deviation of 2.64 (-0.045 coefficient multiplied by the standard deviation of 0.85). The predictive power of accounting and business related topics is robust to the model specification. These topics are similarly significant if we use the total number of the topic related words instead of the logarithm, and also if we use the percent of the first letter devoted to the topic.

provides detailed definition of all variables. Year and industry fixed effects are included in all regressions, and robust standard errors are clustered by year.

	Business Description Topic Cloud	Valuation Topic Cloud	Accounting Topic Cloud
Log(# Letters)	0.102	0.063	0.071
	(1.43)	(0.98)	(1.04)
Log(Topic Cloud words, letter)	-0.055**	-0.014	-0.026*
	(-2.31)	(-1.49)	(-1.97)
Log(Topic Cloud words, S1)	-16.337	-29.077*	-33.950**
	(-1.48)	(-2.17)	(-2.49)
Control Variables	Yes	Yes	Yes
Observations	766	766	766
Adjusted R^2	0.014	0.016	0.022

In an effort to understand why some topics are more strongly related to post-IPO returns (and thus less incorporated into price at the time of the IPO), we consider the extent to which concerns on different topics provide incremental information to investors. Some types of SEC questions relate closely to material voluntarily provided by companies in the preliminary prospectus. In contrast, other topics more frequently include questions that relate less closely. For example, SEC demands to provide more detail on the valuation of options would be closely related to information in the prospectus, as other details regarding these options would have already been provided by the company. In contrast, SEC requests for information regarding contracts with overseas suppliers or risk related to transportation of goods would be substantially less closely related, in particular if companies don't tend to disclose any details regarding such suppliers or transportation channels in the first version of the prospectus. Looking back at Table 2.2, we see that the topics that are significantly related to post-IPO performance are also the topics that are least closely related to information in the prospectus. In particular, the topic that is most strongly related to post-IPO returns is also least closely related to what was in the prospectus. The KL-divergence measure

for business description is the highest at 3.5.[39] While the absolute value of this number is not particularly informative, the fact that it is greater in relative terms than others indicates that SEC questions on this topic are less closely related to information in the prospectus.

Our results are related to a contemporaneous paper by Ryans (2016), who examines letters in response to 10-K filings by mature firms and finds that some types of concerns are related to firm valuation, whereas others are not. He takes a very different approach of identifying the important issues from market reactions at the time of letter disclosure, which relies to some extent on investors paying sufficient attention to the release of the letters.

In sum, using information that can be easily inferred at the time of the IPO, i.e., the number of SEC letters, investors are unable to predict post-IPO abnormal performance. However, the details on the topics of SEC concern, which are released a minimum of 45 days after the IPO, are significantly related to post-IPO performance. This evidence is consistent with the regulator playing a unique role and identifying information that investors do not.

Conclusion

The IPO process is complex, with many players taking an active role. There is a large literature on the role of the issuer, underwriter, analysts, market makers, auditor and lawyers. In addition to these entities, while regulators play a substantial

[39] The only topics to have higher KL-divergence measures are the boilerplate topics. As mentioned earlier, these contain phrases such as "Please avoid use of the term 'solution' as it is jargon". Such phrases are obviously not closely related to material in the prospectus, and thus it is intuitive that the KL-divergence measures are high.

role, there is limited information about how the regulator influences the IPO process. This paper strives to fill some of this gap.

We find that the SEC is actively involved in each IPO, communicating with the company an average four times between the filing of the initial prospectus and the IPO date. The extent of scrutiny is higher for more complex companies, for companies with lower quality advisors, and for companies with less complete disclosure in the preliminary prospectus. The more concerns the SEC has the longer it takes the firm going public, which in turn make the IPO process more costly and risky for the company. Moreover, the extent of SEC review contains information regarding post-IPO dynamics: companies with the most extensive reviews have significantly higher initial returns and post-IPO volatility.

Using LDA techniques, we extract the main subjects of the SEC review and also quantify the extent of each topic in each letter. Results indicate that the greatest number of SEC questions relate to requests for clarification on the business model and underlying risk factors; in addition, the SEC also focuses on issues related to accounting, compensation, and valuation.

Using a new method that builds on the properties of LDA topics and on the concept of KL-divergence, we find that SEC concerns related to the underlying business model contain the most incremental information, in the sense that they are least closely related to material in the preliminary prospectus. Moreover, these topics of SEC concern that contain the most incremental information also represent the strongest negative signals regarding subsequent firm performance. Our findings suggest that

firms that were subject to greater scrutiny by the SEC experienced significantly higher initial returns and significantly higher post-IPO volatility.

Our findings indicate that the process of SEC review highlights issues that are relevant to underlying company value and which investors do not independently uncover. This conclusion contrasts with a Coase (1960) – type framework where there is no role for a regulator. The public-good nature of information about companies going public means that the regulator's ability to both demand information and impose enforcement criteria has value.[40] Along this dimension, our results are consistent with the regulator's influence increasing transparency for investors. However, the fact that much of the regulator's information is not made public until at least 45 days after the IPO raises questions related to why this additional transparency is not made immediately available to investors.

[40] See La Porta et al (2006) for a discussion.

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CHAPTER 3

INTIAL PUBLIC OFFERINGS: A SYNTHESIS OF THE LITERATURE AND DIRECTION FOR FUTURE RESEARCH

Abstract

The purpose of this chapter is to provide an overview of the IPO literature since 2000. The fewer numbers of companies going public in recent years has raised many questions regarding the IPO process, in both academic and regulatory circles. As we all strive to understand these changes in the market, it is especially important to understand the dynamics underlying the IPO process. If the process of going public is too costly or the IPO mechanism is plagued by too many conflicts of interest among the various intermediaries, then private companies may rationally choose other methods of raising capital. In a related vein, it is imperative that new regulations not be based on research focusing solely on large, more mature firms. Newly public firms have unique characteristics, and an increased understanding of such issues will contribute positively to well-functioning public markets and further growth of the entrepreneurial sector.

Introduction

Transitioning from private to public status is a watershed event in the life of any firm. For most firms and managers, the process of conducting an IPO is something they will only go through once. As such, there exists much uncertainty

over the process, starting with the decision of whether to go public and including issues such as when to go public, who to select as advisors, how to price the offering and how to structure the governance of the newly public firm. A broad set of academic literature has studied all of these issues, and the purpose of this chapter is to review the existing evidence and also to suggest areas in which our understanding is less complete and which would benefit from further research.

We begin with a discussion of why firms go public. While the most obvious factor would seem to be the raising of capital, this is far from the only determinant and many studies conclude that it is not the most important determinant. A continuing debate in the literature concerns whether firms go public primarily to raise money for future investment or for other reasons such as market timing, i.e., because they expect the market to value them higher than their 'true' value. We review the evidence on both sides of this debate and also discuss the myriad of other factors that potentially play at least some role in managers' decisions to take their firms public: capital structure re-adjustment, providing liquidity for the owners, advantages of having a publicly observable stock price, compensation, and the credibility that comes with having multiple parties scrutinize the firm (e.g., analysts, institutional investors, etc.).

Given the broad array of factors that motivate companies to go public, it is perhaps not surprising that the types of firms going public varies widely. In the interests of providing the reader with an informed overview of this market, we highlight a number of important stylized facts concerning the IPO market in Section 2. One of the many fascinating things about this market concerns the ways it has varied over time, and for this reason we disaggregate many of these stylized facts by time.

Capital markets in the U.S. change and evolve at a relatively rapid pace, and consistent with this we observe strong differences in the types of companies choosing to go public and also in the ways in which they structure their offerings. It will perhaps be informative to consider jointly some of these time trends as a way to better understand the changes in our markets, including for example the lower frequency of IPOs over the past 15 years.

More than most corporate events, IPOs present a number of "puzzles". For example, it is well known that IPOs are on average underpriced, with average first day returns of approximately 15% - but the reasons for such large one-day returns continue to be debated. Beyond this one-day return, the returns associated with IPOs over longer time intervals are more complex. Do IPOs underperform over the long-term, measured as the three or five years following the offering? The answer is yes if we compare them to a broad market index, but the answer is no if we compare them to firms of similar size and book-to-market.

The story becomes even more complex when we consider the strong time-series fluctuations within each of these pricing patterns. We know that many companies go public during some periods but relatively few in others. Over many decades, this variation was explained largely by fluctuations in companies' demands for capital and by changing investor sentiment that influenced the price at which a company could sell itself. However, neither of these factors is sufficient to explain the dramatic fall in the number of IPOs since 2000. Finally, the type of company going public in "hot" versus "cold" markets is different and there is some evidence that

companies going public during hot markets perform worse, but measurement issues can make definitive conclusions difficult.

These fluctuations in performance highlight the extent of uncertainty surrounding these companies. In fact, 36% of IPO firms delist within the first five years after the IPO, with 12% being due to poor performance and 24% because they are acquired. In addition, many companies that start the process to go public do not complete the process: 20% of IPOs are withdrawn, and of those that are withdrawn relatively few ever successfully complete an IPO.

Given this high uncertainty combined with the fact that most companies only ever conduct an IPO one time, intermediaries have the potential to play a particularly important role. The number of intermediaries involved in the months surrounding many firms' IPOs is large: venture capitalists, underwriter banks, lawyers, analysts, institutional investors, regulators, etc. While the effects of some of these intermediaries has received considerable attention, the influence of other parties, e.g., regulators, is less understood. We both overview the current state of knowledge regarding the roles of these various entities, and comment on what we perceive to be gaps in our understanding.

Finally, an area of growing research concerns the governance of newly public firms. While multiple forces in the markets (e.g., exchange listing requirements, pension fund recommendations, proxy advisory service company recommendations) have been pushing firms toward a common set of governance standards, there are reasons to believe that the governance demands of newly public firms are unique and very different from those of their more mature counterparts. Because the vast majority

of corporate governance research is based on similar samples of mostly mature firms such as the S&P1500, the aforementioned recommendations are largely based on these mature firms. We argue that these conclusions are frequently not appropriate for younger firms. We review the still nascent literature in this area, and encourage further research along this dimension.

Perhaps the issue that has garnered the most attention in recent years with respect to IPOs is the decreased number of them. Why are fewer companies choosing to raise public equity on US markets? While new companies are being founded on a regular basis, these small private companies are with increasing frequency being acquired by large, already public companies. As a result, a smaller number of companies are controlling an increasing percentage of entrepreneurial activity. From an antitrust perspective, this raises obvious concerns. A lack of sufficient competition has the potential to put a downward bias on future innovative activity. We hope that a more complete understanding of many dynamics surrounding IPOs, as overviewed in this chapter, will help guide researchers in efforts to better address these issues. To the extent that companies are increasingly concluding that the costs issuing public equity for the first time exceed the benefits, it is clear that we need a better understanding of these costs and benefits and the ways they have changed over time.

The literature on going public is rich and vast. Given the depth and breadth of the literature we made a decision to concentrate this review mainly on research published in the 21st century. And even within this prism we were not able to both cover all grounds and keep this review within a manageable length, while delving into some of the topics more deeply. To facilitate discussion and analysis of the most

important facets of the IPO process, we also decided to replicate some of the main empirical results concerning IPOs ourselves using the most comprehensive coverage in terms of the length of the sample period and the cross section of firms included. This enables us to see how some of the empirical regularities have changed over time and how others are more immune to the time period one examines.

Why do firms go Public?

Why do firms go public? On the face of it, the answer sounds obvious: firms go public to raise capital because they need money for investments. Let's assume for a moment that this is indeed an important reason why firms go public. Still it cannot be the complete answer: A question still remains. Why do firms choose to raise capital in the public equity market and not in the private equity market or in the debt market? In other words, why do some firms go public while others refrain from doing so and raise capital through other means? In this section we attempt to give some perspective about these very important questions. We feel that the issues we discuss here are not only important, but that our current knowledge is insufficient. These questions provide fertile ground for future research.

Our starting point is the relation between a firm's investment needs and the decision to go public. The striking result Pagano Panetta, Zingales (1998) document is that the answer to this question is not obvious. They examine the determinants of going public in the Italian market and find that future investment needs is not the dominant reason why firms go public, at least not in the sample of the 66 IPO firms they examined. They find that the main factor affecting the probability of going public is the industry market to book ratio. This result suggests that perhaps firms in

industries with higher investment opportunities-- and hence higher investment needs -- are more likely to tap the public equity market. However, it may also suggest that firms in industries that are over-valued are those who decide to go to the public equity markets. Possibly, firms go public because they can. Not because they need. Examining those firms' performance in the years after the IPO, Pagano et. al. (1998) find that both their investment and profitability decline, suggesting over-valuation as the more likely explanation.[41]

Pagano et al (1998) also find that larger firms and firms that have experienced higher growth are more likely to IPO. These latter findings may be unique to Italy or to the time period of the study. In a very interesting paper Brau and Fawcett (2006) use a survey method and ask 336 CFOs why firms go public. Strikingly, there is no evidence that a need for cash is the driving force behind the IPO decision. This result, that a need for cash does not show up as a dominant motive for going public, is interesting and surprising. It is not what we would expect.

Using a large set of firms from across the globe Kim and Weisbach (2008) took another look at a related question: They analyze how firms spend the money they raise through equity issuances. (So unlike the Pagano et al paper, they do not examine why firms go public rather than staying private. The question they ask is what IPO and SEO firms do with the money they raise.) Not surprisingly, they find that in the year of the IPO cash reserves increase by about 50 cents on every dollar raised. Four years after the IPO the cash reserves are still significant higher (about 40 cents on the

[41] Pastor, Taylor and Veronesi (2009) develop a model in which post-IPO declines in profitability occur in spite of no overvaluation or behavioral effects. Such declines are the result of owners rationally choosing to go public when the diversification benefits are sufficiently high to outweigh the loss of private benefits of control.

dollar). The second largest impact is on investment (capital expenditure and R&D). There they find an increase of about 28 cents on each dollar raised in the first year and a much larger increase after four years. These are important findings, suggesting that a significant portion of the money raised through the IPO is being used for investments. Of course, money has no color, so we do not know whether the IPO money went to finance investments, or came from other sources such as earnings over the years following the IPO. Likewise, some of this money may have been channeled back to investors through share repurchase programs or dividends. Kim and Weisbach control for the first issue (other sources of funds) but not for the second. Nevertheless, the Kim and Weisbach study presents important evidence suggesting that a significant portion, though not the majority, of the money raised through the IPO financed firms' investments.

At the same time it is important to note that the study, by design, does not attempt to address the question of whether the IPO firms could have achieved their goals through other means of equity capital raising, be it through VCs or other private equity vehicles that are becoming more and more popular; or through private debt.

At this point it is worth summarizing the possible objectives for firms to go public and whether those objectives can be achieved through other vehicles such as private equity or debt. We can think of many possible reasons, which are not mutually exclusive. The first, is the need for cash for investment. As also summarized in Table A, this need can be achieved through private equity or debt. Thus if investment is the main motive for going public we would like , ideally, to be able to show that firms use

the proceeds for investments and to understand why they chose this channel (IPO) rather than other channels.

The second reason is over-valuation. If over-valuation is common for both public and private equity (as we expect), it can be a good reason for why firms raise equity capital; but not why they go public. For the latter, there must be another friction. For example, over-valuation is more pronounced in public than in private markets. Lowry's (2003) finding that more companies go public when investor sentiment is higher suggests that overvaluation is a significant determinant of the decision to go public. In economic terms, her findings suggest that it is more important than demand for capital (e.g., for future investments).

The third reason is capital structure adjustment. This clearly can be achieved both with public and private equity markets.

The fourth reason is owners' need for liquidity. Shortly after a firm goes public its owners, both individuals and VCs can liquidate (part or all of) their positions with minimal transaction costs. The liquidity provision allows holders to buy and sell their stocks any time after the end of the lockup period. This goal can be achieved only through the public equity channel. Selling securities of private firms can be prohibitively costly. This liquidity reason may be even more acute when VCs have stakes in the company, as they must liquidate their investments within a set number of years. (This of course can be done either through an IPO or through an acquisition by another company.) Using data on industrial firms from the census, Chemmanur, He and Nandy (2009) find that firms in industries with great average liquidity of already

listed equities are more likely to go public. Like Pagano et al, they also find that larger and more successful firms are more likely to go public.

Owners' diversification (reason #5 below) represents another potential reason to go public. IPOs allow the original owners to diversify their holdings and increase liquidity by selling shares in the secondary market. (To the extent that an occasional secondary equity offering is possible also in the private equity markets, owners' diversification, at least to an extent, can be achieved both in the public and private markets). A natural extension of the basic diversification story is that less diversified shareholders have more to gain from taking their firm public, and hence may be willing to accept a lower IPO price. Bodnaruk, Kandel, Massa, and Simonov (2008) study the effect of controlling owners' diversification on the IPO price, specifically whether they are more willing to accept a lower price for shares. Using Swedish data with detailed information about owners' portfolio composition between 1995-2001, the paper finds that: (1) private firms held by less diversified controlling shareholders are more likely to go public; (2) less diversified individual shareholders sell more of their shares at the IPO; (3) the extent of owners' diversification is related to the underpricing of the IPO. While the data used in this study is limited, its findings are interesting and insightful, suggesting that diversification is an important factor in the decision to go public. Chod and Lyandres (2011) examine a different aspect of diversification, arguing that public firms' owners tolerate higher profit variability than owners of private firms because of their ability to diversify. Hence, public firms can take riskier investment strategies than private firms -- which improves their

competitive position. This adds another aspect why diversification through IPO may be beneficial.

The sixth reason in the table below encompasses several motives, as related to the presence of a publicly available market value of the firm's equity. It is argued that often firms go public because they want to use their publicly traded stocks as acquisition currency (versus having to pay for acquisitions with cash). This is a valid motive to go public, in the presence of some market friction such as financial constraint that may prevent companies to raise additional equity if they need cash for acquisition. Alternatively, if insiders believe the firm is overvalued then paying with equity rather than cash may be preferred. This motive is unique to IPOs and cannot be achieved if the company remains private, even if it issues shares in the private market. Brau and Fawcett (2006) using surveys, find that the primary motivation for going public is to facilitate acquisitions (#6 in the Table above). They also find support for the notion that market timing plays a role in the decision. Relatedly, Hsieh, Lyandres, and Zhdanov (2011) suggest that the reduction of valuation uncertainly associated with having a market value through the IPO process leads firms to a more efficient acquisition strategy—and hence also increases its value. Some theoretical research argues that the going public decision strengthens the insiders' bargaining position in the case of an acquisition (Zingales 1995), and allows insiders to cash out at a higher valuation-- and hence increases the firm value.

Another reason (# 7 in the table below) that is closely tied to having a publicly available market value relates to compensation, specifically the ability for firms to use the price of their publicly traded shares to value stock options given to owners and

employees. Going public allows firm's stakeholders to have an agreed upon firm-value which can be used for various purposes. Relatedly, the 8th reason is based on the idea that since market prices aggregate the valuation of many market investors (e.g., Grossman and Stiglitz, 1980) they can also be used as a source of information to the firm about its value or even the course of action it is taking.

Being a public firm offers an additional benefit to firms, in the form of certification and reduction of uncertainty (#9). The scrutiny of the SEC (e.g., Lowry, Michaely, and Volkova, 2016) combined with the constant watching and nudging of sell-side analysts, activists, and other investors adds credibility to the firm, certifies its value. The reduced risk and greater transparency achieved through the going public process also increases the confidence of suppliers and consumer about its value and well-being; which in turn affect its cost of dealing with suppliers, its cost of debt capital and revenues. This value certification reduces the uncertainty and potentially results in high valuation. However, the flip side is that for the right or wrong reasons, many managers do not like the scrutiny by market participants. In either case, it is difficult to see how this can be achieved in the private equity market.

Finally, reason # 10 suggests that going public may be an effective marketing device: it puts the firm in center stage both in the financial community and perhaps more importantly, among consumers. Thus going public can increase its consumer base, increase consumer loyalty—especially since consumers can now become shareholders. This can both increase revenue and decrease the cost of capital. The broadening of investors' base can also increase stock liquidity. Neither private equity nor debt instruments will achieve these goals.

These motives and how they relate to the decision of whether to raise capital (public equity, private equity, or debt) and how they relate to the decision to go public (vs. private equity or debt) are summarized in Table 3.0. Nine out of the ten reasons we outlined are not related to the fact that firms exchange stocks for cash during the IPO process. That is, they do not suggest that firms go through an IPO because they need cash. The relative importance of these motives remains an open empirical question.

Table 3.0: Summary of reasons companies go public

	Source Of Capital	Public Equity	Private Equity	Debt
1	Investment	+	+	+
2	Overvaluation (market timing)	+	+	0
3	Capital Structure Adjustment	+	+	-
4	Stock liquidity	+	0	0
5	Owners' Diversification	+	+	0
6	Currency for Acquisitions	+	0	0
7	Compensation and Market Valuation	+	0	0
8	Feedback effects from market	+	0	0
9	Certification by analysts, SEC and markets	+	0	0
10	Marketing	+	0	
11	Corporate control	+	0	

So why do firms go public? We believe we know the possible motives (as we outlined in the Table above), but we need more direct evidence on the relative importance of the various motives. Interesting evidence from Sweden suggests that diversification is an important motive. The evidence we discussed on the need for cash as a reason for IPO is mixed, but it is very likely to play some role. There is more consistent evidence that having a verifiable market value is an important motive, be it

for acquisition currency, stock options, or ability to take more aggressive strategies. Why firms go (or do not go) public is perhaps one of the most important questions related to IPOs, with significant possible implication on policies, governance, and on firms' cost of capital. It would be wonderful to have more, and more complete evidence on this issue.

Many of the models described above incorporate the costs as well as the benefits of going public vs. staying private, as well as how these costs and benefits may change over time. The Maug (2001) model, for example, suggests that an IPO occurs when insiders' information advantage over outsiders disappears; a natural progression over the firm's life cycle. More generally, the going public decision is an equilibrium outcome such that at the time of going public, the benefits outweighs the costs. It is therefore important to study the timing of going public as well as the type of firm that decides to go this route.

The reduction in the number of public firms in the last 25 years (Grullon, Larkin and Michaely, 2016) and the reduction in the number of firms going public (Gao, Ritter, and Zhu 2013) suggest that the costs of being public may have increased and/or the benefits of being public decreased over the last several decades. Several papers have attempted to shed light on this issue.

Regarding the costs of being a publicly listed firm, reporting requirements have become more complicated and time consuming, and there is increased pressure on management to pursue short term, rather than long-term objectives. Interestingly, neither Gao, Ritter, and Zhu (2013) nor Doidge, Karolyi and Stulz (2013) find support for increased regulation playing an important role: they find no evidence that either

the Sarbanes-Oxley Act of 2002 or the 2003 Global Settlement had a material effect on IPO activity. However, Ritter (2011) conjectures that such regulatory changes have probably had at least some effect.

Doidge et al (2013) conjecture that financial globalization has contributed toward the lower numbers of companies going public in the U.S., i.e., that the net benefits of going public in the US versus in other markets have decreased. Consistent with this, the fraction of worldwide IPOs occurring on US markets has fallen from 50% or more in the early 1990s, to approximately 30% in the late 1990s, to 10% or less in the 2007 – 2011 period. At the same time, financial globalization has increased. While these trends appear consistent with increased globalization contributing to the fall in US IPO volume, a more critical examination casts doubt on this conclusion. Specifically, while the fall in US IPOs is significantly related to the increased globalization, Doidge et al's findings are not consistent with IPOs in the rest of the world simultaneously increasing. In other words, they find no evidence that companies are choosing to go public in other markets rather than in the US.[42]

Gao et al (2013) highlight that the decrease in the number of companies going public is concentrated among small offerings, and they offer an economies of scope argument for the observed trends. They conjecture that it is increasingly difficult for small firms to operate independently in today's rapidly changing markets. Thus, small firms find it increasingly optimal to sell out to larger firms, who have a broader network to develop products more quickly and to bring the products to market faster. Consistent with this, both Brau, Francis and Kohers (2003) and Gao et al document

[42] Specifically, Column 2 of Table 8 of Doidge et al indicates a small negative effect of globalization on Non-US IPOs, -0.297 (= $\beta_{Globalization} + \beta_{NonUS*Globalization} = -1.656 + 1.359$).

that venture-backed firms are increasingly likely to be acquired: the percentage of VC-backed firms exiting via acquisition as opposed to IPO has increased from the 25-35% range over the 1991 – 1996 period, to the 40 – 60% range over 1997 – 2000, to over 80% since 2001. Moreover, these trends are particularly strong among small venture-backed private firms. Along the same lines, Grullon et. al (2017) report that the average US firm tripled in size (in real terms) since the turn of the century, consistent with the notion of economies of scope. We note that these patterns are informative, and we would like to encourage future research that could examine the causal effects of such influences.

Finally, while historically a key benefit of being a public firm was broader access to capital from a disperse group of shareholders, in recent years such capital has become increasingly available to private firms. In other words, some researchers suggested that the spread between the opportunity cost of capital for private and public firms had narrowed in the last decade. In a study of 13 mutual fund families (103 unique funds) across the 1995 – 2015 period, Kwon, Lowry, and Qian (2017) document that these funds in aggregate held less than $20 million in VC-backed private firms in 1995 and 1996, $70 – 120 million between 2000 and 2010, and $7 billion in 2015. They find some evidence that this increased availability of funding enables companies to stay private for longer. Importantly, mutual funds represent just one of several sources of funding available to private firms, with other sources including pension funds and sovereign wealth funds. The extent to which changes in the market continue to make such capital increasingly available has the potential to substantially influence the IPO market in the future.

Stylized Facts

In this section, we review the stylized facts about IPOs using a long-term data sample of initial public offerings in U.S. While some aspects of IPOs remain relatively constant throughout the 43 years of our sample period, other relations vary with the time and with market conditions. IPO data for this section is pulled from the SDC Platinum database and consists of the companies that went public on the NYSE, AMEX and Nasdaq stock exchanges between 1972 and 2015. Consistent with the vast majority of academic research, the constructed sample excludes REITs, units, ADRs, closed-end funds, offerings with the stock price below $5, and companies not listed on CRSP within 14 days of the IPO. The start of the sample corresponds to the beginning of SDC Platinum IPO coverage. The total sample includes information on approximately 9,145 initial public offerings that satisfy these criteria. Additional data is collected from CSRP and Compustat.

We decided to replicate many of the results concerning IPOs for three reasons. First, it allows us to verify many of the results reported in prior literature and to examine their empirical validity over longer time periods. Second, while many studies use different sample selection criteria and different methodologies, here we use a unified and consistent empirical framework allowing for better comparison among the different results in the literature. Third, results presented in this section are based on a sample of IPO that is larger than that of any published paper of which we are aware.[43]

[43]For example, our sample includes a greater number of IPOs than Ritter (https://site.warrington.ufl.edu/ritter/files/2016/12/IPOs2016Statistics_Dec21_2016.pdf) because we do not exclude banks.

Figure 3.1 and Table 3.1 show how both the number of IPOs and total proceeds raised in IPOs vary over time.

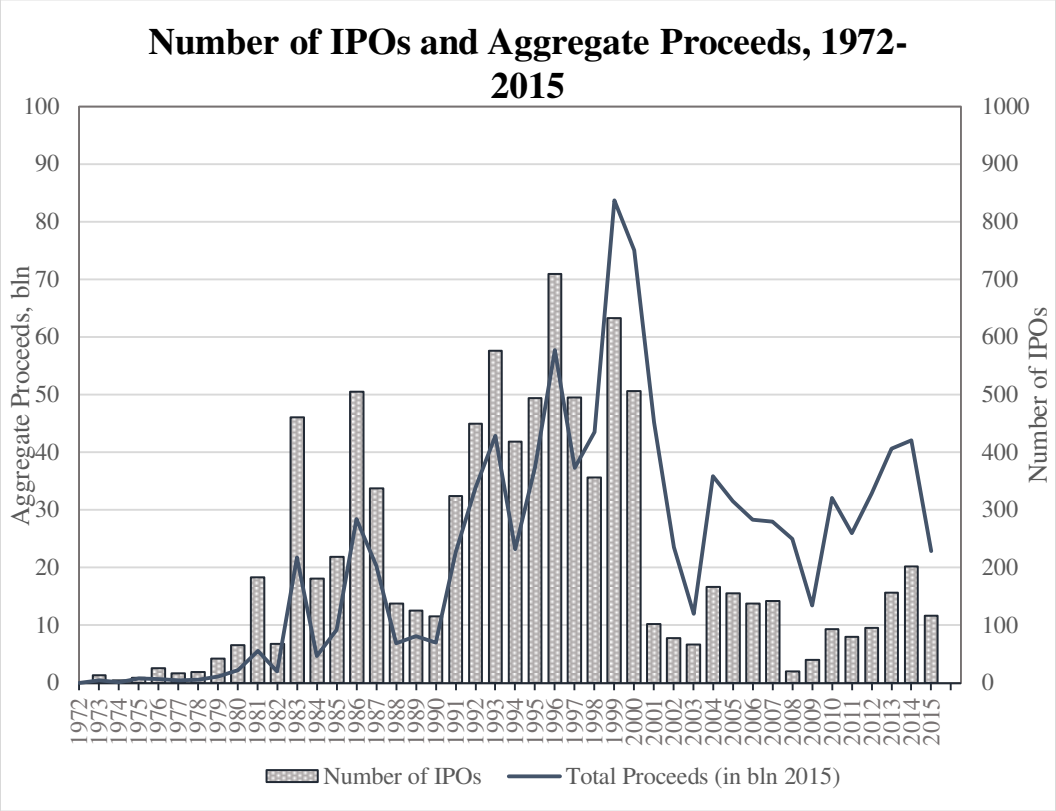


Figure 3.1. Number of IPOs and Aggregate Proceeds.

The IPO sample is constructed based on information from the SDC Platinum database. The sample consists of companies that went public between 1972 and 2015 on NYSE, Nasdaq and AMEX stock exchanges. IPOs with an offer price below $5, REITs, ADRs, units, and companies without CRSP records are excluded. The final sample includes 8,543 IPOs. Proceeds (obtained from SDC) are expressed in real 2015 billion dollars, using the GDP implicit price deflator.

Table 3.1. Mean IPO Initial Returns and Average Proceeds, 1972-2015

The IPO sample is constructed based on information from the SDC Platinum database. The sample consists of companies that went public between 1972 and 2015 on NYSE, Nasdaq and AMEX stock exchanges. IPOs with an offer price below $5, REITs, ADRs, units, and companies without CRSP records are excluded. The final sample includes 8,543 IPOs. Proceeds (obtained from SDC) are expressed in real 2015 million dollars, using the GDP implicit price deflator. Initial returns equal the return from the offering price to the first day closing price, where the offer price is from SDC and the first closing price from CRSP.

Year	# IPOs	Initial	Average	Aggregate

		Returns	Proceeds (mil)	Proceeds (mil)
1972	1	2.0%	43.9	43.9
1973	13	10.8%	39.0	507.3
1974	4	5.7%	24.1	96.3
1975	9	3.8%	91.1	820.2
1976	26	3.0%	26.9	699.5
1977	17	4.3%	23.7	402.8
1978	19	14.9%	29.1	553.5
1979	42	13.5%	26.4	1,110.3
1980	66	15.8%	33.9	2,237.5
1981	183	6.6%	30.2	5,529.9
1982	68	12.5%	30.0	2,037.6
1983	461	10.2%	47.2	21,747.1
1984	181	2.7%	25.9	4,679.7
1985	219	8.2%	42.3	9,259.9
1986	505	7.5%	56.2	28,384.6
1987	337	6.0%	60.3	20,322.7
1988	138	4.6%	50.1	6,917.1
1989	125	7.7%	64.8	8,103.4
1990	115	9.3%	60.7	6,977.4
1991	324	10.1%	70.0	22,674.8
1992	450	9.0%	75.3	33,865.1
1993	576	12.0%	74.4	42,830.2
1994	418	8.1%	55.4	23,152.0
1995	494	20.2%	75.8	37,445.8
1996	709	15.6%	81.4	57,708.8
1997	495	13.7%	75.3	37,292.4
1998	356	22.1%	122.2	43,507.8
1999	633	76.9%	132.2	83,708.4
2000	506	59.4%	148.4	75,076.2
2001	102	14.4%	443.3	45,220.8
2002	78	8.8%	302.2	23,575.3
2003	67	13.1%	179.1	11,997.0
2004	167	12.4%	214.9	35,894.3
2005	156	9.3%	202.0	31,518.8
2006	138	12.7%	205.1	28,297.0
2007	142	13.1%	197.3	28,013.8
2008	20	5.0%	1,249.9	24,997.9
2009	40	12.5%	337.2	13,489.1
2010	93	7.3%	345.3	32,115.8
2011	80	13.8%	324.4	25,953.1
2012	96	19.5%	342.7	32,895.2
2013	157	20.0%	258.7	40,618.1
2014	202	16.4%	208.5	42,111.3
2015	117	16.5%	195.2	22,832.6
Total	**9145**	**19.1%**	**111.2**	**1,017,222.1**

Throughout the 1970s, the number of companies going public each year was quite low, with an average of 16 IPOs per year. During the mid-1980s IPO volume was markedly higher, with 341 IPOs per year over the 1983 – 1987 period. After

another dip in the late 1980s and early 1990s, IPO volume rose to record levels in the mid to late 1990s. The year 1996 witnessed the highest number of IPOs, with 709 offerings in that single year—an average of almost three IPOs per trading day. There continued to be many IPOs over the rest of the 1990s, and then very few following the crash of the internet bubble in 2000. Many of these fluctuations in IPO volume are strongly positively correlated with market-wide returns. However, since 2000 IPO volume has never recovered to anywhere close to the levels observed in the 1990s, despite strong market performance during much of this period. As shown in Figure 3.4 (and also discussed by Gao et al (2013)), the majority of this drop in IPO volume has been among smaller companies. Larger companies have continued to go public at a similar pace. Smaller private companies have become increasingly likely to be acquired rather than to go public.

Total annual IPO proceeds (all expressed in constant 2015 USD) follow a trend similar to that shown for the number of firms going public, throughout much of this period.[44] Aggregate proceeds raised averaged $530 million per year in the 1970s, compared to $11 billion per year in the 1980s, and $39 billion per year in the 1990s. Following the crash of the internet bubble in 2000, aggregate proceeds have recovered to a greater extent than the raw number of offerings. While the average number of companies going public since 2000 (135 per year) is about a third of the number of IPOs in the 1990s (457 per year), proceeds raised during the two periods are more similar (an annual average of $39 billion during the 1990s compared to an annual

[44] We deflate using the GDP Implicit Price Deflator rather than the CPI because the GDP Deflator reflects changes in prices in the entire economy, rather than changes in prices of a fixed basket of consumer goods.

average of $32 billion between 2000 – 2015). This is driven by the fact that the average size of companies going public has increased substantially over the past 15 years. Over the entire sample period, the annual correlation between number of IPOs and total annual proceeds is 0.71, and it is an even higher 0.89 over the early sample period 1972 - 2000.

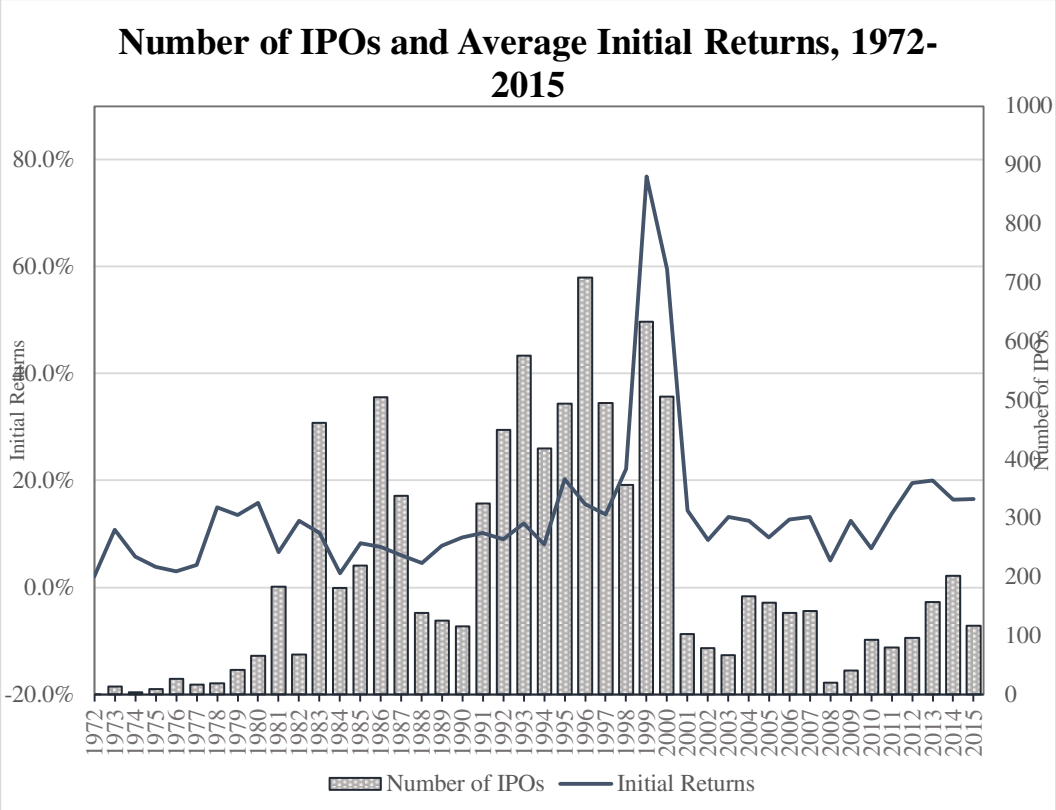


Figure 3.2. Number of IPOs and Initial Returns

Figure 3.2 shows average initial returns across all companies going public each year, with the number of IPOs plotted on the same graph to facilitate comparisons of the two. Initial returns are defined as the percent difference between the offer price and the closing price on the first day of trading. Across our entire sample of 9,145 IPOs average initial returns equal 19.1%, but the figure highlights the extent to which

this average has varied over time. Average initial returns each year ranged between 2 – 15% in the 1970s, 2 – 16% in the 1980s, 8 – 77% in the 1990s, and 5 – 20% since 2001. During the height of the Internet Bubble period, average initial returns reached record levels: 77% in 1999 and 59% in 2000. In addition to varying substantially over time, there is also a co-movement between IPO volume and initial returns. Using lower frequency monthly data, Lowry and Schwert (2002) show that initial returns tends to lead IPO volume by approximately three months, meaning that high initial return periods tend to be followed by many companies going public. While this lead-lag feature of the data is difficult to discern at the annual frequency shown in Figure 3.2, the positive correlation between the two series is evident.

Figure 3.3 is similar to Figure 3.2, but it plots average annual initial returns against aggregate proceeds raised in IPOs each year. The strong positive relation between the series is even more evident here. Both metrics spike in 1999: aggregate IPO proceeds reach $83.7 billion and initial returns average 77%.

Figure 3.4 provides some more details on the relation between initial returns and proceeds. Specifically, we divide the sample into three bins: IPOs with proceeds less than $30 million, IPOs with proceeds between $30 and $120 million, and IPOs with proceeds greater than $120 million (all measured in constant 2015 USD). This

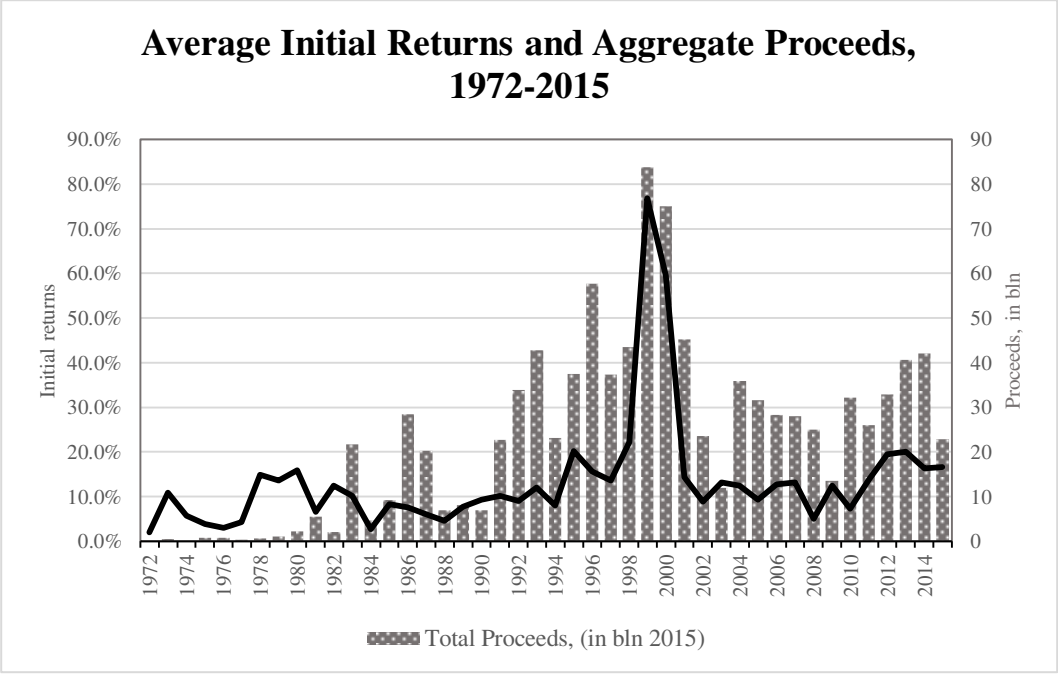


Figure 3.3. Initial Returns and Aggregate Proceeds.

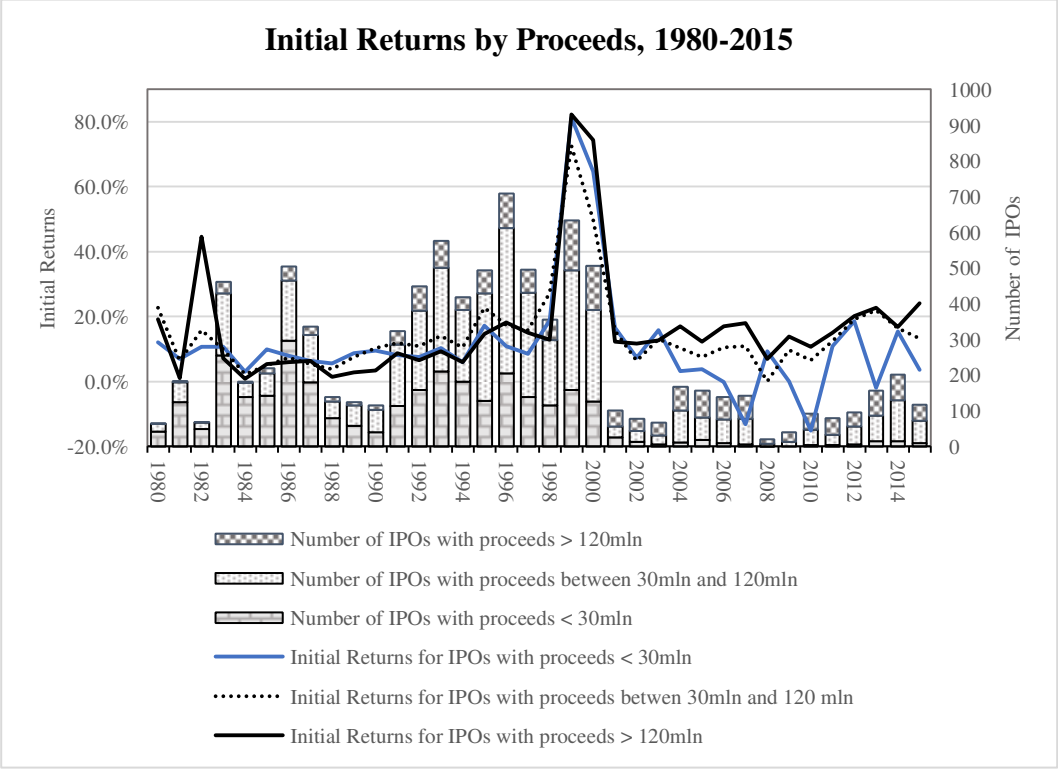


Figure 3.4. IPO Initial Returns and Proceeds.

Table 3.2. IPO Initial Returns by the Proceeds Amount, 1972-2015
This table presents the number of IPOs and average initial returns within three groups: IPOs with proceeds below $30 million, IPOs with proceeds between $30 million and $120 million, and IPOs with proceeds above $120 million. Proceeds are in real 2015 million dollars.

Year	# IPOs	# IPOs, Proceed < 30mln	# IPOs, Proceeds between 30mln and 120mln	# IPOs, Proceeds > 120mln	Initial Returns, Proceeds < 30 mln	Initial Returns, Proceeds between 30 mln and 120 mln	Initial Returns, Proceeds > 120 mln
1972	1	0	1	0	NA	2.0%	NA
1973	13	8	5	0	12.5%	8.1%	NA
1974	4	3	1	0	7.2%	1.4%	NA
1975	9	3	5	1	10.5%	0.8%	-0.8%
1976	26	19	7	0	2.8%	3.5%	NA
1977	17	15	2	0	4.4%	3.2%	NA
1978	19	11	8	0	15.0%	14.8%	NA
1979	42	32	9	1	8.3%	16.9%	150.0%
1980	66	42	21	3	12.1%	22.8%	19.0%
1981	183	125	55	3	6.9%	6.3%	1.0%
1982	68	49	18	1	10.7%	15.7%	44.6%
1983	461	256	173	32	10.8%	9.8%	7.1%
1984	181	138	40	3	2.9%	2.1%	0.8%
1985	219	143	63	13	9.9%	4.9%	5.3%
1986	505	296	169	40	7.9%	7.3%	5.9%
1987	337	180	132	25	6.4%	5.3%	6.4%
1988	138	79	48	11	5.6%	3.7%	1.4%
1989	125	58	58	9	8.7%	7.6%	2.8%
1990	115	40	63	12	9.6%	10.3%	3.4%
1991	324	114	172	38	8.2%	11.8%	8.7%
1992	450	159	222	69	7.6%	10.8%	6.4%
1993	576	210	292	74	10.3%	14.0%	9.3%
1994	418	182	200	36	5.8%	10.5%	5.9%
1995	494	128	301	65	17.2%	22.7%	14.6%
1996	709	205	407	97	10.8%	17.4%	18.1%
1997	495	138	294	63	8.5%	15.8%	15.1%
1998	356	115	183	58	18.7%	27.2%	12.9%
1999	633	158	336	139	81.2%	72.6%	82.2%
2000	506	127	256	123	64.7%	49.6%	74.4%
2001	102	25	31	46	16.7%	15.6%	12.2%
2002	78	14	30	34	7.3%	6.3%	11.6%
2003	67	6	25	36	15.9%	13.1%	12.7%
2004	167	11	91	65	3.1%	10.3%	16.9%
2005	156	18	64	74	3.7%	7.6%	12.2%
2006	138	9	67	62	-0.1%	10.5%	17.0%
2007	142	6	71	65	-13.3%	10.9%	18.0%
2008	20	2	6	12	9.3%	-0.1%	6.9%
2009	40	0	13	27	NA	9.7%	13.8%
2010	93	5	43	45	-15.1%	6.6%	10.6%
2011	80	4	29	47	10.8%	12.4%	14.9%
2012	96	6	51	39	18.6%	19.2%	20.1%
2013	157	15	72	70	-2.0%	21.8%	22.8%
2014	202	15	115	72	15.4%	16.3%	16.7%
2015	117	9	64	44	3.5%	13.2%	24.0%
Total	**9145**	**3178**	**4313**	**1654**	**14.8%**	**20.4%**	**23.9%**

disaggregation highlights several patterns. First, the number of the small IPOs has decreased markedly over time, and there are very few IPOs with proceeds less than $30 million since 2001. Between 2001 and 2015, there were a total of 145 IPOs in this category, which represents less than 9% of all IPOs over this period. Second, the number of the largest IPOs, i.e., those with proceeds greater than $120 million, as a portion of all companies going public has risen dramatically. Third, in the earlier part of the sample the smallest IPOs tended to be more underpriced, but since the 1990s this relation has reversed and it is the largest IPOs that are frequently the most underpriced.

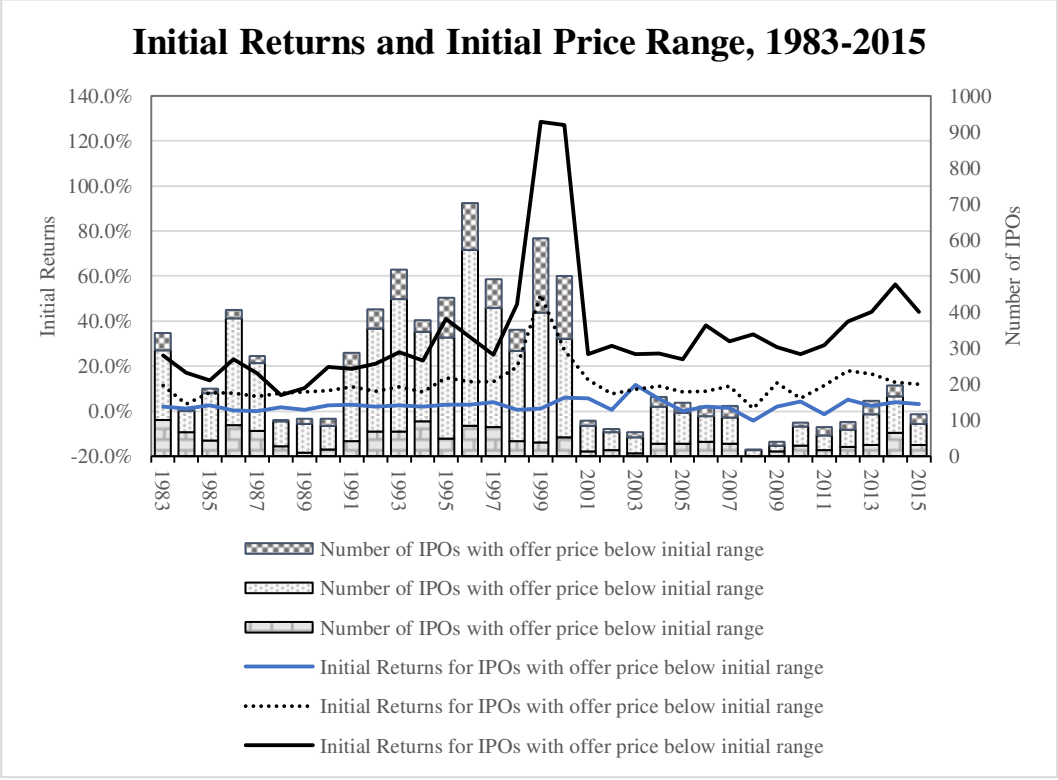


Figure 3.5. IPO Initial Returns and Initial Price Range.

Table 3.3. Initial Returns and the Initial Price Range, 1983-2015

This table presents the number of IPOs and average initial returns for three groups: IPOs with whose offer price is below the initial price range, within the initial price range, and above the initial price range. Further details on the sample composition are provided in Figure 1. The sample in this figure is additionally restricted to companies that went public in 1983 - 2015, as SDC does not have the initial price range information for IPOs in earlier years.

Year	# IPOs	# IPOs, offer price < range	# IPOs, offer price within initial range	# IPOs, offer price above the range	Initial Returns, offer price below initial range	Initial Returns, offer price within initial range	Initial Returns, offer price above initial range
1983	342	100	193	49	2.1%	11.5%	24.7%
1984	129	67	58	4	1.2%	3.2%	17.2%
1985	187	43	131	13	2.6%	8.3%	13.6%
1986	405	86	296	23	0.4%	8.0%	22.9%
1987	277	70	188	19	0.0%	6.6%	16.7%
1988	100	28	68	4	1.6%	7.9%	7.1%
1989	104	9	81	14	0.5%	8.7%	10.4%
1990	103	18	67	18	2.6%	9.2%	19.7%
1991	286	42	204	40	2.8%	10.8%	18.7%
1992	408	68	287	53	2.0%	9.0%	20.9%
1993	518	68	368	82	2.7%	10.8%	26.3%
1994	377	97	249	31	2.1%	8.6%	22.3%
1995	440	48	281	111	2.8%	14.9%	41.0%
1996	702	84	489	129	2.9%	13.0%	33.0%
1997	491	80	331	80	3.9%	13.2%	25.0%
1998	350	42	250	58	0.7%	19.6%	47.3%
1999	604	38	360	206	1.2%	51.9%	128.6%
2000	499	53	272	174	6.0%	27.1%	127.1%
2001	99	14	71	14	5.8%	13.8%	25.2%
2002	75	17	49	9	0.7%	7.7%	29.1%
2003	67	8	45	14	11.5%	9.6%	25.3%
2004	164	35	102	27	5.4%	11.2%	25.7%
2005	149	34	86	29	0.1%	8.7%	23.1%
2006	138	39	72	27	2.1%	8.9%	38.1%
2007	139	35	72	32	1.4%	11.2%	30.9%
2008	19	3	13	3	-4.2%	1.1%	34.2%
2009	39	14	15	10	2.0%	12.4%	28.4%
2010	93	29	54	10	4.2%	5.7%	25.3%
2011	80	17	40	23	-1.3%	11.3%	29.4%
2012	95	25	49	21	5.2%	17.8%	39.7%
2013	154	31	85	38	2.4%	16.4%	44.0%
2014	196	64	102	30	4.0%	12.8%	56.2%
2015	116	31	59	26	3.1%	12.0%	44.0%
Total	**7945**	**1437**	**5087**	**1421**	**2.4%**	**15.0%**	**56.8%**

Figure 3.5 depicts how the level of underpricing varies depending on where the offer price was relative to the initial price range, as stated in the prospectus.

Companies that are priced below the initial range have average underpricing of 2.4%

and this level is relatively stable over the all sample years. In comparison, companies that are priced within the initial price range have average underpricing of 15.0%, while companies priced above the range have an average underpricing of 56.8%. Initial returns for these two latter groups is even higher during the Internet Bubble period.

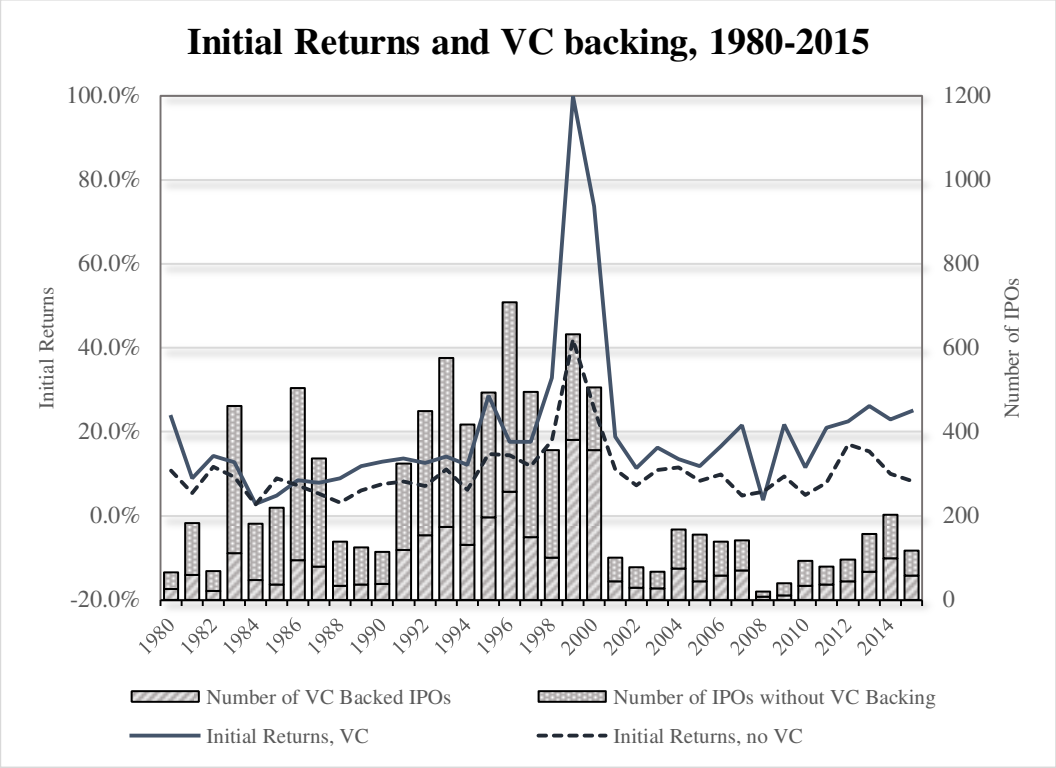


Figure 3.6. IPO Initial Returns and Venture Capital Backing

Figure 3.6 shows show the level of initial returns varies across offerings that are VC- versus nonVC-backed, and it also shows patterns in VC backing over time, where firms are denoted as VC-backed according to the Venture Capital Backed IPO Issue Flag in the SDC Platinum database. Across our entire sample period 37% of our IPOs are VC backed. This proportion has risen somewhat over our sample period, from 33% in the 1970s and 24% in the 1980s, to 37% in the 1990s and 49% over the 2000 – 2015 period. VC-backed issues tend to be more underpriced than their non-VC

Table 3.4 Mean Initial Return for IPOs with and without Venture Capitalist Backing, 1972-2015
For IPOs with versus without VC backing, this table shows: the number of IPOs, average initial returns, firm age, and portion of companies in a technology industry. We rely on SDC for information on VC backing ('Venture Backed' variable), offer price, and membership in a technology industry (' Technology Industry' variable). Firm age is obtained from Jay Ritter website.[45]

Year	# IPOs	#IPOs, VC	#IPOs, no VC	Initial Returns, VC	Initial Returns, no VC	Age, VC	Age, no VC	% Tech IPO, VC	% Tech IPO, no VC
1972	1	0	1	NA	2.0%	NA	NA	NA	0.0%
1973	13	3	10	13.8%	9.9%	NA	NA	33.3%	30.0%
1974	4	1	3	9.8%	4.4%	NA	NA	100.0%	0.0%
1975	9	0	9	NA	3.8%	NA	43.8	NA	22.2%
1976	26	11	15	6.8%	0.2%	8.7	32.3	63.6%	20.0%
1977	17	3	14	14.5%	2.1%	2.7	10.6	33.3%	7.1%
1978	19	9	10	22.8%	7.9%	9.1	24.6	88.9%	20.0%
1979	42	16	26	13.9%	13.3%	9.7	15.0	62.5%	23.1%
1980	66	26	40	23.5%	10.8%	7.3	10.9	73.1%	32.5%
1981	183	60	123	8.9%	5.5%	10.1	13.1	63.3%	29.3%
1982	68	22	46	14.3%	11.6%	9.0	9.9	90.9%	32.6%
1983	461	112	349	12.8%	9.3%	7.2	20.3	68.8%	24.1%
1984	181	47	134	2.8%	2.6%	8.1	24.4	70.2%	16.4%
1985	219	36	183	4.9%	8.9%	9.3	26.1	52.8%	14.2%
1986	505	94	411	8.4%	7.3%	9.3	26.4	60.6%	12.7%
1987	337	80	257	8.0%	5.3%	7.3	29.4	73.8%	10.9%
1988	138	34	104	8.9%	3.2%	5.8	36.1	70.6%	17.3%
1989	125	37	88	11.8%	6.0%	7.3	21.2	59.5%	21.6%
1990	115	38	77	12.8%	7.6%	9.3	26.5	76.3%	11.7%
1991	324	119	205	13.6%	8.1%	8.9	27.5	77.3%	22.9%
1992	450	154	296	12.7%	7.1%	10.8	30.1	68.2%	23.0%
1993	576	174	402	14.1%	11.1%	9.9	20.3	68.4%	16.9%
1994	418	131	287	12.2%	6.2%	10.3	19.4	66.4%	23.0%
1995	494	196	298	28.6%	14.7%	10.7	15.6	79.1%	36.2%
1996	709	257	452	17.7%	14.4%	10.4	18.6	75.5%	38.9%
1997	495	150	345	17.7%	11.9%	10.4	24.6	68.0%	35.9%
1998	356	100	256	32.8%	18.0%	8.4	21.2	86.0%	35.2%
1999	633	381	252	99.9%	42.0%	5.8	19.8	89.2%	62.7%
2000	506	356	150	73.7%	25.5%	6.0	22.3	95.5%	62.0%
2001	102	44	57	18.9%	11.1%	10.4	31.7	75.0%	45.6%
2002	78	29	49	11.5%	7.3%	22.6	28.7	69.0%	34.7%
2003	67	27	40	16.3%	11.0%	11.5	33.1	81.5%	27.5%
2004	167	75	92	13.6%	11.5%	8.3	26.0	85.3%	25.0%
2005	156	44	112	11.9%	8.3%	9.5	37.0	90.9%	25.9%
2006	138	58	80	16.6%	9.9%	9.3	36.2	81.0%	23.8%
2007	142	70	72	21.6%	4.9%	8.6	26.8	85.7%	25.0%
2008	20	7	13	3.8%	5.7%	11.3	40.7	85.7%	7.7%
2009	40	10	30	21.8%	9.4%	9.1	36.5	70.0%	50.0%
2010	93	33	60	11.6%	5.0%	10.0	27.2	63.6%	20.0%
2011	80	36	44	21.0%	7.9%	8.7	22.3	83.3%	25.0%
2012	96	44	52	22.5%	17.0%	9.7	31.8	86.4%	17.3%
2013	157	67	90	26.2%	15.4%	10.3	34.7	85.1%	22.2%
2014	202	99	103	23.0%	10.0%	9.9	24.5	89.9%	25.2%
2015	117	58	59	24.9%	8.3%	8.4	14.8	89.7%	32.2%
Total	**9145**	**3348**	**5796**	**32.2%**	**11.5%**	**8.8**	**23.7**	**78.6%**	**27.5%**

[45] We thank Jay Ritter for making this information publicly available on his website.

backed counterparts, with average initial returns of 32% versus 11%. This difference is particularly pronounced during the Internet Bubble, with average initial returns of 100% versus 42% among VC-backed versus non-VC backed IPOs, respectively, in 1999. At least part of this difference likely stems from differences in underlying company type. VC-backed companies tend to be younger (9 versus 24 years old, on average, for VC vs non-VC backed IPOs, respectively) and are more likely to belong to a technology industry (79% of VC-backed IPOs are in technology, compared to 28% of non-VC backed IPOs).

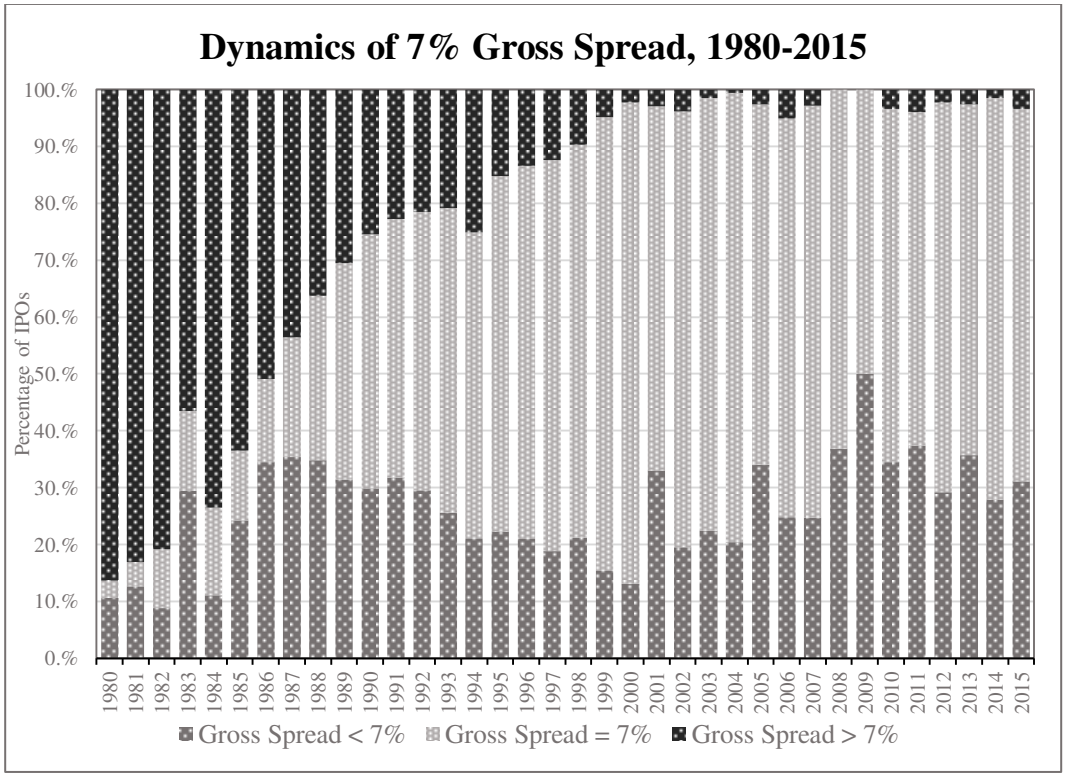


Figure 3.7. Underwriter Spread

Table 3.5. IPO Initial Returns and Underwriter Spread, 1980-2015

The left-hand side of the table shows the portion of IPOs per year with the underwriter spread below, equal to and above 7%. The right-hand side of the table shows average spreads among IPOs with proceeds less than $30 million, between 30 and $120 million, and greater than $120 million. Information regarding proceeds (which are expressed in real 2015 dollars) and the underwriter spread are obtained from SDC. The composition of the IPO sample is described in Figure 1, and the sample in further restricted to offerings in 1980-2015 with non-missing information on the underwriter spread.

		Percent of IPOs with spread:			Average spread among IPOs with proceeds:		
Year	# IPOs	< 7%	= 7%	> 7%	< 30 mln	30 -120 mln	> 120 mln
1980	66	10.6%	3.0%	86.4%	8.3%	7.2%	6.0%
1981	183	12.6%	4.4%	83.1%	8.2%	7.2%	6.3%
1982	68	8.8%	10.3%	80.9%	8.2%	7.1%	7.0%
1983	461	29.3%	14.1%	56.5%	8.1%	6.9%	6.2%
1984	181	11.0%	15.5%	73.5%	7.9%	7.0%	6.6%
1985	219	24.2%	12.3%	63.5%	8.0%	6.9%	6.2%
1986	505	34.5%	14.7%	50.9%	7.8%	6.9%	5.9%
1987	337	35.3%	21.1%	43.6%	7.6%	6.8%	5.6%
1988	138	34.8%	29.0%	36.2%	7.4%	6.7%	5.7%
1989	125	31.4%	38.0%	30.6%	7.6%	6.8%	5.8%
1990	115	29.8%	44.7%	25.4%	7.5%	6.9%	5.5%
1991	324	31.8%	45.5%	22.7%	7.4%	6.7%	5.9%
1992	450	29.6%	48.9%	21.6%	7.7%	6.8%	5.9%
1993	576	25.6%	53.5%	20.9%	7.8%	6.9%	6.0%
1994	418	21.1%	53.7%	25.2%	7.6%	6.9%	5.8%
1995	494	22.2%	62.5%	15.3%	7.9%	6.9%	6.0%
1996	709	21.0%	65.6%	13.5%	7.6%	6.9%	6.2%
1997	495	18.9%	68.8%	12.4%	7.6%	6.9%	6.4%
1998	356	21.1%	69.1%	9.7%	7.5%	6.9%	6.0%
1999	633	15.3%	79.8%	4.8%	7.2%	6.9%	6.4%
2000	506	13.1%	84.7%	2.2%	7.2%	7.0%	6.5%
2001	102	33.0%	64.0%	3.0%	7.1%	6.9%	5.9%
2002	78	19.5%	76.6%	3.9%	6.8%	6.9%	6.6%
2003	67	22.4%	76.1%	1.5%	7.0%	7.0%	6.7%
2004	167	20.4%	79.0%	0.6%	7.0%	7.0%	6.4%
2005	156	34.0%	63.4%	2.6%	6.9%	6.9%	6.3%
2006	138	24.8%	70.1%	5.1%	7.2%	7.0%	6.5%
2007	142	24.6%	72.5%	2.9%	6.8%	7.0%	6.5%
2008	20	36.8%	63.2%	0.0%	7.0%	7.0%	6.0%
2009	40	50.0%	50.0%	0.0%	NA	6.9%	6.1%
2010	93	34.5%	62.1%	3.4%	7.1%	7.1%	6.4%
2011	80	37.3%	58.7%	4.0%	6.5%	7.0%	6.1%
2012	96	29.2%	68.5%	2.2%	7.0%	7.0%	6.1%
2013	157	35.7%	61.7%	2.6%	7.0%	6.9%	6.1%
2014	202	27.8%	70.6%	1.5%	7.1%	6.9%	6.0%
2015	117	31.0%	65.5%	3.4%	7.1%	6.9%	6.3%
Total	**9014**	**24.5%**	**52.4%**	**23.1%**	**7.7%**	**6.9%**	**6.2%**

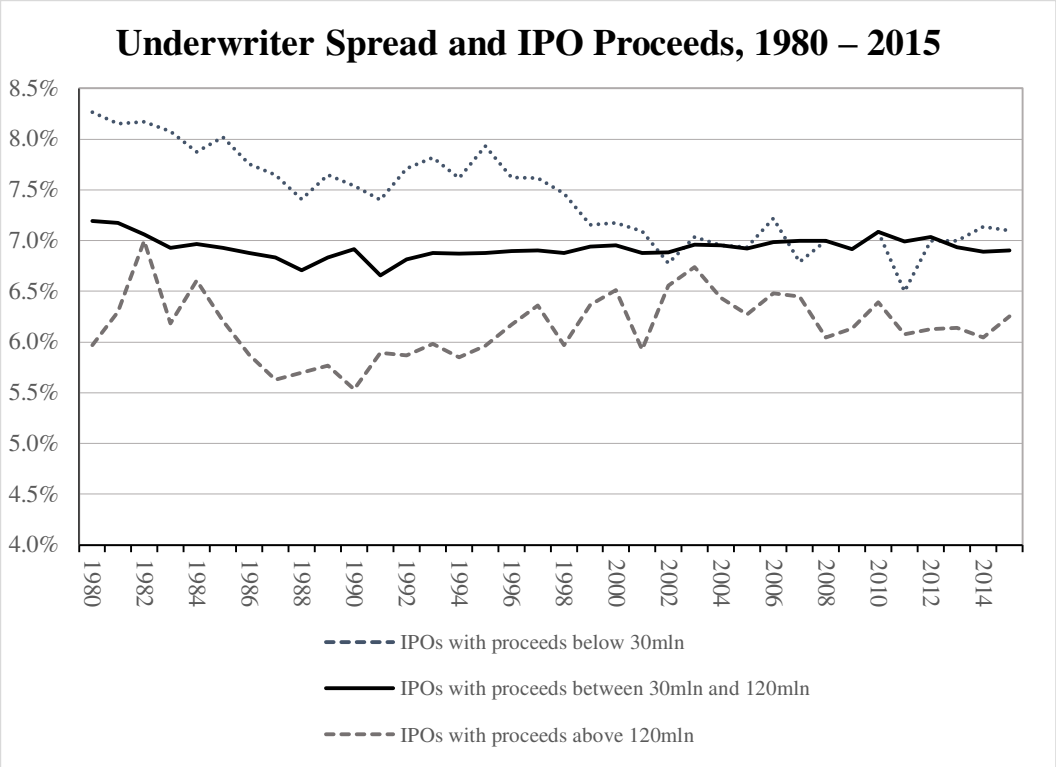


Figure 3.8. Average Underwriter Spread and IPO proceeds

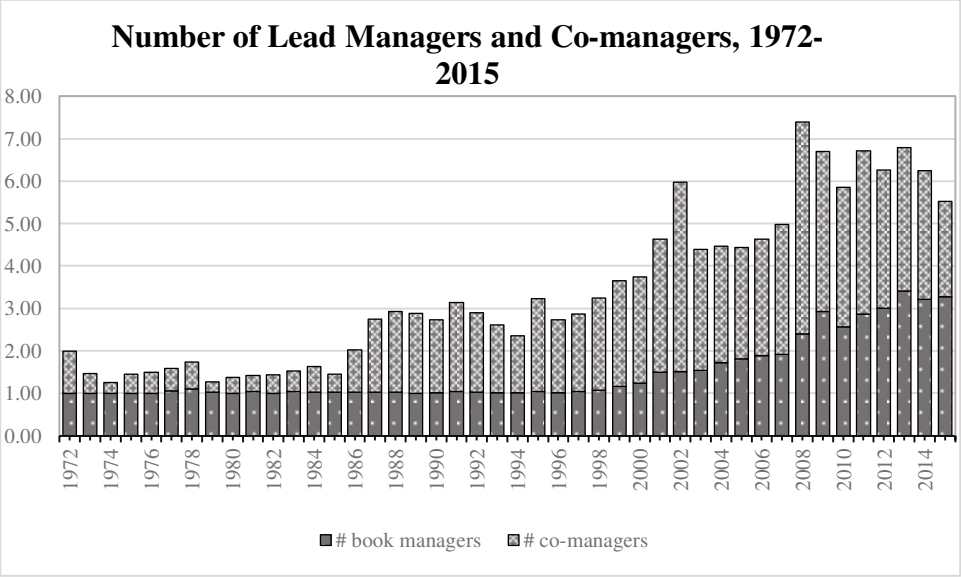
Figures 3.7 – 3.9 examine various aspects of the underwriting syndicate, with Figures 3.7 and 3.8 focusing on the percent of proceeds that goes toward underwriter compensation and Figure 3.9 looking at the members of the syndicate beyond the lead underwriter(s). Direct underwriter compensation for managing an IPO represents a fixed portion of IPO proceeds and is called the underwriter spread. As shown in Figure 3.7 and Table 3.5, the underwriter spread most commonly equals 7%. In our sample, more than a half of all IPOs have an underwriter spread of this magnitude. On average, the underwriter spread has decreased over time. For instance, more than three quarters of all IPOs in the first years of our sample had a spread above 7%, compared to less than 5% of all IPOs in the last decade of the sample. At the same time, the portion of

Table 3.6. Number of Lead Underwriters and Co-managers, 1972-2015

This table presents the average number of lead underwriters and co-managers for IPOs between 1972 and 2015. Last six columns of the table present the average lead managers and co-managers for the IPOs with proceeds below $30 million, between $30 million and $120 million, and above $120 million. Information about the managers and syndicate member is obtained from SDC, where codes "BM", "JB" , "JL" (book manager, joint book, and joint lead, respectively) are defined as lead managers, "CM" as co-managers, and "SD" as other syndicate members.

				IPOs with prceeds < $30 mln		IPOs with proceeds between $30 - 120 mln		IPOs with proceeds > $120 mln	
Year	# IPOs	# Leads	# Co-mgrs	# Leads	# Co-mgrs	# Leads	# Co-mgrs	# Leads	# Co-mgrs
1980	66	1.00	0.38	1.00	0.14	1.00	0.76	1.00	1.00
1981	183	1.04	0.38	1.03	0.23	1.04	0.73	1.67	0.33
1982	68	1.00	0.44	1.00	0.27	1.00	0.89	1.00	1.00
1983	461	1.04	0.49	1.01	0.24	1.07	0.71	1.09	1.25
1984	181	1.03	0.59	1.03	0.45	1.05	1.03	1.00	1.33
1985	219	1.03	0.42	1.03	0.21	1.03	0.68	1.00	1.54
1986	505	1.03	0.99	1.03	0.52	1.03	0.98	1.00	4.50
1987	337	1.02	1.73	1.02	0.82	1.02	1.98	1.00	6.96
1988	138	1.02	1.91	1.04	1.25	1.00	2.90	1.00	2.27
1989	125	1.00	1.88	1.00	1.59	1.00	1.74	1.00	4.67
1990	115	1.01	1.73	1.03	1.58	1.00	1.70	1.00	2.42
1991	324	1.05	2.10	1.03	1.35	1.04	2.24	1.16	3.66
1992	450	1.02	1.87	1.02	0.89	1.03	2.04	1.03	3.58
1993	576	1.02	1.59	1.00	0.83	1.02	1.97	1.04	2.28
1994	418	1.01	1.34	1.01	0.82	1.01	1.40	1.03	3.61
1995	494	1.04	2.19	1.00	1.70	1.02	1.90	1.20	4.54
1996	709	1.02	1.71	1.00	0.80	1.01	1.78	1.09	3.36
1997	495	1.04	1.83	1.01	1.54	1.04	1.79	1.11	2.62
1998	356	1.07	2.17	1.03	1.17	1.04	2.04	1.24	4.57
1999	633	1.17	2.48	1.18	1.95	1.10	2.35	1.32	3.41
2000	506	1.24	2.50	1.15	1.92	1.20	2.19	1.43	3.72
2001	102	1.50	3.13	1.32	1.72	1.42	2.06	1.65	4.61
2002	78	1.51	4.46	1.29	7.86	1.37	3.00	1.74	4.35
2003	67	1.54	2.85	1.50	4.33	1.28	2.16	1.72	3.08
2004	167	1.72	2.75	1.18	0.82	1.55	1.86	2.05	4.32
2005	156	1.81	2.63	1.06	0.44	1.44	2.08	2.32	3.64
2006	138	1.88	2.75	1.22	0.89	1.54	2.16	2.35	3.65
2007	142	1.92	3.06	1.00	1.67	1.56	2.54	2.40	3.75
2008	20	2.40	5.00	1.00	0.50	1.50	2.00	3.08	7.25
2009	40	2.93	3.78	NA	NA	2.00	2.08	3.37	4.59
2010	93	2.57	3.29	1.40	0.20	1.95	2.67	3.29	4.22
2011	80	2.88	3.84	1.25	0.75	2.14	2.17	3.47	5.13
2012	96	3.01	3.25	1.67	0.67	2.37	2.37	4.05	4.79
2013	157	3.41	3.38	1.13	1.27	2.51	1.90	4.83	5.36
2014	202	3.22	3.02	1.20	0.33	2.46	2.04	4.85	5.15
2015	117	3.27	2.26	1.33	0.78	2.52	1.78	4.77	3.25
Total	**9145**	**1.30**	**1.89**	**1.04**	**0.93**	**1.20**	**1.85**	**2.04**	**3.87**

Panel A. Number of IPO Lead Managers and Co-managers



Panel B. Syndicate Size

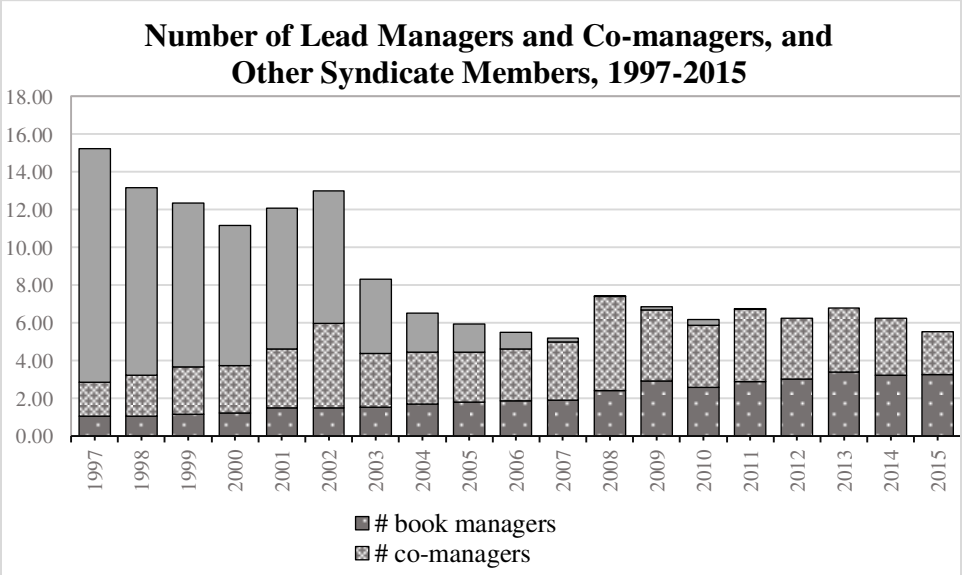


Figure 3.9. Investment Banks and IPO

companies with a spread equal to 7% grew throughout the 1980s and 1990s, and the portion of companies with a spread less than 7% has increased over the past 15 years.

Underwriters tend to charge larger IPOs a smaller spread. For instance, the average spreads are 7.7%, 6.9%, and 6.2%, for IPOs with proceeds below $30 million, $30 – $120 million, and above $120 million, respectively. Thus, the decrease in the average underwriter spread over the past 15 years partially reflects the higher prevalence of large deals over this period. Figure 3.8 depicts the time-series dynamics of underwriter spreads by IPO size. One of the most pronounced observations from this figure is that the average spread for the medium size IPO remains unchanged over the entire period, at 7.0%. Average spreads for the large IPOs are more volatile, but there is no apparent time trend. Finally, spreads for smaller IPOs have tended to decrease over time. Thus, the decrease in spread shown in Figure 3.7 is likely due to the changing nature of the type of firms that go public rather than a fundamental change in the equilibrium level of the spread.

Figure 3.9 and Table 3.6 show the composition of the IPO investment bank syndicate, which consists of lead managers, co-managers and other syndicate members. Panel A shows statistics related to the lead manager and co-managers over the entire 1972 – 2015 sample period, whereas Panel B focuses on the shorter 1997 – 2015 period for which available data allow us to look at the total syndicate composition. The panels show an interesting contrast. The average number of lead and co-managers has increased up through 2009 and then remained relatively constant, whereas total syndicate size has decreased over the 1997 – 2015 period. Looking first at panel A, in the 1970s, the average IPO had only one lead underwriter and only one out of three IPOs had a co-manager. Over our 43-year sample period, the number of lead underwriters has increased from 1 to 3.3, on average. At the same time, the

number of co-managers has increased markedly as well. Panel B shows that contemporaneous with this increase in participation of lead and co-managers, participation of other syndicate members has fallen dramatically. SDC data, on which these figures are based, indicate that the average IPO had 15 syndicate members in 1997 compared to zero in 2015. This is surprising. It suggests that all the IPOs in 2015 had no syndicate members other than lead underwriters and co-managers. We therefore verified manually all of the prospectuses of the 2015 IPOs; in addition, a random sample of IPOs in other years revealed no systematic errors in these SDC data.

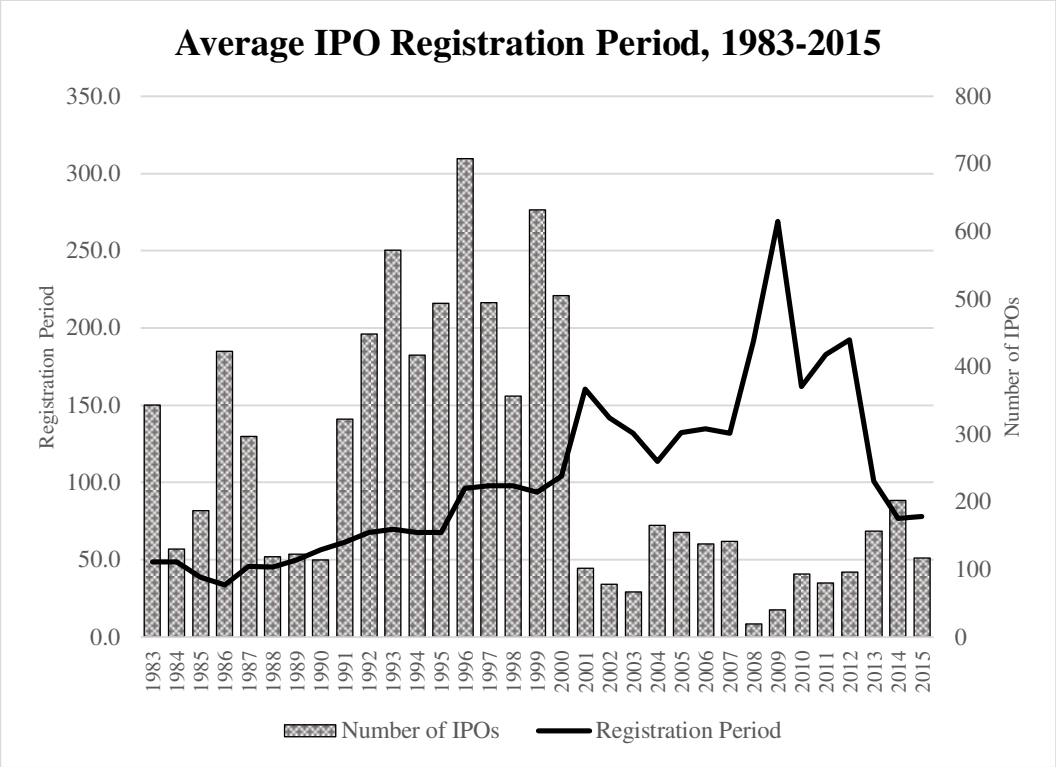


Figure 3.10. Number of IPO and Registration Period

Figure 3.10 and Table 3.7 illustrate the average registration length, for companies going public between 1983 (the first year necessary data are available on SDC) and 2015. The registration period is defined as the number of days between the

Table 3.7. IPO Registration Length, 1983-2015

This table shows the length of the registration period and the number of IPOs by year. The last three columns present the average length of the registration period for the IPOs with proceeds below $30 million, between $30 million and $120 million, and above $120 million. The length of the registration period is defined as the number of days between the filing of the first IPO prospectus and the IPO date, where both variables are taken from SDC. The composition of the sample is described in Table 1, and the sample is further restricted to the companies that went public between 1983 and 2015 as SDC does not include information on the filing date prior to 1983.

Year	# IPOs	Registration Period Length (days)	Registration Period Length (days) among IPOs with: Proceeds < 30 mln	Proceeds 30 – 120 mln	Proceeds > 120 mln
1983	343	48.7	50.6	47.0	41.6
1984	130	48.7	49.4	48.4	17.5
1985	187	38.5	40.0	36.4	30.9
1986	423	33.6	36.1	30.8	26.8
1987	297	45.8	48.0	44.8	36.8
1988	119	45.4	48.2	40.3	52.7
1989	122	50.0	56.7	44.4	43.9
1990	114	56.7	68.4	48.3	62.3
1991	322	61.3	65.4	58.6	61.0
1992	448	67.8	72.8	63.4	70.7
1993	572	69.9	69.7	68.7	75.1
1994	417	67.7	69.8	64.5	75.1
1995	494	67.6	65.8	68.4	67.6
1996	708	96.4	80.6	78.9	203.1
1997	495	97.8	103.2	97.8	86.0
1998	356	97.9	95.8	103.9	83.4
1999	632	93.8	83.9	99.6	91.0
2000	505	103.9	108.9	104.1	98.3
2001	102	160.6	191.9	189.0	124.4
2002	78	142.0	169.9	133.7	137.9
2003	67	131.9	74.3	112.3	155.1
2004	165	113.7	136.7	113.0	110.8
2005	155	132.2	79.6	140.0	138.4
2006	138	134.6	157.8	138.3	127.2
2007	141	131.7	177.2	134.4	124.4
2008	19	191.5	318.5	151.4	187.0
2009	40	269.0	NA	281.8	262.7
2010	93	162.2	99.0	156.6	174.5
2011	80	182.7	344.3	211.6	151.1
2012	96	192.3	105.0	219.6	169.9
2013	157	100.7	108.0	76.4	124.0
2014	202	76.9	95.4	53.3	110.8
2015	117	78.0	172.4	51.2	97.7
Total	**8334**	**84.8**	**71.3**	**82.9**	**111.6**

filing date and the offer date. During the 1980s the average length of the registration period was 44 days. It has increased steadily over most of the sample period, then spiked upwards during the financial crisis years of 2008 and 2009 and fell following the passage of the JOBS Act in 2012. While the exact causes of the spike around the Financial Crisis are beyond the scope of this review chapter, we posit that the substantially greater demands on regulatory agencies, highly uncertain market conditions, and offering postponements by the IPO companies were all contributing factors. The JOBS Act has a more mechanical effect on registration periods. Companies filing under the JOBS Act are allowed to 'test the waters' by distributing a version of the prospectus with qualified investors before the roadshow and before any version of the prospectus is publicly filed on EDGAR. Thus, the filing date, as measured by the first prospectus filing on EDGAR and recorded as such in SDC, occurs later in the process for companies filing under the JOBS ACT. This results in a shorter registration period for these companies.

One of the key determinants of the registration period involves interactions with the SEC regarding approval of the prospectus. The SEC reviews the prospectus of each company going public, and issues comment letters detailing issues that need to be clarified, elaborated upon, etc. In response to each comment letter the company must issue a revised prospectus, and the company is not permitted to go public until it has satisfied all SEC concerns. As shown in Figure 3.11, the extent of SEC review, as measured by the number of comment letters, varies considerably across companies, from a minimum of one letter to more than eight letters. There is a nearly monotonic relation between the number of SEC letters and the length of the registration period.

On average, each additional round of SEC review is associated with 28 extra days in registration.

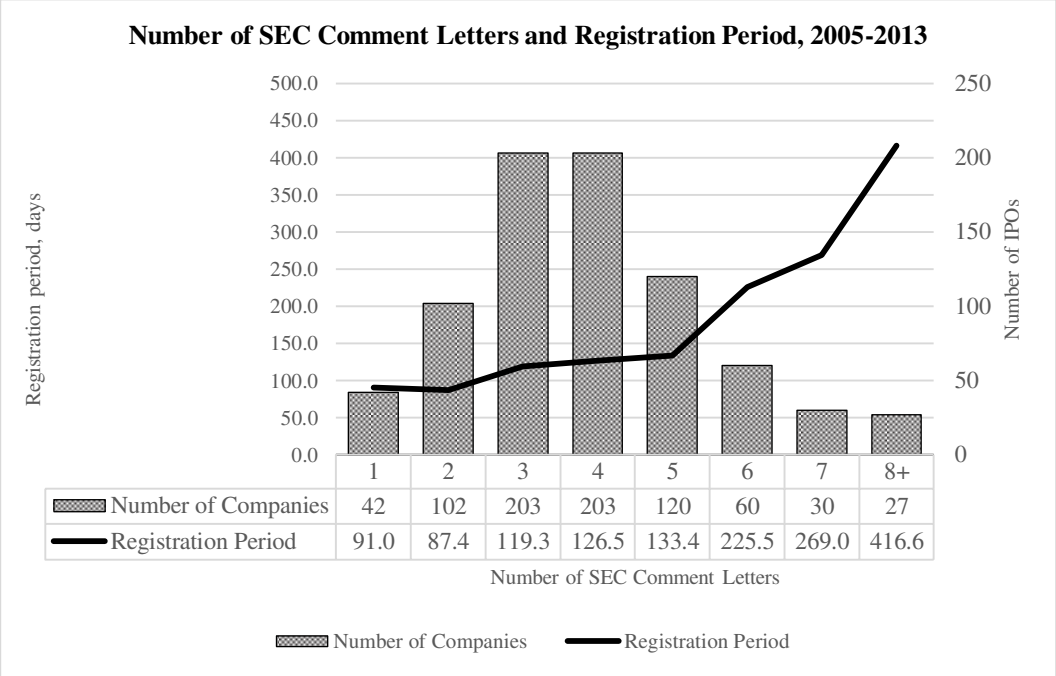
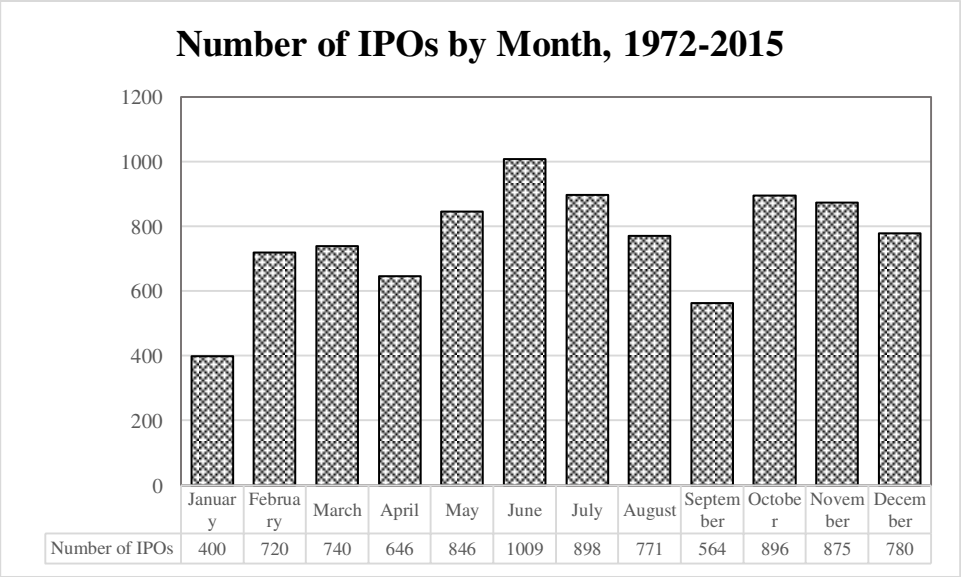


Figure 3.11. Registration Period and Number of SEC letters.

In addition to the SEC review process influencing the length of the registration period and thus the timing of the IPO, there are other factors that also affect the timing of a companies' offerings. These other factors primarily relate to an effort to time both their roadshows and offerings for period when market attention will be sufficiently high. Because companies go on roadshows several weeks prior to the IPO, this means that IPO volume tends to be lower both immediately following vacation times. As shown in Panel A of Figure 3.12, companies are less likely to go public in January (following the December holiday season) and in September (following the August vacation season). Somewhat surprisingly, volume is not markedly lower in the months of August or December.

Panel A. Number of IPO by Month



Panel B. Number of IPO by Weekday

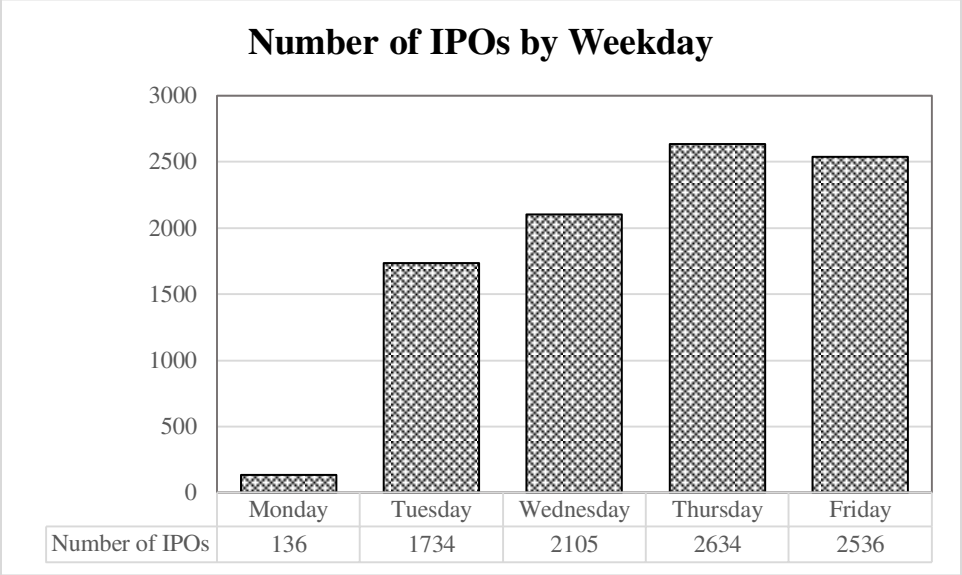


Figure 3.12. Monthly and Weekly Paterns of the IPO Date.

The general objective of going public when market attention is sufficiently high also yields within-week patterns. Only 136 out of 9,145 IPOs started trading on Mondays. Trading volume and daily returns tend to be lower on Mondays (Lo and Wang, 2009), and consistent with this Panel B of Figure 3.12 shows fewer IPOs on

these days. In addition, the fact that the offer price is generally set the night prior to the offering further decreases the number of Monday IPOs. Finally, there are also a greater number of holidays on Mondays when the market is closed, which also contributes to these patterns.

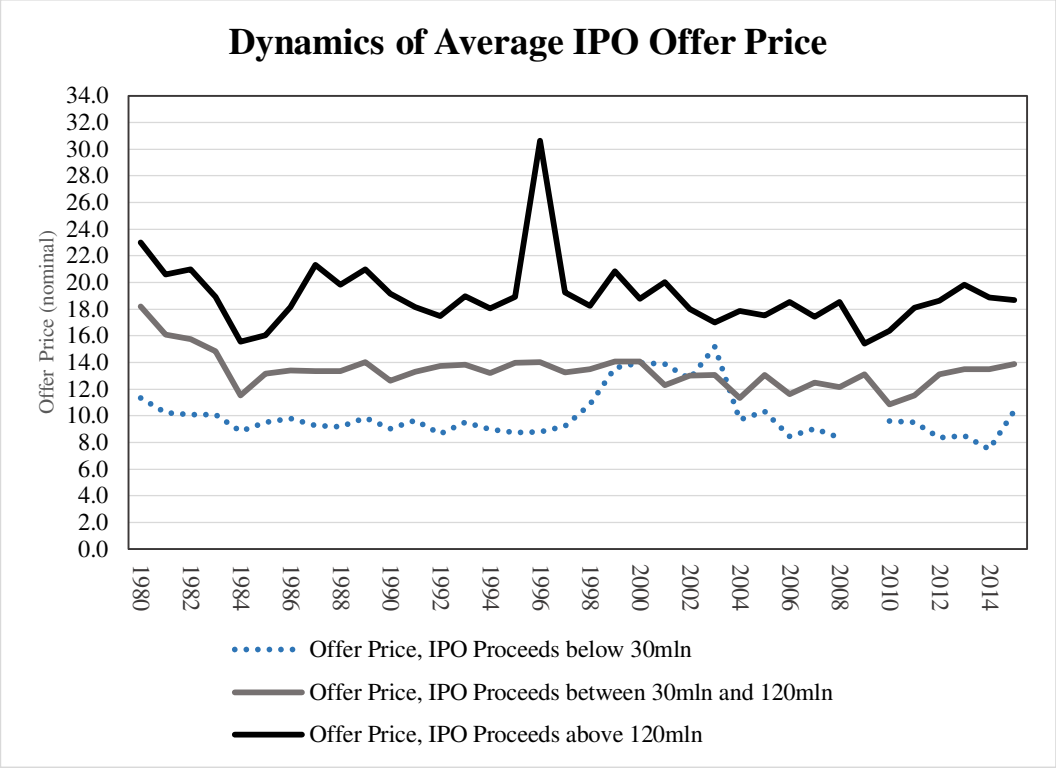


Figure 3.13. Dynamics of Nominal IPO Offer Price.

While many of the above figures highlight substantial time-series variation in many aspects of IPOs, a striking contrast is the relative constant level of offer prices throughout our 43-year sample period. Despite average inflation per year of 3.6% over the sample period, Figure 3.13 shows that there has been no upward trend in the offer price. This relatively constant offer price holds across offer size categorizations, but is higher among larger IPOs. Average offer prices equal $9.90, $13.60, and $19.30 among IPOs with proceeds less than $30 million, $30 - $120 million, and

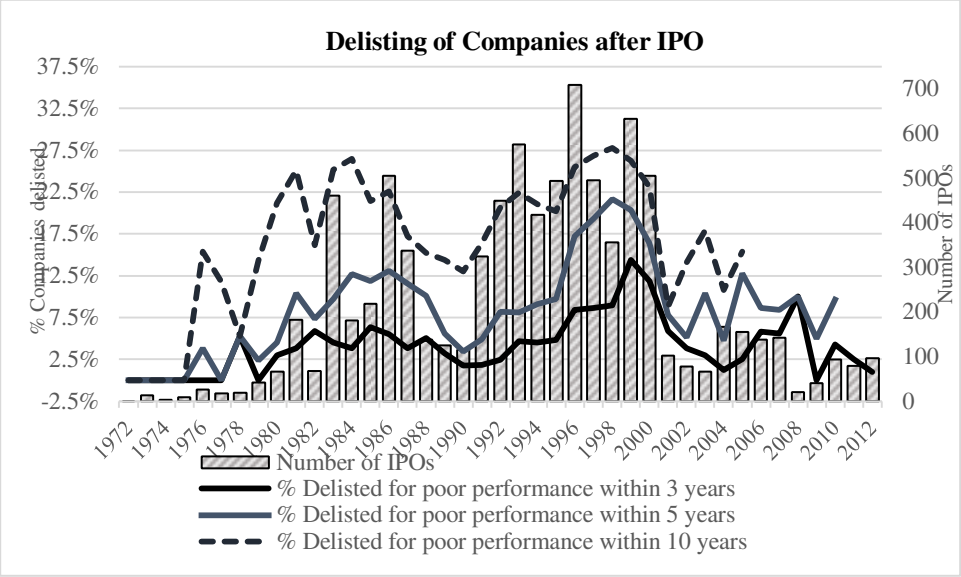
greater than $120 million, respectively. It is possible that higher offer prices represent a signal about company characteristics, though we are unaware of any model that formalizes such a scenario. While we find the lack of an upward trend in prices over time to be puzzling, we note that it is consistent with relatively constant average prices among publicly traded stocks. Specifically, Benartzi, Michaely, Thaler, and Weld (2009) find that the nominal stock price has been $30 over a long time period.

Table 3.8. Dynamics of the Average Offer IPO Price

This table shows the average nominal offer price by year. Last three columns of the table present the average nominal offer price for the IPOs with proceeds below $30 million, between $30 million and $120 million, and above $120 million.

			Offer Price among IPOs with:		
Year	# IPO	Offer Price	Proceeds < 30 mln	Proceeds 30 – 120 mln	Proceeds > 120 mln
1980	66	14.0	11.3	18.2	23.0
1981	183	12.2	10.2	16.1	20.6
1982	68	11.7	10.1	15.7	21.0
1983	461	12.5	10.1	14.9	18.9
1984	181	9.6	8.8	11.5	15.6
1985	219	11.0	9.5	13.2	16.1
1986	505	11.7	9.8	13.4	18.2
1987	337	11.7	9.2	13.3	21.3
1988	138	11.5	9.2	13.3	19.8
1989	125	12.6	9.9	14.0	21.0
1990	115	12.1	9.0	12.6	19.2
1991	324	12.6	9.7	13.3	18.1
1992	450	12.5	8.7	13.8	17.5
1993	576	12.9	9.5	13.8	19.0
1994	418	11.8	9.0	13.2	18.0
1995	494	13.3	8.7	14.0	18.9
1996	709	14.8	8.8	14.0	30.6
1997	495	12.9	9.2	13.3	19.2
1998	356	13.4	10.8	13.5	18.2
1999	633	15.4	13.6	14.1	20.8
2000	506	15.2	14.0	14.1	18.8
2001	102	16.2	13.9	12.3	20.0
2002	78	15.1	12.8	13.0	18.0
2003	67	15.4	15.2	13.1	17.0
2004	167	13.8	9.7	11.3	17.9
2005	156	14.9	10.3	13.1	17.5
2006	138	14.5	8.4	11.6	18.5
2007	142	14.6	9.0	12.5	17.4
2008	20	15.6	8.4	12.2	18.6
2009	40	14.7	NA	13.1	15.4
2010	93	13.5	9.6	10.8	16.4
2011	80	15.3	9.5	11.5	18.1
2012	96	15.1	8.4	13.1	18.6
2013	157	15.8	8.5	13.5	19.8
2014	202	15.0	7.5	13.5	18.9
2015	117	15.4	10.4	13.9	18.7

Panel A. Delisting for Poor Performance



Panel B. Acquisition after IPO

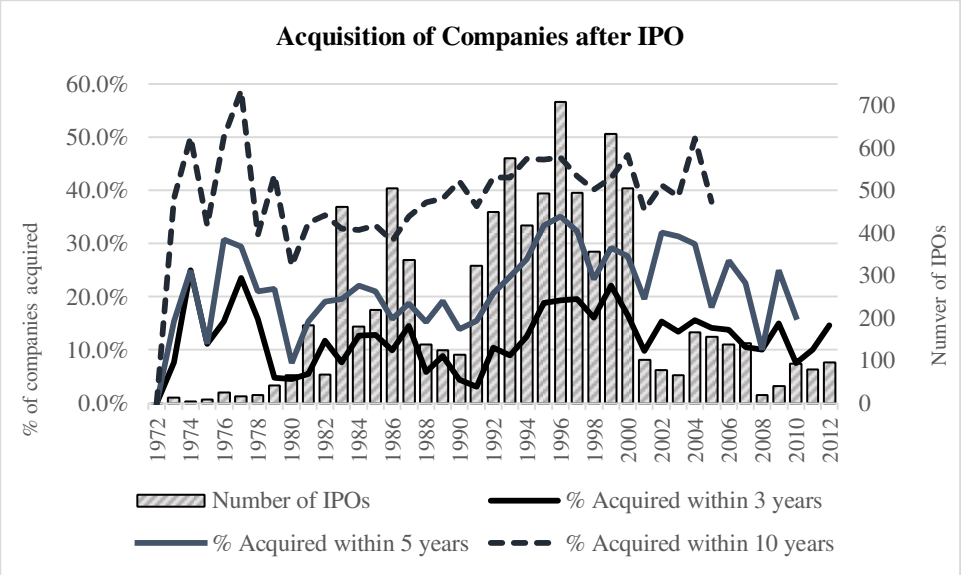


Figure 3.14. Delisting and Acquisition of the Companies after IPO.

Table 3.9. IPO Delisting for Poor Performance and Acquisition, 1972-2015
The table shows the percent of IPOs delisted for the poor performance within 3, 5 and 10 years after the offering, and the percent of IPO that were acquired within 3, 5 and 10 years after the offering. Delisting and acquisition information are obtained from CRSP.

		Percent of IPOs delisted within			Percent of IPOs acquired within		
Year	# IPO	3 years	5 years	10 years	3 years	5 years	10 years
1972	1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1973	13	0.0%	0.0%	0.0%	7.7%	15.4%	38.5%
1974	4	0.0%	0.0%	0.0%	25.0%	25.0%	50.0%
1975	9	0.0%	0.0%	0.0%	11.1%	11.1%	33.3%
1976	26	0.0%	3.8%	15.4%	15.4%	30.8%	50.0%
1977	17	0.0%	0.0%	11.8%	23.5%	29.4%	58.8%
1978	19	5.3%	5.3%	5.3%	15.8%	21.1%	31.6%
1979	42	0.0%	2.4%	14.3%	4.8%	21.4%	42.9%
1980	66	3.0%	4.5%	21.2%	4.5%	7.6%	25.8%
1981	183	3.8%	10.4%	25.1%	5.5%	15.3%	33.9%
1982	68	5.9%	7.4%	16.2%	11.8%	19.1%	35.3%
1983	461	4.6%	9.8%	25.2%	7.6%	19.5%	32.8%
1984	181	3.9%	12.7%	26.5%	12.7%	22.1%	32.6%
1985	219	6.4%	11.9%	21.5%	12.8%	21.0%	33.3%
1986	505	5.5%	13.1%	22.6%	9.9%	15.8%	30.5%
1987	337	3.9%	11.6%	17.2%	14.5%	18.7%	35.0%
1988	138	5.1%	10.1%	15.2%	5.8%	15.2%	37.7%
1989	125	3.2%	5.6%	14.4%	8.8%	19.2%	38.4%
1990	115	1.7%	3.5%	13.0%	4.3%	13.9%	41.7%
1991	324	1.9%	4.9%	16.4%	3.1%	15.4%	37.0%
1992	450	2.4%	8.2%	20.7%	10.4%	20.7%	42.4%
1993	576	4.7%	8.2%	22.4%	9.0%	23.8%	42.4%
1994	418	4.5%	9.1%	21.1%	12.4%	27.0%	45.9%
1995	494	4.9%	9.7%	20.2%	18.8%	33.4%	45.7%
1996	709	8.5%	17.2%	25.5%	19.3%	35.1%	46.1%
1997	495	8.7%	19.4%	26.9%	19.6%	32.3%	42.6%
1998	356	9.0%	21.6%	27.8%	16.0%	23.3%	40.2%
1999	633	14.4%	20.4%	26.2%	22.1%	29.2%	42.3%
2000	506	11.9%	16.4%	23.1%	16.6%	27.7%	46.6%
2001	102	5.9%	7.8%	8.8%	9.8%	19.6%	36.3%
2002	78	3.8%	5.1%	14.1%	15.4%	32.1%	41.0%
2003	67	3.0%	10.4%	17.9%	13.4%	31.3%	38.8%
2004	167	1.2%	4.8%	10.8%	15.6%	29.9%	49.7%
2005	156	2.6%	12.8%	15.4%	14.1%	17.9%	37.8%
2006	138	5.8%	8.7%		13.8%	26.8%	
2007	142	5.6%	8.5%		10.6%	22.5%	
2008	20	10.0%	10.0%		10.0%	10.0%	
2009	40	0.0%	5.0%		15.0%	25.0%	
2010	93	4.3%	9.7%		7.5%	16.1%	
2011	80	2.5%			10.0%		
2012	96	1.0%			14.6%		
Total	**9145**	**6.1%**	**12.1%**	**21.8%**	**13.4%**	**24.4%**	**40.4%**

Finally, Figure 3.14 and Table 3.9 provide evidence on the outcome of these IPO companies, three, five and ten years after the IPO. Panel A shows the percent that are delisted for poor performance, and Panel B shows the percent that are acquired. For comparison purposes, each panel also shows the number of companies going public each year. Looking first at Panel A, it is striking that a greater percent of companies going public during 'hot markets' tend to delist for poor performance over subsequent periods. There is some evidence that this effect is greatest for companies going public during the latter part of these hot markets. For example, over the 1990s boom period, the greatest number of companies went public during 1996, and the rate of delisting was greatest for those that went public during 1998 and 1999. Almost 30% of companies that went public in 1998 were delisted for poor performance within the subsequent ten years.

Panel B of Figure 3.14 shows a similar albeit weaker pattern in the percent of IPOs that are acquired. There is some evidence that companies going public in hotter markets are more likely to be subsequently acquired. For example, 40% of companies that went public during 1998 were subsequently acquired (in addition to the 30% that delisted for poor performance). Together, Panels A and B highlight that a relatively small portion of companies that go public are still independent and publicly traded ten years later.

The IPO process[46]

A milestone for any company is the issuance of publicly traded stock. While companies may have many motivations for an initial public offering, the mechanism

[46] This section is largely based on Elis, Michaely, O'Hara (1999).

for successfully completing an IPO is not trivial. In this section, we outline the process by which companies are brought to market in an initial public offering.

When a company wishes to make a public offering, its typical first step is to select an investment bank to advise it and to perform underwriting functions in connection with the issue. During the selection process, commonly referred to as the bake-off, the company considers potential investment banks' general reputation, their expertise, and their quality of research coverage in the company's specific industry. The selection also depends on whether the issuer would like to see its securities held more by individuals or by institutional investors (i.e., the investment bank's distribution expertise). Prior banking relationships the issuer and members of its board (especially the venture capitalists) have with specific firms in the investment banking community also influence the selection outcome. Often, the selection process is a two-way affair, with the reputable investment banker choosing its clients at least as carefully as the company should choose the investment banker.

The most common type of underwriting arrangement is the "firm commitment" underwriting in which the underwriter "purchases" the entire issue of securities from the issuer and then attempts to resell the securities to the public. We put "purchases" in quotes because the underwriter, at best, purchases the shares from the issuer only on the night before it goes public, when most of the uncertainty has been resolved. The difference between the price at which the underwriter buys and subsequently sells the issue is called the gross spread and in the majority of cases represents 7% of gross proceeds.

Public offerings can be managed by one underwriter (sole managed) or by multiple mangers. The trend in the last two decades has been toward greater number of underwriters acting as co-managers; and at the same time toward fewer number of investment banks as part of the syndicate (Corwin and Schultz, 2005). When there are multiple managers, one investment bank is selected as the lead or book-running manager. The lead manager almost always appears on the top left of the cover of the prospectus, and it plays the major role throughout the transaction. The managing underwriter makes all the arrangements with the issuer, establishes the schedule of the issue, and has the primary responsibility for the due diligence process, pricing and distribution of the stock. The lead manager is also responsible for assembling a group of underwriters (the syndicate) to assist in the sale of the shares to the public. Members of the syndicate are paid a portion of the gross spread for their participation.

Figure 3.9 reports dynamics of the number of lead managers and the co-managers for all IPOs between 1972 and 2015. The majority of IPOs in 1970s were managed by one lead underwriter. Over the years the mean number of book-running managers rises to 3.2 per offering. The number of co-managers in the offering increases as well; and in the last decade the IPO is managed by six underwriters on average.

Panel B of Figure 3.9 provides more detail on syndicate composition. We begin this analysis in 1997, because Corwin and Schultz state that the SDC data on these variables are unreliable prior to this. Since 1997, at the same time as the number of lead managers and co-managers has increased (as shown in Panel A), total syndicate size has decreased (as shown in Panel B). This divergence is driven by

changes in the participation of other syndicate members. Companies going public in 1997 had an average 14 other syndicate members, which decreased steadily to 8 for companies going public in 2002. Since 2002, SDC reports zero other syndicate members. Hand-checking of all prospectuses among 2015 IPOs verifies that there were no other syndicate members.

The lead underwriter, the co-managers and the other syndicate members all receive compensation from the company for being involved in the IPO process. This compensation comes from the gross spread—the difference between the price the securities are bought from the issuer, and the price at which they are delivered to the public. The lead underwriter receives a fee for its efforts that is typically 20% of the gross spread. The second portion of the spread is called the "selling concession", and it is the amount paid to the underwriter and other syndicate members for actually selling the securities. This is typically equal to 60% of the gross spread. Each syndicate member receives a selling concession based on the amount of the issue it sells to its customers. Institutions occasionally directly designate the selling concession credit associated with their stock purchase to a specific syndicate member regardless of who actually sold the stock. These designated orders usually arise as compensation for sell side equity research services performed by investment houses. (These research services are not about the upcoming IPO but rather about research on other firms that has been provided by the sell side analysts.) The remaining portion of the gross spread (approximately 20%) is used to cover underwriting expenses (underwriter counsel, road show expenses, etc.). If anything remains after deducting

all expenses, it is divided proportionately among the underwriter and syndicate members depending on the amount of securities each underwrote.

One of the lead underwriter's first-agenda items (usually before any significant expenses have been incurred) is to draft a letter of intent. An important aspect of the letter of intent is to protect the underwriter against any uncovered expenses in the event the offer is withdrawn either during the due diligence and registration stage, or during the marketing stage. Thus, the letter of intent contains a clause requiring the company to reimburse the underwriter for any out-of-pocket expenses incurred during the process. Another important aspect of the letter is to specify the gross spread or the underwriting discount. In most cases, the gross spread is 7% of the proceeds (see Chen and Ritter (2000) for an excellent discussion of the uniform size of the gross spread).

Figure 3.7 reports the time trend in the gross spread. The portion of offerings with a gross spread above 7% drops sharply after 1980 while the percent of companies with a spread below 7% increases. In the last decade approximately half of companies have a spread of exactly 7%, with most other companies having a spread below 7%. Figure 3.8 shows the dynamics of the gross spread for each of three size groups: IPOs with gross proceeds up to $30M, IPOs with gross proceeds between $30M and $120M; and IPOs with gross proceeds above $120M. The average spread for the medium-size companies constantly stays on the 7% level, while the spread of large companies tends to decrease.

The letter of intent also typically includes: a commitment by the underwriter to enter into a firm commitment agreement (or other underwriting agreements, as the case may be); an agreement by the company to cooperate in all due diligence efforts,

and to make available all relevant information to the underwriter and its counsel; and a commitment by the company to grant a 15% overallotment option to the underwriter.

The over-allotment option is an integral part of almost any underwriting agreement, allowing the underwriter the option to sell an additional 15% of the issue. In practice the underwriter sells 115% of the size of the original issue at the time of the offer (effectively selling 100% of the issue and short-selling an additional 15% of the issue). If the issue is successful and its price goes up in the aftermarket, the underwriter exercises the overallotment option, receives the proceeds from the additional 15% of shares, and covers its short position. Alternatively, if the issue is less successful, the underwriter covers its short position in the aftermarket by buying back some of the overallotment shares, thereby supporting the price of the newly traded firm in the market. By regulation, the underwriter is permitted to buy back shares at any price less than or equal to the offer price. (For a more detailed description of the over-allotment option and how it is being used, see Ellis, Michaely and O'Hara (2000)).

It is important to note that there is no guarantee of the final offering price (and, in most cases, no mention of any valuation) in the letter of intent. The letter of intent remains in force until the Underwriting Agreement is executed at pricing, on the night before the firm goes public. Only then is the underwriter firmly committed to buy the securities at a specific price from the issuer. By that point, the underwriter has very good indications on how successful the deal will be and at what price the market will be willing to buy the deal. This knowledge allows the underwriter to determine a

price for the issue. It also allows it to "firmly commit" to buy the shares at a price, with minimal risk exposure.

The Securities Act of 1933 mandates that the company and its counsel draft and file with the SEC a registration statement, based upon an outline that is frequently provided by the lead underwriter. It usually takes several weeks and many meetings of the working group (the company management, its counsel and auditors, the underwriters, the underwriters' counsel and accountants) before the registration statement is ready to file. The registration statement is circumscribed by Section 5 of the Act, which gives specific requirements for the registration statement. The registration statement consists of two parts: the prospectus, which must be furnished to every purchaser of the securities, and "Part II" which contains information that need not be furnished to the public through the prospectus, but is made available for public inspection by the SEC. (Part II contains information such as other expenses on issuance and distribution, indemnification of directors and officers, and recent sales of unregistered securities.)

The purpose of the registration and disclosure requirements is to ensure that the public has adequate and reliable information regarding securities that are offered for sale. To achieve this, the underwriter has a "due diligence" requirement to investigate the company and verify the information it provides about the company to investors. Companies have some ability to exclude information from the prospectus that is deemed to be sensitive for competitive reasons. As discussed by Boone, Floros and Johnson (2016), companies can request that certain information be given confidential treatment, e.g., details about a product or service, trade secrets, etc.

While such 'redactions' of proprietary information decrease transparency and thus may be costly to companies, they have the benefit of protecting the company from disclosing competitive secrets.

The Securities Act also makes it illegal to offer or sell securities to the public unless they have first been registered. It is important to note, however, that the SEC has no authority to prevent a public offering based on the quality of the securities involved. It only has the power to require that the issuer disclose all material facts. As a safeguard, the Securities Act requires that the registration statement be signed by the directors and principal officers of the issuer as well as the underwriters, accountants, appraisers and other experts who assisted in the preparation of the registration statement. Any purchaser of the securities who is damaged as a result of a misstatement or omission of a material fact in the registration statement may sue these signatories under Section 11 of the 1933 Securities Act. Such disclosure-based lawsuits have been relatively constant at around 6% of the IPOs (see for example Lowry and Shu, 2002).

The version of the registration statement that is filed with the SEC is referred to as the preliminary prospectus (or "Red Herring".) The preliminary prospectus is one of the primary tools in marketing the issue. During the period after the filing, the SEC examines the registration statement and engages in a series of communications with issuer regarding any changes necessary to bring about SEC approval. The company typically responds to these comments and issues through letters to the SEC and via amended prospectuses. This back and forth between the issuer and the company can, and often does, continue through multiple rounds. Each round of correspondence

between the company and SEC takes about 30 days on average, Figure 3.11 shows the relationship between length of registration and number of rounds. Our knowledge of how the SEC affects the IPO process is limited. A recent paper by Lowry et al (2016) tries to fill this gap by examining the role of the SEC from the time the company files it prospectus until the IPO. Their findings highlight the ways in which the SEC influences the information that companies provide to investors during the IPO process. Throughout the filing period, the SEC expresses its concerns about the validity and completeness of information provided in each company's prospectus. Typically, this is an interactive process of multiple rounds, where the SEC expresses its concerns and asks for more information in letters to the company, and the company adjusts its prospectus accordingly. The benefits of SEC reviews can be substantial: the regulatory process serves as a monitoring device and ensures efficient and fair information revelation practices. However, the costs can be substantial as well. A prolonged process with the SEC may force the company to reveal private information that will reduce its competitive advantage. It also distracts management from the running of the company and may delay the entire process.

Lowry et al (2016) find evidence that regulators play an active role around the time of the IPO. Companies receive between one and thirteen comment letters, with each letter having between two hundred and over seven thousand words. The greatest number of SEC questions relate to requests for clarification on the business model and about the uncertainties associated with it. The paper also finds that more complex companies tend to receive longer letters from the SEC and a greater number of letters. Companies with higher quality advisors tend to receive fewer questions on

issues related to valuation and business description, while companies with a more uncertain tone in the prospectus receive significantly more questions on both these topics. Finally, companies with a higher likelihood of fraud receive significantly more questions related to accounting.

Once the company has addressed the substantial issues raised by the SEC, the marketing of the offering begins. Often the prospectus is sent to sales people as well as to institutional investors around the country. At the same time, the company and the underwriter promote the IPO through the road show, in which the company officers make numerous presentations to (mainly) institutional investors as well some retail salespeople. A typical road show lasts 3-4 weeks and includes two or more meetings a day.

As the road show progresses, the underwriter receives indications of interest, the majority of which tend to be from institutional investors. The indications of interest by individual investors and by institutions differ along several dimensions. First, retail investors typically submit a "market order" in which only the quantity desired is stated. Institutions, on the other hand, sometimes submit limit orders where the quantity demanded is subject to a maximum price. Second, retail orders are received earlier than institutional orders since institutions prefer to wait to a later stage of the process before submitting their orders. Third, in some cases, institutions submit an order with a commitment to purchase more shares in the open market if their order is fulfilled, a process that is referred to as laddering (see Griffin, Harris, and Topaloglu (2007) for a detailed analysis of laddering). These differences between retail and institutional investors may affect the investment bank's marketing strategy. However,

regardless of the source of the indication of interest, at this stage, prior to the effective day, no shares can be officially sold, so any orders submitted are only indications of interest and are not legally binding.

The registration and marketing process can take several months, and it is therefore impossible for the underwriter to include certain information (such as the final IPO price, or the exact number of shares to be offered) in its initial filing with the SEC. The initial price range is typically included in one of the amended prospectuses, which is filed after the company has addressed the majority of the SEC's comments and before the roadshow begins. If the company and its underwriter learn particularly positive or negative news during the roadshow period, then the company issues an amended prospectus with an amended price range. Specifically, the company must increase (decrease) the price range if the expected offering proceeds will be more than 20% above the maximum amount (more than 20% below the minimum amount) previously designated. Figure 10 reports the distribution of the length of the IPO process from the time of the filing of the initial prospectus until the IPO. The number of days between the filing and the IPO increases from 50 days in the mid-1980s to 120 days in the last decade.

On the day prior to the effective date, after the market closes, the firm and the lead underwriter meet to discuss two final (and very important) details: the offer price and the exact number of shares to be sold. Particular attention during the pricing decision is given to the order books (where institutions and other investors' indications of interest are recorded). Discussions with investment bankers indicate that they perceive that an offer should be two to three times oversubscribed to create a "good

IPO".[47] There is extensive evidence (see, for example, Ritter (1991)) that IPOs tend to be "underpriced". This means that investors in an IPO can expect the price to rise on the offer day, a characteristic that enhances demand for the issue. From the company' s perspective, such underpricing "leaves money on the table" in the sense that the company is not getting the full value for its shares, but it may be preferable for the company if it guarantees that the issue succeeds. Why firms are willing to leave so much money on the table is one of the biggest puzzles surrounding IPOs.

After those final terms are negotiated, the underwriter and the issuer execute the Underwriting Agreement, the final prospectus is printed, and the underwriter files a "price amendment" on the morning of the chosen effective date. Once approved, the distribution of the stock begins. On this morning, the company stock opens for trade for the first time. The closing of the transaction occurs two to three days later, when the company delivers its stock, and the underwriter deposits the net proceeds from the IPO into the firm's account.

However, the IPO is far from being completed. Once the issue is brought to market, the underwriter has several additional activities to complete. These include the after-market stabilization, the provision of analyst recommendations, and making a market in the stock. The stabilization activities essentially require the underwriter to support the stock by buying shares if order imbalances arise. This price support can be done only at or below the offering price, and it is limited to a relatively short period of time after the stock has began trading. Interestingly, during this period, the standard

[47] This "pricing meeting" will never be held on Friday since the underwriter does not want to take the risk of pricing a firm on Friday and being able to sell the firm only on Monday. Indeed, there are practically no firm commitments IPOs on Mondays.

prohibitions against price manipulation do not apply to the underwriters, and they are free to trade so as to influence the price of stock. (See Ellis Michaely and O'Hara, 2000 and Aggarwal 2000 for an in-depth analysis of the underwriters' activities in the post-IPO period). In general, the underwriter will continue to actively trade the stock in the months and years following the offering. By "making a market in the stock", the underwriter essentially guarantees liquidity to the investors, and thus again enhances demand for the shares.

The final stage of the IPO begins 25-40 calendar days after the IPO when the so-called "quiet period" ends. (The exact length of the quiet period has varied over time and also depends on issue size). This "quiet period" is mandated by the SEC, and it marks a transition from investor reliance solely on the prospectus and disclosures mandated under security laws to a more open, market environment. It is only after this point that underwriters (and other syndicate members) can comment on the valuation and provide earnings estimates on the new company. The underwriter's role thus evolves in this after-market period into an advisory and evaluatory function (e.g., see Michaely and Womack (1999), Cliff and Denis (2004), Ljungqvist, Marston, and Wilhelm (2006, 2009), for an evaluation of the role of the underwriters' post-issuance recommendations).

Importantly as a response to the low IPO volume since 2000 and in an attempt to jump-start the market, some of the regulations relevant to IPOs have recently changed. In April 2012, the Jumpstart Our Business Startups Act (JOBS Act) was enacted to help revitalize the initial public offering (IPO) market, especially for small firms. Most importantly, it allows small firms (less than $1b in annual revenues) to file

IPO draft registration statements confidentially and thus reduce the risk associated with the IPO process by enabling issuers to disclose information to the SEC, but not competitors. Further, partially motivated by the argument that internal controls imposed by the Sarbanes-Oxley Act of 2002 (SOX) increased the burden on small firms who want to become public, the JOBS act exempts small firms from certain accounting and disclosure requirements.

Dambra, Field, and Gustafson (2015) document increased US IPO activity in the two years after the JOBS act, not found on other active IPO markets around the world. Further the higher IPO volume is concentrated in small IPOs for which the JOBS act applies. Equally interesting Dambra et al (2015) find that the risk reduction is likely to be the more dominant reason for the increased IPO activity in the post JOBS act era. Specifically, they find a shift in IPO activity towards firms associated with high proprietary costs of disclosure (measured by research intensity and industry concentration). Small firms have been using the de-risking provision quite often and the JOBS act seems to have had a significant impact in the IPO landscape.

Overall, the initial public offering process thus involves a complex combination of tasks by the company, the underwriter, the syndicate members and regulators. Throughout the process, the company relies on the underwriter's expertise to market, price, distribute, stabilize, and support the issue. The completion of the process provides new capital for the firm, and a new investment opportunity for the public. In the following sections we discuss many of these issues (such as the role of the underwriter, and the pricing and performance of IPOs as an investment vehicle) and related them to the rich academic literature on IPOs in more detail.

IPO Pricing and the role of the underwriter

Initial Public Offerings (IPOs) are underpriced on average. Over our sample period, less than one out of every five IPOs has negative first-day returns, and the average return to purchasing an IPO at the offer price and selling at the end of the first day is 19.1%. Many of the theories advanced in the literature to explain this phenomenon are based on the existence of information asymmetry between the underwriter, the company, and/or the market. Each party has a certain information advantage, but at the same time lacks other critical information. Management of the company arguably has the most detailed information about the company, but they likely find it difficult to credibly convey this information to the market without disclosing valuable information to competitors. In contrast, market participants as a whole know more than the firm about one critical input to the IPO pricing process: aggregate demand for the firm's shares. Most of the fundamental models of IPO underpricing focus on one of these levels of information asymmetry.

A second critical component of most of the fundamental models of IPO underpricing concerns the role of the underwriter, which is consistent with the fact that nearly every company issuing public equity for the first time relies on the services of an underwriter. The precise role of the underwriter is a function of the IPO mechanism and process, which has varied over time and across countries. The majority of our discussion of IPO pricing focuses on the bookbuilding mechanism, which represents the dominant method of bringing companies public in the US and increasingly around the world. However, in subsection 4.5 we consider differences between bookbuilding and auctions. A distinguishing feature of bookbuilding is that

the underwriter both sets the price at which the company goes public and controls allocations. As discussed in detail in this section, underwriters' control over both these factors generates potential advantages as well as potential disadvantages. At a minimum, underwriters' incentives in setting the offer prices are not straightforward.

Information asymmetry between the company and investors: Rock model

Rock's (1986) model of underpricing is based on information asymmetry between the company and investors. In the model, the underwriter controls price but not allocations, meaning it is not strictly consistent with bookbuilding. Specifically, the model assumes that the company has superior information to any particular investor, but some investors are better informed than others. There are two classes of investors: informed and uninformed. The informed investors are able to determine whether the firm is high or low quality (i.e., given the offer price, whether the offering is overpriced or underpriced), and they only subscribe to the high quality issues. In contrast, uninformed investors are unable to determine the quality of the firm, and they subscribe to all or no offers. Because the informed investors only subscribe to the high quality issues, uninformed investors receive a disproportionate allocation of the low quality issues. Hence, in order to ensure that the uninformed investors receive a fair rate of return and thus participate in the market, issues must be underpriced on average.

Because the underwriter controls price but not allocations, this model is only partially consistent with the bookbuilding mechanism. Nevertheless, it receives wide empirical support in both the US and in other countries that employ bookbuilding. For example, Michaely and Shaw (1994) find that master limited partnerships (MLPs),

which are known to have limited institutional participation and thus greater homogeneity among investors, have significantly lower underpricing. Moreover, consistent with Beatty and Ritter's (1986) extension of Rock's model, issues with lower information asymmetry, such as issues backed by higher ranked underwriters, also have lower underpricing.

Amihud, Hauser and Kirsh (2003) are able to conduct a particularly powerful test of Rock's model, using data from the Tel Aviv Stock Exchange. They have the subscriptions of each investor for a sample of IPOs, and allocations were made by equal proration during their sample period. Consistent with Rock's model, individual investors received larger allocations in overpriced IPOs. Further, the number of investors submitting orders is higher in underpriced offerings, which is consistent with both informed and uninformed investors participating in more underpriced offerings, while only the latter investors participate in overpriced offerings. However, the average underpricing of 12% was not sufficient to compensate these uninformed investors for the allocations they received, and they earned a negative average initial returns across all the IPOs in which they invested.

Empirical tests of Rock's model have also focused on the extent to which higher quality advisors, which should lower the information asymmetry associated with the company, contribute to lower underpricing. All else equal, a company that has the backing and thus the certification of a higher quality underwriter should have less information asymmetry and therefore lower initial returns. In a similar vein, backing by a venture capitalist should also lower underpricing. Early tests of these idea using samples of IPOs in the 1970s and 1980s, including both Carter and

Manaster (1990) and Michaely and Shaw (1994), supported these predictions.[48] However, more recent papers lack a consensus on the robustness of those findings across different time periods. It seems that in the more recent period some of these relationships, such as the impact of VCs on IPO underpricing, have changed signs.

Beatty and Welch (1996) find that higher ranked underwriters began to have a *positive* effect on underpricing in the 1990s. Loughran and Ritter (2004) conjecture that this reflects a change in issuers' objective function as issuers became increasingly focused on analyst coverage: an issuer may be willing to accept higher underpricing as the cost of higher quality analyst coverage. Because the higher quality analysts tend to be concentrated among the banks that represent the highest quality underwriters, this will cause a positive relation between underwriter rank and underpricing. In contrast, Habib and Ljungqvist (2001) argue that the observed positive relation between underwriter rank and underpricing stems from endogeneity, i.e., the highest quality banks are more likely to underwrite the IPOs of firm types that tend to have higher information asymmetry and underpricing. They conclude that after controlling for the endogeneity, there is no evidence that the higher ranked underwriters underprice IPOs by a greater amount (in the second stage regression of underpricing on rank, the coefficient on rank is insignificantly negative). While we agree that endogeneity is likely to be an issue, and underwriters and companies are not matched randomly, we are not totally convinced by Habib and Ljungqvist's choice of

[48] Carter and Manaster's (1990) rankings, as updated by Carter, Dark and Singh (1998) and Loughran and Ritter (2004) are based on placements on tombstone ads, while Megginson and Weiss's rankings are based on underwriter market share. Loughran and Ritter (2004) offer a more updated ranking (available on Jay Ritter's website) that is based on both tombstone ad placements and conversations with practitioners.

pre-IPO assets and pre-IPO earnings as instruments. These variables are likely to be related to firm information asymmetry and thus to expected underpricing, meaning they may not satisfy the exclusion criterion.

In sum, using firm characteristics as proxies for information asymmetry, Rock's model as extended by Beatty and Ritter receives broad empirical support. It is commonly viewed as one of the fundamental models of underpricing. While in theory higher reputation intermediaries should decrease the level of information asymmetry and thus contribute to lower underpricing, there are many confounding factors that make it difficult to ascertain the true nature of these relationships.

Information production and collection by underwriters: Benveniste and Spindt model

Benveniste and Spindt's (1989) model focuses more directly on underwriters' control over both price and allocations, as is the case in bookbuilding IPOs. Key aspects of the model include the information advantage of market participants, the decisions of investors whether to provide information to underwriters, and the fact that underwriters will be better able to forecast aggregate market demand if they have this information. After determining a preliminary estimate of firm value, the underwriter and the firm go together on a road show to market the issue to prospective institutional investors. The underwriter wants to learn about investors' valuations, so that it can more accurately price the deal. If investors believe that the company is worth more than the original estimate, the underwriter would be able to raise the offer price and hence raise more money for the company (and earn greater fees for itself).[49] However,

[49] While beyond the Benveniste and Spindt model, we note that the precise relation between the offer price and underwriters' incentives is complex. Underwriters' direct compensation represents a fraction of proceeds raised, meaning a higher offer price will result in higher fees. However, the direct benefits

investors have an incentive not to share this information; they prefer to buy the offer at a lower price and pocket a higher return. Benveniste and Spindt note that the repeated game nature of this problem enables a solution. The equilibrium outcome is for investors to share the positive information, but for underwriters to only partially incorporate this information into the final offer price. Investors benefit from the fact that the issues are still underpriced, enabling them to earn a positive abnormal return. Underwriters benefit from the more accurate pricing compared to what they would have achieved without investors' information, and hence they reward investors that provide this information with higher allocations of the underpriced shares.

Extending this model further, Sherman (2000) and Sherman and Titman (2002) focus on the extent to which underwriters can motivate investors to engage in information collection on these heretofore private firms, about which there tends to be little readily available public information.[50] Under the assumption that there are costs to investors of collecting information, an underwriter that strives for both a high offer price and high price accuracy will optimally underprice new issues; the incentive of receiving allocations of underpriced shares causes investors to engage in this costly information collection and to disclose their information to underwriters. Thus, similar to Benveniste and Spindt, the result is that underwriters are able to more accurately price the issue.

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of a higher offer price (and thus higher proceeds) are generally perceived to be outweighed by the benefits of the indirect compensation related to allocating more underpriced shares to favored clients. These issues are discussed in more detail in section 4.4.

[50] They argue that information collection is a more binding constraint than truth telling, which is the focus of Benveniste and Spindt.

An additional implication of both Sherman (2000) and Sherman and Titman (2002) is that the underwriter will optimally limit the investor pool as a means of controlling information collection costs, a conclusion that Yung (2005) also reaches after endogenizing the information production of both banks and investors. In addition to limiting the size of the investor pool, Sherman (2000) concludes that there are reasons for underwriters to build long-term relationships with investors and to favor these regular investors in allocations.

Empirical evidence on the extent to which underwriters rely on the information production/collection of investors in book building offerings is mixed. Hanley (1993) provides the first empirical test of an important implication of the Benveniste and Spindt model. If information learned during the filing period is only partially incorporated into the offer price, then there should be a significant positive relation between the price update and the initial return, where the price update is measured as the percentage difference between the midpoint of the filing range and the offer price, and the initial return is measured as the percentage difference between the offer price and the first aftermarket closing price. Consistent with this logic, Hanley finds that offers that are priced above the upper bound of the price range have average initial returns of 20.7%, compared to 0.6% for offers that are priced below the lower bound of the range. This pattern is quite stable over time. As shown in Table 3.3, across the entire sample period of 1983 to 2015, we find that the analogous initial returns are 56.8% versus 2.4%, respectively. As we discuss later in this section, while this result is consistent with the Benveniste and Spindt model, it is also consistent with other explanations of why IPOs are underpriced.

An obstacle to more detailed tests of the Benveniste and Spindt model relates to the general lack of data on both allocations and the underwriter's order book. While no researcher has been able to obtain detailed U.S. data on underwriters' books containing investors' indications of interest, several papers have obtained such data on samples of European offerings. Earlier papers were based on relatively small samples and found conflicting results. Cornelli and Goldreich (2001) find that bidders who include limit prices and who revise their bids obtain more shares, and Cornelli and Goldreich (2003) find that bids by large, regular bidders who include limit prices affect the issue price. However, Jenkinson and Jones (2004) find little support for the importance of information production. They find that the extent to which an investor is expected to be a long-term holder of the stock is substantially more important than whether or not they submit more informative bids. This conclusion is further substantiated in a subsequent survey by the same authors (Jenkinson and Jones, 2009).

More recently, Jenkinson, Jones and Suntheim (2016) conduct a broader study, which is based on detailed information related to bids, allocations, and fees for 220 IPOs predominantly in Europe between January 2010 and May 2015. They find some support for bookbuilding theories, i.e., that investors who provide more information through bids are rewarded with larger bids. First, there is weak evidence that price-sensitive bids (as opposed to strike bids) receive higher allocations, but the effect varies substantially across banks and allocations in some banks are completely independent of bid type. Second, investors who participate in pre-IPO meetings, an interaction that is potentially associated with information exchange, tend to receive higher allocations. Third, regular investors tend to receive larger allocations.

However, Jenkinson et al also find substantial evidence that factors other than information exchange affect allocations; we discuss these finding in subsection 4.4 on conflicts of interest.

In light of the lack of detailed US data, several papers have attempted to assess the extent of investor information production through other means. For example, Wang and Yung (2011) posit that higher ranked underwriters should have an advantage in information production, either because of greater networks of investors or greater skill. Consistent with this conjecture, they find that firms brought public by higher ranked underwriters have greater filing price revisions and lower secondary market volatility. Price revisions of firms brought public by less reputable banks cluster on exactly zero dollars - the partial adjustment phenomenon is primarily due to higher ranked underwriters. One could argue, however, that more reputable underwriters, might be able to gather more precise information even before the roadshow begins, through the due diligence process, through conversations with more qualified sell-side analysts, etc, Such advantages would cause their initial price ranges to be more precise, resulting in fewer revisions. Wang and Yung's findings on the magnitude of high reputation banks' price revisions may be subject to more than one interpretation.

As an alternative way to test the extent of information production, several papers have examined either IPO allocations or post-IPO holdings. Bookbuilding theories predict that investors who engage in the most information production should obtain the largest allocations. Consistent with this, Aggarwal, Prabhala, and Puri (2002) find a strong positive relation between institutional allocations and first day

returns. During their 1998 – 1999 sample period, institutions are allocated approximately 75% of underpriced issues on average, compared to an average 55% of overpriced issues.[51] In addition to obtaining substantial allocations, Chemmanur, Hu and Huang (2010) are able to verify that institutions earn substantial profits from these IPO investments. They find that institutions earn an average 67% abnormal return on their IPO investments, calculated based on numbers of allocated shares and detailed transaction data on when they sold the shares.[52] However, as discussed in detail in subsequent subsections, agency-related issues such as favoritism or quid-pro-quo for other services are very likely to contribute to these relations. In sum, these studies in aggregate provide some support for the Benveniste and Spindt model of bookbuliding, but suggest that factors other than those incorporated in this model likely have a greater influence on the IPO process.

Both Loughran and Ritter (2002) and Lowry and Schwert (2004) highlight two additional implications of the Benveniste and Spindt model. First, the model implies that private information should be partially incorporated into offer prices, but that public information should be fully incorporated. In other words, underwriters have no reason to reward investors by only partially incorporating public information into the offer price; underwriters can observe this information themselves and thus have reason to rely on institutional investors. Second, while positive private information should only be partially incorporated, negative information should be fully incorporated.

[51] As noted by the authors, this finding is also consistent with Rock's model, under which informed investors are able to avoid the lemons.

[52] Boehmer, Boehmer, and Fishe (2006) find further that institutions receive higher allocations in IPOs with the highest long-run performance. However, the importance of this to institutions is unclear, given Chemmanur et al's finding that institutional investors are not penalized for flipping shares soon after the IPO, a phenomenon commonly referred to as flipping.

Both underwriters and institutional investors want to avoid overpriced issues (underwriters' incentives are related to difficulty of selling the issue and reputational effects). Both Loughran and Ritter (2002) and Lowry and Schwert (2004) empirically test and find support for the predicted asymmetry effect of positive versus negative information. However, there exists less consensus on the effects of public versus private information.

Loughran and Ritter (2002) employ a series of univariate regressions to examine the effects of public versus private information. First, they note that a regression of the percentage change between the first aftermarket closing price and the midpoint of the filing range represents an estimate of the firm beta, which they estimate to be 2.37 on average. Second, they argue that if public information is completely incorporated into the offer price, then a regression of the percentage change between the offer price and the midpoint of the filing range on market returns should yield a similar coefficient estimate on market returns. However, in contrast to this prediction, they obtain a coefficient estimate of 0.76, and based on this they conclude that only 32% of the public information is incorporated into the offer price, a finding that is inconsistent with the Benveniste and Spindt model.

Lowry and Schwert (2004) argue that a stronger test of the effects of public versus private information should include proxies for both in one regression, due to the likely positive correlation. The price update, measured as the percentage difference between the midpoint of the filing range and the offer price, should incorporate the effects of both public and private information that becomes available over the filing period, while market returns should capture just public information.

Regressing initial returns on both these factors (as well as a variety of other firm- and offer-specific characteristics), the coefficient on market returns should capture the effects of public information and the price update coefficient should isolate the effects of private information. Using this framework, Lowry and Schwert conclude that nearly all public information is incorporated into prices. A one standard deviation change in market returns (approximately 11%) is associated with an 0.08% standard deviation change in initial returns (1.6%). In contrast, a one standard deviation change in the price update is associated with an 0.40 standard deviation change in initial returns (8%).[53]

In sum, to a large extent the process by which underwriters set the offer price is yet unclear to the public and academics alike. The lack of publicly available allocation data raises questions regarding whether some investors have advantages over others, for example if certain information is not fully incorporated into price, and whether post-IPO price dynamics are predictable as a result. For example, Cornelli and Goldreich find that when there is more disagreement about the offer price, i.e., the elasticity of limit quotes is lower, the offer price tends to be lower and post-IPO market returns higher. Should more information be available? In today's world of increased disclosure requirements and increased attention from regulatory authorities on disclosure, these questions provide ample opportunity for future research.

Information production more broadly

As highlighted in the previous subsection, empirical support for information production by the lead underwriter during the bookbuilding period is mixed, and

[53] Lowry and Schwert find that the coefficient on market returns is positive and statistically significant, but the economic significance is trivial.

despite many efforts it is largely circumstantial: papers based on samples of European IPOs find conflicting results regarding both the prevalence of informed bids and the extent to which such informed bids are rewarded with higher allocations. However, there is strong evidence that institutions, on average, receive higher allocations than retail investors, and institutions earn high profits on these allocations. One possible explanation for this mixed evidence relates to uncertainty regarding the time of information production and/or revelation. There are three periods of time during which information is potentially produced and revealed: prior to the IPO filing, during the bookbuilding period, and in the secondary market. While the above-cited papers focus on information production during the second period, both Jenkinson, Morrison and Wilhelm (2006) and Hanley and Hoberg (2010) emphasize the potential for information production during the first period.

It is quite clear that in the first period, for example during the due diligence process, much information about the issuers is gathered by the underwriters: they talk with management, they talk with suppliers, they talk with the relevant VCs and other stake holders, in conjunction with the lawyers and auditors they thieve through companies documents, they examine inventories and examine the company's accounting and governance. The underwriters combine this information with their assessment of industry and market valuations and eventually come up with a value range for the company. Hanley and Hoberg's (2010) analysis of prospectuses is consistent with certain underwriters and managements engaging in meaningful pre-filing information production. They find that the uniqueness of the text in the prospectus, specifically in the MD&A section, is related to more accurate offer prices,

i.e., to smaller absolute value of price updates and to lower initial returns. The authors further find that the uniqueness of information in the prospectuses is positively related to underwriter fees, which they interpret as being consistent with information production rather than a decision to simply disclose more information. Moreover, information related to inputs into valuation models is found to be most relevant, e.g., finance and accounting terms, product market, governance, etc. Jenkinson et al (2006) suggest that the extent of information collection prior to the IPO filing is even more extensive in Europe, where regulations governing pre-IPO (and prior to the intent to file an IPO) interactions between investors and issuers are less stringent.

Consistent with this idea that information production can occur prior to the IPO, a number of countries have variations in issuing strategies, which offer potential benefits at least for certain types of firms. For example, firms in the United Kingdom use a two-stage issuing strategy, where they list without issuing equity and then subsequently issue.[54] Derrien and Kecskes (2007) conclude that this first-stage trading reduces valuation uncertainty, resulting in lower initial returns. Similarly, Aussenegg, Pichler, Stomper (2006) analyze pre-IPO trading that occurs in the German market, and they find that this 'when-issued' trading reveals substantial information, thereby reducing costs of bookbuilding. However, they also conclude that bookbuilding still provides incremental information. Finally, Chang, Chiang, Qian and Ritter (2016) focus on the pre-market in Taiwan, and in a similar vein conclude that pre-market prices contain substantial information regarding post-IPO prices

[54] Because no primary shares are sold, the only shares available for sale are secondary shares, i.e., shares of current shareholders such as owners, managers and employees.

While the theoretical literature focused on the relationship between "the underwriter" and investors, Corwin and Schultz (2005) examine the determinants of syndicate composition. Their results highlight the importance of relationships among banks: banks that have worked together in syndicates in the past are likely to also work together in subsequent syndicates. They find that the composition of this syndicate is related to the amount of information production. The causal interpretation would be that larger syndicates tend to result in more information production, as measured by the likelihood of the offer price being revised. However, it is difficult to differentiate this causal story from one in which firms whose value is more uncertain choose to work with larger syndicates.

Corwin and Schultz also highlight the changes in syndicates over their 1997 – 2002 sample period, with total syndicate size decreasing but the number of co-managers increasing. We collected more data on the syndicate size and find that since 2002, total syndicate size has continued to decrease, rather substantially: median syndicate size is eleven in 2002 compared to only five in 2015.[55] Interestingly, the number of co-managers has also decreased, from a median of three in 2015 to a median of two in 2015. However, the number of book managers has increased over this period, going from a median of one in 2002 to a median of three in 2015.[56] While 29% of IPOs in 2002 had multiple book managers, that number had increased to

[55] These statistics are based on SDC data combined with manual checking of prospectuses. We confirm that SDC data on syndicate size are largely correct for these years, with the exception that actual syndicate size equals SDC's reported syndicate size minus the number of underwriters listed as Global Coordinator (because these underwriters are included in either the book manager or joint book manager categories).

[56] Book managers, coded as book manager or joint book manager in SDC, receive the greatest share allocations. We would expect joint leads to also receive relatively large share allocations (i.e., larger than co-managers), but in more recent years the differentiation between joint leads and other members of the syndicate (e.g., co-managers) in SDC is less clear.

nearly 90% by 2015. The contrasting trends are explained by a strong decline in the number of co-managers and other syndicate members. In fact, across the 125 IPOs in 2015, none had other syndicate members (as recorded in SDC and manually verified by examining the prospectuses). Figure 3.9 shows the evolution of the syndicate over time. The determinants of both syndicate size and the number of book managers are interesting and seem to be understudied. It would be useful to better understand the reasons for the variation both across time and across IPOs.

Overall, this body of literature emphasizes the advantages that underwriters have in ensuring that investors both collect information on the firms going public and share the information with underwriters. In particular, the repeated nature of IPO-related interactions between underwriters and investors, underwriters' access to both company management and to internal company documents, and underwriters' expertise in valuations are key factors. However, in spite of these advantages, Lowry, Officer and Schwert (2010) show that underwriters have limited ability to accurately value IPOs. While various theories suggest that underwriters have incentives to underprice IPOs, it is difficult to conjecture that they would gain by overpricing these offerings. Nevertheless, approximately one-third of IPOs are trading below their offer price one month after the IPO. Moreover, measures of mis-pricing are significantly related to the difficulty of valuing the company, for example company-level uncertainty and information asymmetry. They conclude that while underwriters may gather a lot of information in the first stage (the due diligence process) and may perhaps get valuable feedback about demand (a la Benveniste and Spindt) from outside informed investors, at the end of the day, IPO pricing is still very imprecise

probably because the process lacks sufficient detail about one critical element: market-wide demand for these new issues. In sum, while underwriters and institutions do engage in information production, the aggregation of information through this process and the ability to value a heretofore private firm is limited. One should wonder whether an auction type process, where all market participants have a chance to bid, would improve the process along these dimension.

Conflicts of Interest between underwriters and issuing firms

While papers advocating the advantages of bookbuilding tend to focus on underwriters' role in information production, a balanced discussion must also consider the disadvantages of bookbuilding that stem from underwriters' conflicts of interest. Unfortunately, the precise features that contribute towards underwriters' information production, i.e., the repeated game nature of interactions between underwriters and potential investors, also contribute to agency-type problems. A number of papers have examined whether underwriter – investor relations, combined with underwriters' conflicts of interest, cause shares to be allocated in ways that are not beneficial to the issuing firm.

Ritter and Zhang (2007), Reuter (2006), and Goldstein, Irvine, and Puckett (2011) examine whether investors receive more allocations of underpriced IPOs if they have more direct relations to the underwriter. Reuter (2006) finds a positive relation between the commissions that a mutual fund family paid to an investment bank and the fund's holdings of IPOs that were underwritten by that same bank. Moreover, this relation is concentrated among issues that had nonnegative first day returns. His findings are consistent with banks using IPO allocations as a way to

reward investors that provide benefits to the bank. Ritter and Zhang (2007) focus on funds that are directly affiliated with the underwriter, and they find that such funds are more likely to be allocated shares of hot IPOs, thus boosting their performance. Using Abel-Noser data that contains detailed information regarding commissions received by lead underwriters, Goldstein, Irvine, and Puckett (2011) find a similar relation between the commissions that investors pay and the allocations of hot IPOs that they can expect to receive. Specifically, they conclude that institutions increase commissions through round-trip stock trades, higher average commissions per share, and the payment of unusually high commissions on some trades. This practice is most common for non-regular investors; underwriters' concern for their long-term client relationships limits the practice.

Nimalendran, Ritter, Zhang (2007) devise a clever way to examine the extent of the allocations for commissions strategy. They posit that if institutional investors are churning shares as a way to generate commissions and increase allocations of hot IPOs, then we should observe a spike in the trading volume of the most liquid stocks. Consistent with this conjecture, they find that the trading volume of the 50 most liquid stocks in the market is 3 – 4% higher in the six days preceding a hot IPO.

On the whole these papers present strong prima-facie evidence suggesting that allocations are strongly motivated by favoritism, whereby investment banks reward good clients by giving them underpriced IPO, and/or by clients that increase banks' revenue through inflated trading commissions in return for receiving underpriced IPOs. This may be an optimal decision by investment banks and by their institutional investors. It is less clear why issuing firms, in competitive markets, agree to this.

Further, it suggests that what many models describe as informed investors, may not actually provide information about the IPO firm but rather receive the IPO shares as part of a quid-pro-quo.

Liu and Ritter (2010) focus on side payments to executives through a practice known as spinning. Spinning refers to the investment bank's practice of allocating underpriced shares of IPOs to executives of other companies, where there is an implicit understanding that these allocations are in exchange for the executives directing future underwriting business to the bank. This practice is not legal. Liu and Ritter (2010) examine a sample of 56 companies in which top executives received allocations of other firms' hot IPOs. They hypothesize and find support for the hypothesis that these executives will bargain less aggressively for the highest possible offer price in their own company's IPO: when these 56 companies went public, they had 23% higher underpricing than other companies. Moreover, these 56 companies were substantially less likely to switch underwriters for follow-on offerings.

In addition to spinning, laddering represents another practice for which underwriters received much criticism (and which violates SEC regulations related to market manipulation), in particular during the internet bubble period of the late 1990s through 2000. Laddering refers to the requirement that investors purchase additional shares in the aftermarket, as a precondition for receiving allocations in the IPO. Hao (2007) models the effect of laddering, specifically the ways in which the increased demand in the aftermarket contribute to higher aftermarket prices, and Griffin, Harris, and Topaloglu (2007) find empirical evidence consistent with the practice during their 1997 – 2002 sample period.

Survey evidence in Brau and Fawcett (2006) confirms that issuers perceive these agency-type issues to be important. Forty-two percent of CFO respondents believe that underwriters strive to underprice IPOs in order to curry favor with institutional investors. In comparison, Benveniste and Spindt's model receives only minimal support from survey respondents: only 10.25% of CFO respondents believe that underpricing compensates investors for truthfully revealing the price that they are willing to pay. However, respondents overwhelmingly suggest that underpricing serves purposes other than just side payments to underwriters: nearly 60% of respondents believe it compensates investors for taking the risk of the IPO, and over 40% believe it increases the post-issue trading volume of the stock and/or contributes to a wide base of owners.

Importantly, most of the findings suggesting that institutional investors receive higher allocation in exchange for information production / collection (which was presented in the previous subsection) would also be consistent with the agency-related motives described here. Consider the finding that institutions tend to receive larger allocations. Does this reflect a reward to institutions for sharing value-relevant information with underwriters, or does it reflect a quid pro quo arrangement where the bank is rewarding its best clients? In a similar vein, does the partial adjustment phenomenon represent the mechanism that enables underwriters to successfully solicit information from informed investors, or does it represent the underwriter simply allocating more underpriced shares to their favorite costumers by only partially adjusting the price to what they learn during the roadshow? This is an immensely important issue, and one that we hope future research will be able to address directly.

4.5 Bookbuilding versus auctions

By definition, underwriters' ability to manage investors' information acquisition by controlling allocations is unique to bookbuilding. As highlighted by Sherman (2005), under auctions the number of participating investors and their information production are uncertain and beyond the control of underwriters. Rational investors will only acquire information and place a bid if they expect to recover their information production costs, i.e., if they expect the shares to be sufficiently underpriced. However, if the auction mechanism is set such that the offer price equals the point where demand equals supply, then shares will not tend to be underpriced. Interestingly, as a way to mitigate such problems, W.R. Hambrecht (the underwriter that managed auction IPOs in the US) purposefully stated that the auctions would be ' dirty' auctions, in which the offer price is set below the clearing price.[57] Nevertheless, Sherman suggests that auctions' susceptibility to these problems might explain the worldwide trend toward bookbuilding. We are still puzzled by this. It seems that issuers and regulators should push toward an auction system. It will create a more level playing field for investors, it will give investors the right incentives, and it will likely increase proceeds to the IPO firms. Since it reduces the role of bankers in the process, it might also reduce their fees.

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[57] A recent paper by Schnitzlein, Shao and Sherman (2016) suggests a hybrid auction structure as an alternative way to overcome the problems of auctions (e.g., insufficient participation and price discovery), but still preserve their advantages. Specifically, they consider a hybrid auction that includes a price-setting tranche open to institutions plus a non price-setting tranche for retail investors

While bookbuilding may offer advantages such as enhancing underwriters' ability to elicit information from investors, the discussion in the previous subsection highlights the costs that stem from underwriters' conflicts of interest. In light of this evidence, several papers have attempted to empirically examine the superiority of bookbuilding versus auctions. Sherman (2000) shows that bookbuilding is replacing auctions around the world, a piece of evidence that she interprets as being consistent with the superiority of bookbuilding. However, it is also possible that a small group (e.g., underwriters) derives strong benefits from the bookbuilding method, while a large disperse group (issuing companies) would benefit more if an auction method were prevalent. Consistent with this possibility, there exists a small number of underwriters who are both better informed and repeat players, while there exist a large number of individual companies each of which has little prior experience with public markets only has an IPO one time.

Derrien and Womack (2003) compare auctions, bookbuilding, and fixed price offers in the French market. They find that auctions are associated with less underpricing and less variance of underpricing, suggesting that auctions are on average preferable. However, it is admittedly challenging to ascertain the effects of the mechanism itself versus the type of firm choosing the mechanism. Nevertheless, subsequent studies by Lowry, Officer, and Schwert (2010) and Degeorge, Derrien and Womack (2010) reach similar conclusions in examinations of the small sample of firms that have gone public via auctions in the US market. Using detailed bid data, Degeorge et al are able to conduct an in-depth investigation of the extent to which these auctions suffer from either low investor participation or low information

production. Notably, while prior literature suggests that these represent the biggest problems of auctions, Degeorge et al find little evidence to support these concerns. In a similar vein, an examination of the demand schedules of 27 Israeli IPOs by Kandel, Sarig and Wohl (1999) finds that demand is very elastic, suggesting substantial price discovery.

In examinations of Taiwanese IPOs, Chiang, Hirshleifer, Qian, and Sherman (2011) and Chiang, Qian and Sherman (2010) find that individuals' behavior in auctions contrasts dramatically with institutions' behavior. Individuals are more susceptible to behavioral biases, for example being more likely to bid in an IPO auction if they received high returns in past IPO auctions. Institutions are more likely to base their decision to bid on information costs: institutions enter an auction if the expected initial returns are sufficient to cover their costs of collecting information. These findings suggest that ensuring institutional participation in auctions is key.

The documented advantages of auctions increase the importance of the question raised at the beginning of this subsection: why is bookbuilding overtaking auctions as the dominant mechanism of bringing companies public. Kutsuna and Smith (2004) show that after Japan's 1997 introduction of bookbuilding as an alternative to hybrid auctions, all issuers in Japan began to choose bookbuilding. They conclude that net benefits of auctions versus bookbuilding vary by firm type. For the average firm, auctions result in smaller issuance costs. However, the authors also find some evidence that small, high uncertainty firms, which are most susceptible to Myers and Majluf – type lemons problems and which would thus glean the highest benefits from the certification of an underwriter, avoided going public when auctions were the

only available mechanism. As noted by the authors, results regarding this disadvantage of auctions are suggestive rather than conclusive, as they are unable to rule out the influence of hot markets that caused smaller companies to go public in many countries around the world during this late-1990s time period (which represents the time period of the bookbuilding sample). Degeorge, Derrien and Womack (2007) posit that the marketing behind bookbuilding issues explains the fact that this mechanism has grown in growing popularity, despite the lower costs and potentially greater pricing accuracy of the auction mechanism. Further, the fact that with only a few exceptions (see the Google IPO) most of the largest investment banks refuse to take part in any IPO unless it uses book building represents a significant reason for the lack of popularity of the auction method.

How IPOs are allocated to investors is an immensely important aspect of the IPO process for more than one reason. Clearly, bookbuilding - the most dominant method and arguably de facto the only method - does not treat all investors in an equal and fair manner. The adverse selection it creates for uninformed investors may be a reason that companies have to leave so much money on the table in the IPO process (Rock 1986). It gives an unfair advantage to institutions, especially to those institutions that have close contact with investment banks and that generate significant trading commissions for the banks. Bookbuilding also gave rise to laddering, which may artificially inflate IPO prices and at least in the short term cause a deviation of market prices from true prices even after the IPO; these effects are again to the detriment of uninformed (mainly individual) investors. In sum, bookbuilding seems to distort prices both at the time of the IPO and during the first months of trading.

What then can be the justification for bookbuilding? Investment bankers argue that it helps them put the shares in the "right hands", meaning allocating shares to those investors who will not flip the shares. But this is clearly not the case as it is institutional investors who do most of the flipping. It is also argued that those institutions who get preferential treatment are also those who buy the cold IPOs, and thus on average make less profits than perceived. The jury is still out on the empirical validity of this argument. But even if true, we are not convinced that this cross subsidy is desirable or efficient. Finally, Benveniste et al (1989) and several follow up papers suggest that this method is optimal because this allocation method encourages institutions to gather information and reveal their private information about the upcoming IPO, resulting in a more efficient process. Maybe. Clearly, investment banks are better off with this allocation mechanism. The fact that auction type allocation mechanisms are not more popular is puzzling.

From an empirical perspective, is it clear that the lack of data on allocations (with only a few exceptions) makes it difficult to draw definitive conclusions. In our opinion it is in the best interests of the SEC and other regulatory bodies to make such data available to researchers so that the public and regulators will have a better understanding of how shares are allocated in practice and of the associated costs and benefits. The fact that investment banks are so reluctant to reveal IPOs allocations may suggest that the current practices are not in the best interests of the investing public. This is exactly the point where regulators should step in. Clearly, this is another area where more research can be immensely useful.

Agency costs within the issuing company

While Section 4.4 focused on the effects of conflicts of interest within underwriter banks, a separate stream of literature has considered the effects of agency costs within the company itself on IPO pricing. Habib and Ljungqvist (2001) and Ljungqvist and Wilhelm (2003) note that agency-related issues potentially affect the ways in which managers of issuing firms influence offer prices. For example, an owner that plans to sell many shares in the IPO has strong incentives to limit underpricing, whereas a manager with limited ownership who plans to sell no shares in the IPO cares less about maximizing the offer price. Moreover, as highlighted by Habib and Ljunqvist, companies have the ability to limit underpricing by engaging in greater promotion, for example by hiring a top-rank advisors (e.g., investment banks, lawyers, auditors), by listing on certain exchanges (e.g., a high-tech company may choose to list on the US, rather than on its domestic exchange), and by choosing a firm-commitment offer rather than the lower-fee best efforts offer (where underwriters play much more active roles in firm-commitment offers). Consistent with general economics of agency, cases in which owners benefit more from limiting underpricing, e.g., in larger companies and in cases where the owner plans to sell more in the IPO, the company engages in greater promotion efforts. Ljungqvist and Wilhelm (2003) provide further evidence on the role of agency, finding for example that changes in ownership structure in companies going public in the dot.com era explained a substantial portion of the higher underpricing in these years (though Loughran and Ritter (2004), using a different measures of ownership, question this conclusion).

Lowry and Murphy (2007) similarly test the effects of agency on underpricing, but arrive at the opposite conclusion. They document that in one-third of IPOs,

managers are granted options in which the exercise price is set equal to the IPO offer price. All else equal, such options give managers strong incentives to underprice the offer, as higher underpricing increases the value of these options. However, controlling for pre-IPO ownership and estimating a wide range of empirical tests, they find no evidence of such a relation. This robust non-finding calls into question the effects of agency-related explanations on underpricing, at least in regards to the effects of agency costs of the manager-owner. In a subsequent paper, Chahine and Goergen (2011) estimate specifications where initial returns are regressed on CEO's gains from such options plus a number of interaction variables related to the governance structure of the firm. Including a broad set of such interaction terms, the authors find evidence that options issued at the IPO price do affect IPO underpricing within subsets of more weakly governed firms. Their findings highlight the importance of IPO governance, a topic to which we devote more attention in Section 8.

Information asymmetry between the issuing firm and the investment bank

Baron (1982) develops a model in which banks are better informed about the value of the firm going public, than the firm itself. One way to think about this is that the bank can better estimate market demand for the issue, which is a critical determinant of price. Muscarella and Vetsuypens (1989) test this model by comparing the underpricing of banks who are managing their own IPOs (e.g., Morgan Stanley serving as underwriter on Morgan Stanley's IPOs) to the underpricing of other IPOs. They find that the underpricing of these self-underwritten bank IPOs is no different than the underpricing of other IPOs. While we agree that Baron's model implies that banks should be able to more accurately price their own IPOs, the issue of whether

banks have incentives to price their IPOs closer to true value is debatable. Assuming that the bank benefits by underpricing IPOs, for example because they are easier to sell, it will be more difficult to credibly argue to future clients that it is optimal to underprice their offerings if the bank did not underprice its own offering.

Prospect theory, investor inattention, and investor type

Loughran and Ritter's (2002) finding (previously discussed in section 4.2) that public information is only partially incorporated into the offer price raises questions as to why this is an optimal outcome.[58] A complete explanation must consider the willingness of both underwriters and issuers for such "higher than necessary" underpricing. As discussed in sections 4.4 and 4.6, a number of papers have considered the effects of agency, within both the underwriter bank and the issuing firm. Loughran and Ritter (2002) propose a behavioral explanation, prospect theory: issuers care about the change in their wealth rather than the level. Consider a case in which the IPO is underpriced. The entrepreneur's wealth change around the time of the IPO represents the sum of two components: money lost due to underpricing (from shares sold at the offer price rather than the 'true' value, and also from the dilution effect of selling part of the firm for below market value), plus money gained because retained shares are valued at the higher market price. If the gain from the second component exceeds the loss from the first, then prospect theory argues that the issuer

[58] While Loughran and Ritter (2002) emphasize that their finding of partial incorporation of public information into the offer price is inconsistent with Benveniste and Spindt, we note this finding is not necessarily inconsistent with Rock. However, one might argue that the magnitude of underpricing is difficult to explain within the framework of Rock's model, particularly certain times such as the internet bubble period.

will be content. The fact that the entrepreneur could have been even wealthier if the IPO had been valued more highly is less relevant.

Purnanandam and Swaminathan (2004) conclude that despite the high underpricing of IPOs, the median IPO was significantly overvalued *at the offer price*, when valuations are computed based on industry peer price multiples. In addition to providing high first-day returns, these overvalued IPOs earn significantly lower abnormal returns over the long-run. The authors trace this price trajectory to optimistic growth forecasts around the time of the IPO, which are not realized. They conclude that investors pay insufficient attention to profitability around the time of the offer.

Finally, several papers consider the effects of investor clienteles on underpricing. For example, Derrien (2005) and Ljungqvist, Nanda and Singh (2006) conjecture that issuing firms and the institutional customers of investment banks benefit from the presence of sentiment investors. Building on this, Cook, Kieschnick, and Van Ness (2006) argue that the investment bank underwriter should promote IPOs to retail investors. While endogeneity concerns make it difficult to make definitive conclusions, their results suggest that investment banks do in fact benefit from such promotion efforts, for example through higher offer price revisions and higher offer price valuations relative to comparable firms. Consistent with these relations being driven by participation of retail investors, they find that average trade sizes are smaller in cases where promotional efforts were greater.

Other services provided by underwriters, in bookbuilding IPOs

In addition to marketing and pricing the IPO, underwriters also frequently provide a number of services after the IPO, for example price support, market making activities, and analyst coverage. Starting with Michaely and Womack (1999) and Krigman, Shaw and Womack (2001), analyst coverage in particular has attracted substantial attention for its potential effects on underwriter selection, IPO pricing, and choice of bank for post-IPO transactions such as mergers and SEOs. Brau and Fawcett document that 83% of surveyed CFOs state the "quality and reputation of the research department / analyst" to be an important determinant of underwriter selection.

A number of papers have examined the influence of analyst coverage in the IPO context. In this section, we highlight papers that focus on the relation between analyst coverage and pricing, and future sections the literature on analyst coverage as it relates to IPOs more broadly.

Loughran and Ritter (2002) focus on the link between analyst coverage and underpricing; they posit the analyst lust hypothesis, under which companies are willing to accept large underpricing from prestigious underwriters because of the importance of coverage from influential analysts, which tend to be concentrated in these high-rank investment banks. Consistent with this argument, Cliff and Denis (2004) find that underpricing is higher among issues brought public by underwriters with an all-star analyst covering the issuer's industry. They further conclude that the relation is causal, rather than solely reflecting a scenario where managers underprice their offerings as a way to attract subsequent attention from both analysts and the media (a possibility suggested by Aggarwal, Krigman and Womack (2001)). Specifically, in addition to conducting 2SLS analyses that control for such

endogeneity, Cliff and Dennis also find that companies are significantly more likely to switch lead underwriters between the IPO and SEO if the lead underwriter does not have a recommendation outstanding one year after the IPO. This latter finding regarding the influence of analyst coverage in underwriter switches is consistent with findings in Krigman, Shaw and Womack (2001). In fact, Krigman et al find that underpricing is not an important determinant of underwriter switches, suggesting that analyst coverage is the more important factor.

Liu and Ritter (2011) posit and find empirical support for the conjecture that VCs are particularly focused on analyst coverage, because they want a high price when shares are distributed to limited partners (frequently at the end of the lock-up period, 180 days after the IPO). While Liu and Ritter's reported results are based on OLS regressions and therefore may be sensitive to identification issues that make causal interpretations difficult, they find similar results using 2SLS regressions that control for endogeneity.

In addition to analyst coverage, price support is perceived to be an important service provided by underwriters. The objective of price support is to limit the extent to which the price falls below the offer price, and price support activities are generally concentrated within the first month after the offer. As explained by Ellis, Michaely, and O'Hara (2000) and Aggarwal (2000), underwriters can stabilize the aftermarket price of an IPO through the use of pure stabilizing bids, in which the underwriter purchases shares in the aftermarket, or through aftermarket short covering, in which the underwriter generally repurchases shares that were issued under the overallotment

option.[59] The authors find that pure stabilizing bids (i.e., not supported by over-allotted options) are never used, and that aftermarket short covering is the most common. Ellis, Michaely and O'Hara further show that the lead always becomes market maker, and that the lead takes on substantial inventory, especially for IPOs with negative initial returns. Importantly, the overallotment option (described in more depth in section 3) substantially reduces this risk. Finally, in addition to price support being perceived as valuable by the issuing firm, Ellis et al find no evidence that these activities have to be subsidized by the profits from underwriting. Rather, they find that market making activities, of which the potential for price support represents one component, is on average profitable for the lead underwriter, accounting for an average 23% of total IPO profits. Given the many changes in the markets over recent years, including for example increased participation by high frequency traders and lower bid-ask spreads, it is an empirical question whether trading activity continues to represent a significant source of profits for underwriters.

While price support is perceived by the firm as being beneficial, the economics of why a temporary manipulation of the price would provide long-run benefits are intriguing. Lewellen (2006) finds that stabilization appears to raise the equilibrium stock price, at least in the short run, as there is little evidence of declines in stock prices after the stabilization is withdrawn. However, it remains difficult to determine if the long-run price trajectory would have been different in the absence of both the overallotment option and price support. One possibility is that price support limits

[59] In addition, the underwriter may also employ penalty bids as a deterrence mechanism. Penalty bids refer to cases in which brokers whose clients sold IPO shares shortly after the IPO lose a portion of the commission that they made on the sale of the IPO shares.

cascade-type effects (see, e.g., Welch, 1992) that potentially cause downward spirals in the stock price. To the extent that retail investors would be more susceptible to such phenomena, it is illustrative that Lewellen finds price support to be concentrated in issues with more retail participation.

Effects of the Lockup Period

Most IPOs have lockup agreements that limit the periods during which insiders can sell shares. This is an agreement between the firm and the underwriter, not involving any of the regulatory bodies (see section 3 for more details). In any IPO with a lock-up agreement, insiders can sell shares in the IPO (in which case the sales must be disclosed in the prospectus) or at the expiration of the lockup period, but the lock-up agreement prevents sales in the interim period. The typical length of the lockup agreement is 180 days. Field and Hanka (2001) find that 80% of IPOs from 1988 until 1997 had lockup periods of 180 days, and that lock up agreements tended to become more standard over their sample period: in the last year of their sample more than 90% of companies set the lockup period to 180 days. At the lockup expiration, when insiders first have the opportunity to sell their holdings, Field and Hanka (2001) document a -1.5% average return. They attribute this price drop to insider sales, and they find that it is more severe among companies backed by venture capital, which are themselves subject to the lockup agreements.

Brav and Gompers (2003) explore the potential role of the IPO lockup agreements. They test three hypotheses for the use of lockup agreements. First, a lock-up agreement may represent a signal of company quality: insiders (who are almost surely undiversified) will only agree to limits on selling if they are confident

about the long-term value of the company. Second, the lock-up agreement may represent a commitment device to discipline the management, i.e., to commit them to continue to expend effort and to restrain from consuming excessive perquisites. Third, the lock-up agreement may represent a source of additional rent for the underwriter: the underwriter has the option to release insiders from the lockup 'early'(i.e., prior to the expiration), and in such cases the insiders are only permitted to sell through an SEO or via a block trade through the lead underwriter. In either case, the underwriter would earn additional fees. Cross-sectional comparisons indicate longer lock up agreements among companies with higher levels of potential moral hazard, suggesting they would be more susceptible to the commitment problems highlighted in hypothesis two. In contrast, the authors find no evidence that insiders of higher quality firms 'signal' their quality through longer lockup periods, as the signaling hypothesis would predict. Finally, Brav and Gompers also find that insiders are more likely to be released early from these lockup agreements among companies with higher post-IPO returns, that were backed by VCs, and that were brought public by higher ranked underwriters.

How probability of issue withdrawal affects pricing

In a samples of IPOs between 1985 and 2000, both Dunbar and Foerster (2008) and Edelen and Kadlec (2005) document that approximately 20% of IPOs that are initially filed are withdrawn. Using SDC data we examine the rate of withdrawals for a more recent period. Edelen and Kadlec (2005) and Busaba, Benveniste, and Guo (2001) posit that issuers (possibly together with their investment banks) factor the likelihood of being forced to withdraw the issue into their pricing of the issue. Edelen

and Kadlec argue that any issuer that files to go public prefers public ownership to private ownership, but that this revealed preference must be conditional on the valuation under public ownership. If the issuer's utility from going public at the expected public valuation is large, then the issuer will price the deal conservatively to prevent withdrawal. Alternatively, if the issuer's utility is small, then the issuer will price the deal more aggressively because of a greater indifference between going public versus withdrawing and staying private.

Edelen and Kadlec note that a key implication of their model is that there should be no asymmetry in the extent to which positive versus negative market returns are incorporated into the offer price: following an increase in market returns, issuers should have a larger surplus from going public and thus price conservatively, i.e., incorporate only a portion of the positive information into price and thus accepting a lower price than might be possible. In contrast, following a decrease in market returns, issuers should price aggressively by incorporating only a portion of the negative information into price and thus pushing for a higher price than would be achieved by incorporating 100% of this negative information. They argue that the asymmetry in prior literature is due to a truncation bias, which is driven by the fact that issues that would have been priced lower in response to low market returns are instead withdrawn. Empirical results that control for the sample selection resulting from withdrawn issues provide support.

In a similar vein, Busaba et al (2001) posit that underpricing is lower when investors perceive a greater likelihood that an issuer will withdraw the issue. Issuers with access to alternative sources of financing (proxied by debt ratio), with less

uncertainty about company value (as proxied by level of revenues), and without venture backing have higher probabilities of withdrawal. Viewing this from the perspective of the company, a company that is more likely to withdraw, for example because it has access to more alternative forms of financing, is less willing to accept high underpricing in order to become publicly listed. Thus, we observe a negative relation between likelihood of withdrawal and underpricing.

Lawsuit Avoidance

Tinic (1988) represents a model that is based on a combination of both information asymmetry and various institutional factors. In particular, companies in the United States face a risk of class action, Section 11 lawsuits, and the details of damage calculations cause underpricing to provide a form of insurance against this risk. Specifically, if a company is sued for violations related to its securities offering (i.e., sued under Section 11 of the Securities Act of 1933), damages to investors are calculated as the difference between the price at which they purchased the issue and the lower of the offer price or the price at the end of the first day of trading. To provide an example, suppose an investor purchased a share on the day it went public, where the company went public at $10 per share and closed at the end of the first day at $13. One year later, the company is sued for disclosing insufficient information in its prospectus, and at this time the stock is trading at $8. While in a typical lawsuit, the damages would be based on the difference between $13 and $8, in the case of Section 11 lawsuits related to securities offerings, the damages are based on the difference between $10 and $8. The lower potential damages have two effects: they

decrease the cost in the event of a lawsuit, and they effectively lower the probability that a lawsuit is filed.

Lowry and Shu (2002) find support for Tinic's model in a sample of US IPOs. Using a 2SLS framework to address the endogeneity, they examine both the effects of litigation risk on initial returns, and the effects of underpricing on the probability of being sued. Companies with higher litigation risk underprice their offerings more as a form of insurance, and higher underpricing serves as a deterrent against lawsuits.

Hanley and Hoberg (2012) find that companies employ both underpricing and disclosure to protect themselves against litigation risk. They note that legal penalties are based on both alleged damages and alleged insufficient disclosure in the prospectus, suggesting they can protect themselves by either underpricing, as suggested by Tinic, or by increasing their level of disclosure. They argue that companies with large revisions in price (between the midpoint of the filing range and the offer price) but small changes in the text of the prospectus are particularly likely to have a material omission in the prospectus: some new information caused a change from the expected to the actual offer price, but this new information was not reflected in the prospectus. They find that these companies with a higher likelihood of poor disclosure tend to underprice their offerings by a greater amount. Based on these findings, they conclude that companies tend to employ either high quality disclosure or underpricing as a deterrent against lawsuits. While intuitively plausible, it is important to note that many of the factors contributing to changes in the offer price and to underpricing are not incorporated in the prospectus, for example estimates of future growth, indications of interest from institutional investors, and underwriters'

revisions to marketwide demand. Importantly, SEC demands for added disclosure, as communicated through SEC comment letters, drive many of the revisions to the prospectus.

Litigation continues to have a substantial effect on companies. Approximately 5 to 8% of IPOs are sued under Section 11 (depending on the sample period), and a greater number are sued if we include Section 10B-5 lawsuits as well.[60] Moreover, these lawsuits tend to be concentrated among larger companies, where expected damages are higher, suggesting that the probability of being sued will be much higher within certain subsamples. These lawsuits are costly both to companies and to underwriters, who are frequently named as co-defendants.

Other institutional factors

The IPO market is affected by many institutional factors, as explained in previous section. One of the factors that has received attention in the literature is limits to short selling, as originally proposed by Miller (1977). Miller notes that the heterogeneity of investors' valuations is particularly high for IPO firms, however short sale constraints in early trading limit the extent to which the negative opinions are factored into market prices. These limits to short sales are a function of few shares available to loan, for example because many pre-IPO investors are prevented from selling until after the expiration of the lock-up.

[60] Lowry and Shu find that 8% of IPOs between 1988 and 1995 are sued under Section 11; Hanley and Hoberg (2012) find that 5% of IPOs between 1997 and 2005 are sued under Section 11 and 10% under any form of class action lawsuit. In a sample of 2005 – 2013 IPOs examined by the authors of this review, 6% are sued under Section 11.

Consistent with Miller, Ljungqvist, Nanda, and Singh (2006) develop a model in which post-IPO short sales constraints can explain both the positive initial returns and long-run underperformance. Specifically, because issuers know that sentiment investors will bid up prices in the after-market and the opinions of pessimistic investors will be under-represented, they are able to price the IPO higher than they otherwise would. Institutional investors purchase the over-valued IPO shares because they know they can re-sell them to sentiment investors at even higher prices, resulting in high initial returns. Over time, as short-sales constraints relax, the negative information gets incorporated into prices and the issues underperform. As noted by the authors, this model is based on an assumption that IPOs underperform over the long-run, a premise for which the empirical literature provides mixed evidence and which is reviewed in depth in Section 6.

Ofek and Richardson (2003) focus more narrowly on the internet bubble period, but similarly conclude that stock price patterns on IPOs in this sector are consistent with Miller. Specifically, they document: higher short interest and higher borrowing costs for this set of stocks (consistent with short sale restrictions), heterogeneity in investors that would cause variation over time in the identity of the marginal investor (meaning the most optimistic investors change over time thereby contributing to continually increasing prices), and lock-up expirations that both substantially loosen short-sales constraints that are followed by significantly negative abnormal returns.

In contrast, Edwards and Hanley (2010) obtain actual data on short selling transactions, and they show that short selling occurs simultaneously with the opening

day of trading in 99.5% of IPOs in their 2005 – 2006 sample. Moreover, by the fifth day of trading, the ratio of short selling to volume is only slightly lower than that for a sample of mature firms as documented by Diether, Lee, and Werner (2009). In contrast to the predictions of Miller (1977), Edward and Hanley find that short selling is positively correlated with underpricing. This general availability of short selling in IPOs is consistent with findings of Geczy, Musto and Reed (2002), who find that shorting costs among those IPOs that are available to short are not substantial, averaging 44 basis points per year. However, as highlighted by Edwards and Hanley, shorting costs are unlikely to be equal across all firms, potentially being especially high among firms with low institutional investment (see, e.g., D'Avolio (2002)).

Patatoukas, Sloan and Wang (2016) focus on the cross-sectional differences in shorting constraints across IPO firms, and find substantial evidence that these constraints contribute to both underpricing and long-run returns. They hypothesize that firms with higher information asymmetry, with more divergent investor opinions, and with fewer shares available to trade (i.e., fewer shares issued in IPO and thus not subject to lock-up agreements) will have higher shorting costs. Consistent with predictions, they find that such firms have higher lending fees, higher initial returns, and more negative returns around lockup expirations. In sum, while most IPO firms are available to short after the offering, there are still substantial differences between firms, and these differences appear related to pricing patterns.

Is underpricing a form of advertising?

In their 2002 review paper of IPO underpricing, Ritter and Welch (2002) ask: "On theoretical grounds, however, it is unclear why underpricing is a more efficient

signal than, say, … advertising". Chemmanur and Yan (2009) examine this directly. They hypothesize that firms will choose a higher level of product market advertising when they are planning to issue new equity, and that product market advertising and initial returns represent substitutes. Empirical results, which are based on the subset of IPOs with positive advertising expenditures, provide strong support for their predictions. For example, advertising expenditures are significantly higher in the years of an equity offering, a finding that holds for both IPOs and SEOs. Second, in both OLS regressions and SUR regressions that control for endogeneity, the magnitude of underpricing is significantly lower when a firm expends more on advertising. To the extent that underpricing is a more efficient form of advertising to consumers than to businesses, we note that these relations should be stronger among business-to-consumer companies than among business-to-business companies. The authors do not examine such differences.

In a related vein, Demers and Lewellen (2003) also find that product market advertising is related to various dynamics of the IPO. They provide evidence consistent with the marketing benefits of underpricing: greater underpricing of internet firms is associated with a post-IPO increase in website traffic.

The signaling hypothesis and information cascades

Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989) propose signaling models of underpricing, wherein high quality firms strive to distinguish themselves from low quality firms by incurring a cost, where the cost is underpricing of the IPO. Low quality firms cannot afford to incur this cost, and hence

investors know that an underpriced IPO must represent a high quality firm. In general, this class of models has received little empirical support.

Welch (1992) proposes an information cascade model of IPOs, in which the order in which investors are approached about purchasing the issue affects the ultimate proceeds raised. The general intuition is that each investor has a private signal about firm value, and attempts to infer the private signals of previous investors from their decision of whether to purchase the issue. Thus, the second investor makes a decision to purchase based on his private signal and the observed action of the first investor. The second investor is more likely to purchase if the first investor purchased. Each subsequent investor can observe the decisions of a greater number of prior investors, and thus puts less weight on his own signal. In this way, if the early investors view the offering favorably, the issue is more likely to succeed. Knowing about this cascades model, an issuer has an incentive to underprice the issue to increase the probability that early investors view the offering favorably. Amihud, Hauser and Kirsh (2003) find support for Welch's cascades model using a sample of Israeli data, where they are able to observe investors' subscriptions. Specifically, they find that investors tend to subscribe heavily to new issues, or to largely refrain, consistent with herding.

As this review chapter primarily concentrates on papers published since 2000, we refer the reader to other sources such as the excellent review by Ritter and Welch (2002) for a more detailed discussion of these important issues.

Is the underwriting market competitive?

The ways in which one thinks about the underwriter's role is related to questions regarding the competitiveness of the underwriting market. Chen and Ritter (2000) document a striking clustering of spreads at 7%. Based on both the lower average spreads in other countries and the lack of a negative relation between spreads and proceeds across a wide range of issue sizes, they conclude that spreads for deals about $30 million are above competitive levels. We extend the sample and examine the underwriting spread for a long time period. While spreads today continue to have a substantial clustering at 7% (see Figure 7), investment banks claim that underwriting IPOs is a loss-leader rather than a highly profitable activity. This seems surprising, given average IPO proceeds of approximately $111 million (in constant 2015 dollars, see Table 1), implying fees of around $7.8 million (calculated at 7%). Under an assumption that an IPO requires 3 months work of three associates, one vice-president and ½ of a managing director, being a underwriter would not seem like a loss leader. However, the lack of cost data and the ambiguity related to how costs should be allocated even if one had detailed data make this a difficult question to answer empirically.

Torstila (2003) and Hansen (2001) question the conclusion that the 7% clustering necessarily reflects collusion. Torstila finds that spreads cluster in many IPO markets around the world, and that many countries have greater clustering than the US. However, he notes that the level at which most other countries' spreads cluster is lower than that in the US. Hansen concludes that 7% represents efficient contracting rather than implicit collusion. He argues that underwriters compete on

other dimensions, for example marketing and placement of the issue, and analyst coverage.

In sum, a common theme throughout much of this literature relates to the extent to which the underwriting market is competitive. The concentration of spreads and the large underpricing seem at odds with a competitive market, yet the large number of underwriters is strongly inconsistent with a monopolistic industry. Hoberg (2007) and Liu and Ritter (2010) suggest reasons for these apparent contradictions.

Hoberg (2007) finds strong evidence of underwriter persistence, where some underwriters tend to persistently underprice IPOs by substantially greater magnitudes than other underwriters. If all underwriters provide a similar service, one would expect competitive forces to diminish these differences over time. However, Hoberg concludes that underpricing is actually a proxy for underwriter skill, with the higher quality underwriters underpricing offerings by a greater amount. To the extent that underwriters can exchange underpriced shares for other services, such as discussed above, the higher underpricing potentially substitutes for higher fees than would otherwise be observed. We note that the conclusions of this paper are all based on underpricing being positively related to underwriter rank, however as was discussed in depth in section 4.1 this is debatable.

Consistent with underwriters differing in important ways, Liu and Ritter (2010) argue that the underwriting market can best be modeled as a series of local oligopolies. While there are a large number of underwriters, they are not all competing directly against each other. A limited number of underwriters are positioned to best provide the services demanded by a particular company. For example, a large company

backed by a top tier VC will focus on highly ranked investment banks with an all-star analyst in their industry, as potential underwriters for their IPO. In contrast, smaller, regionally-focused companies may be more likely to select among the set of investment banks with operations focused within their geographic region.

Role of other intermediaries: VC, Banks, Institutions, and Analysts.

In addition to the underwriter, there are several other financial intermediaries involved with the IPO firm, before, during, and in the months following the offering. During the pre-IPO period, institutions such as VCs and banks often provide both an advisory role and also certification for company value. After the offering, financial institutions such as investment banks potentially influence company performance, for example through analysts' recommendations and market making activity. The role of these intermediaries does not end at the IPO, with VCs typically continuing to holding shares after the IPO and banks frequently providing additional loans. We also review here the literature discussing the actions of the VC and other stakeholders at the end of the lock-up period, when insiders can start selling their shares freely.

A typical startup company goes through several rounds of financing before its potential IPO. In the initial round of financing a company attracts "seed capital", generally from individual investors. These investors range from family and friends to wealthy individuals commonly referred to as angel investors. Companies that successfully develop past the initial stage may subsequently attempt to attract financing from a venture capitalist (VC). VCs provide a screening role, a monitoring role, and an advising role. The screening role refers to the VC's decision of which companies to fund, among the hundreds or even thousands of business plans it

receives, whereas the monitoring and advising refer to the active influence of VCs, for example in terms of establishing connections to suppliers and customers, setting up governance structures, and regularly visiting the company and communicating with management. Sorenson (2007) finds that at least two-thirds of the higher valuation of VC-backed companies stems from VCs' active influence on companies.

Prior to the IPO, a VC typically advises a company on its business and financial strategy, helps it to establish a governance structure (Baker and Gompers (2003) and Hochberg (2012)), and assists it in raising additional funds. The VC is generally closely involved with the company until the company successfully exits (where exit is defined as going public or being acquired) or until the investment is written off (a scenario that is commonly referred to as joining the living dead). Among companies that successfully go public, the VC holds shares until at least the end of the lock-up period but frequently much longer (see, e.g., Gompers and Lerner, 1998; Field and Hanka, 2001; Field and Sheehan, 2004). Bernstein, Giroud, and Townsend (2016) show that a higher level of VC engagement with the company increases both the company's innovation and its likelihood of successful exit, and Brav and Gompers (1997) show that IPOs backed by venture capital earn significantly higher returns over the three to five years after the IPO, compared to their non-venture backed counterparts.[61]

Our analysis reveals that among IPOs between 1972 and 2015, 37% were backed by venture capital. As shown in Table 3.4, venture capital backing is more common among younger companies and among companies in technology industries.

[61] The difference in post-IPO returns between venture- and nonventure-backed IPOs is only significant using equally weighted returns.

The VC's role in screening, monitoring, and advising companies should decrease the level of information asymmetry surrounding the firm. Using data from the 1970s and 1980s Megginson and Weiss (1991) conclude that VC backing decreases first day returns, which is consistent with this prediction. However, in more recent periods VC-backed IPOs have tended to have higher initial returns, for example as shown in Figure 3.6. Lee and Wahal (2004) compare underpricing in VC-backed IPO versus non-VC IPOs matched on size, industry, location, book value, underwriter rank and revenue, and find underpricing to be 5-10% higher among the VC-backed sample, with the difference being more pronounced during the "bubble period". This positive relation between VC backing and initial returns may be arttributed to endogeneity: companies backed by venture capital tend to belong to riskier industries and to be more difficult to value, suggesting that the coefficient on VC backing picks up these characteristics rather than the causal effects of VC backing on information asymmetry. In addition to benefits related to lower underpricing, Krishnan, Ivanov, Masulis and Singh (2011) suggest that higher ranked VCs contribute to better post-IPO long-run performance, an effect that they attribute to greater post-IPO involvement of higher ranked VCs. The true causal effects of VC backing on underpricing remain unclear.

In addition to the potential certification effects of VC backing, venture capitalists may also influence initial returns through a grandstanding effect. As posited by Gompers (1996), grandstanding refers to the incentives of younger VCs to take companies public earlier, as a way to demonstrate their ability to the market. The ability to take a company successfully through the IPO process is critical to a VC's reputation, specifically to its ability to raise further capital and to attract high-quality

companies. Thus, the VC is willing to incur the costs of bringing a company public earlier than would otherwise be optimal. From the perspective of the company, which is typically younger and thus has higher information asymmetry, one of the costs of such grandstanding is higher underpricing. Consistent with grandstanding, Gompers finds that IPO firms backed by younger venture capital firms are on average 4.6 years old at the time of the IPO, compared to an average age of 6.6 years among companies backed by more mature VC firms. In terms of initial returns, IPOs backed by younger VC firms have average underpricing of 13.6%, compared to an average 7.3% among companies backed by more mature venture capital firms. Given the changes in the types of firms going public, the changes in the VC industry, and also the changes in the association between VC-backing and underpricing, it would be valuable and interesting to re-examine this effect with more recent data.

A number of additional papers have further examined differences between IPOs backed by highly versus more lower ranked VCs. For example, companies backed by more highly ranked VCs are more likely to exit successfully, tend to have higher post-IPO valuations, and have higher average abnormal stock returns after the IPO (see, e.g., Sorenson (2007), Nahata (2008), Krishnan, Ivanov, Masulis, and Singh (2011))

Finally, Iliev and Lowry (2016) find that VCs financial commitment to the company often extends long after the IPO. While common wisdom has been that VCs strive to exit soon after the IPO (for example at the expiration of the lock-up period), Iliev and Lowry find that that in a nontrivial portion of cases VCs invest additional capital after the IPO. Specifically, in 15% of companies that were backed by venture

capital firms prior to the IPO, a VC invests additional capital within the first five years after the IPO.[62] In approximately half of these cases the VC that funds the firm post-IPO is the same VC that also provided funding prior to the IPO. Their findings suggest that these post-IPO venture capital fundings occur predominantly in high information asymmetry companies with positive NPV projects – companies that Myers and Majluf (1984) characterize as frequently being unable to issue public equity at a viable price.

In sum, VCs perform a number of roles, which in aggregate have a positive effect. First, they screen companies prior to providing funding, meaning that the companies that receive venture backing are of above-average quality. Second, after providing funding, they play a very active role within these companies, both in terms of monitoring management and in advising on matters ranging from employees, to operations, to governance. The extent of VC involvement and the quality of the VC positively affect company innovation, the likelihood of exit (via IPO or acquisition), and post-IPO long-run performance.

Interactions with other financial institutions can similarly provide certification of company value prior to the IPO. This issue was first examined by James and Weir (1990), who find that firms with bank loans prior to the IPO have significantly lower initial returns than their counterparts without pre-IPO loans. While this could reflect either differences in the types of firms obtaining bank loans (e.g., firms with bank loans may have more assets in place, lower information asymmetry) or the causal

[62] There exists considerable variation across VCs. For example, of all IPOs between 1995 and 2010, 3% of those backed by Kleiner Perkins prior to the IPO also received additional funding from Kleiner after the IPO, compared to an analogous rate of 12% for New Enterprise Associates.

effects of the bank loan in lowering information asymmetry, they conclude that their evidence is suggestive of the latter explanation. More recently, Schenone (2004) examines this issue in more depth, in a manner that is better able to overcome the above endogneity issues. Specifically, she focuses on a sample of IPO firms, all of which had syndicated loans prior to the IPO, and she compares firms whose bank could have underwritten the IPO with those in which the bank did not have this capability. She hypothesizes that the effects of the bank loan in lowering information asymmetry should be greater if the bank providing the loan also served as underwriter. Results support this prediction, consistent with the existence of a previous relationship between the bank and underwriter lowering information asymmetry. Her results also indicate that companies with a pre-IPO *lending* relationship with a potential underwriter exhibit significantly lower underpricing than those with a pre-IPO *underwriting* history with a potential underwriter, which is consistent with the lending relationship producing more information. (These findings may suggest that in cases where the investment bank has a prior banking relationship with the firm, the bank should be less concerned with soliciting information from outside investors (Benveniste and Spindt). The extent to which underwriters view these different sources of information as substitutes potentially provides a fruitful avenue for future research.)

Schenone's (2004) findings highlight the greater certification effects of banks that have served as lenders prior to the IPO, compared to banks that serve solely as underwriter. Other potential effects of such lenders, for example as a potential providers of post-IPO capital in cases that the firm becomes financially constrained,

remain an avenue for future research. To the extent that such benefits exist, they would affect many firms. Gonzalez and James (2007) find that 67% of companies have a bank loan prior to the IPO; approximately 25% of IPO firms have a syndicated loans prior to going public.[63].

In recent years, "venture debt" has emerged as another source of capital for pre-IPO firms. Venture debt refers to loans provided to startup companies that typically have little or no positive cash flow but who have venture-capital-baking. The most active and dominant player in this market is the Silicon Valley Bank (SVB). In most cases, companies that take venture loans are not eligible for more conventional bank loans due to the lack of cash flow and/or fixed assets. Instead, innovation and intellectual property are frequently used as collateral. In term of its relevancy to IPO activity, venture debt has parallels to types of lending in terms of both its certification effects and its effects on pre-IPO capital structure. Another interesting aspect is the type of covenant venture lenders impose on companies that in many times have little earnings and at times even low or no revenues.

The recency of the venture debt vehicle suggests that more information and more analysis can enhance our understanding of how debt might resolve both information asymmetry and agency issues and thereby have an impact on the IPO outcome.

Investment banks can influence IPO companies not only through the certification and advising channels prior to the IPO, but also via analysts' coverage after the offering. Analyst coverage is typically initiated at the end of the quiet period

[63] Syndicated loans are made by a group of banks and are generally for substantially larger dollar amounts than non-syndicated loans.

(see for example Michaely and Womack, 1999), where the quiet period refers to a time interval from prior to filing of the initial prospectus until its expiration same days after the IPO. Post IPO, the duration of the quiet period is 40 days, with the exception of companies that go public under the JOBS Act of 2012 who have a quiet period of 25 days. Prior to July 9, 2002, the duration of the quiet period was 25 days for all companies.[64]

The company and its insiders are prohibited from making any forward-looking statements during the quiet period, a limitation that forbids underwriter analysts from making earnings forecasts or stock recommendations during this time interval. The objective of the quiet period is to insure that potential investors rely on the IPO prospectus (which as discussed in Section 3 must be approved by the SEC as satisfying all relevant disclosure requirements) for all material information, that all investors are exposed to the same information, and that the stock is not hyped during this time period. While analysts from unaffiliated brokerage houses could issue recommendations during the quiet period, Michaely and Womack show that the lead underwriter typically issues the first recommendation at the end of the quiet period.

Several papers highlight the changes in analyst coverage of IPO firms over the past several decades. Over the 1990 – 1991 period, Michaely and Womack find that 51% of firms had analyst recommendations within the first year of the IPO, with approximately half of these being buy (or strong buy) recommendations by the underwriters and the other half being lower-level recommendations or

[64] The extension of the quiet period was part of the measure preceding the Global Settlement for managing underwriters. The length of the quiet period was changed by the NASD Rule 2711 http://finra.complinet.com/en/display/display.html?rbid=2403&element_id=3675.

recommendations by non-underwriters. Bradley, Jordan and Ritter (2003, 2008) find that the percent of cases with analyst initiation, the frequency of underwriter involvement, and the positiveness of the recommendations all increased over the 1996 – 2000 period. Across this period, 76% of IPOs had analyst coverage initiated *immediately* at the expiration of the quiet period (increasing from 58% to 95% over this five-year period), and 95% of recommendations were a buy or strong buy. Among 1999 – 2000 IPO, Bradley, Jordan, and Ritter (2008) find that the first recommendation comes from the lead or co-lead underwriter in 89% of cases.

The ways in which the market interprets the positive recommendations of affiliated analysts is a matter of some debate in the literature, potentially due to changes over time. The first paper to take an in-depth look at analyst coverage after IPOs, Michaely and Womack (1999), shows that managing underwriters tend to provide more positive analyst recommendations than other brokerage firms, but that these recommendations are more likely to be biased. Over the long-run, firms with buy recommendations from unaffiliated analysts tend to outperform firms with a similar recommendation from the lead underwriter. Michaely and Womack (1999) empirically show that conflicts of interest within the bank contribute to such a bias. Specifically, analysts might strategically provide more positive recommendations to make the bank more attractive as a potential underwriter in future offerings.

In contrast to Michaely and Womack, Bradley et al (2003) find little difference in either the recommendations or the associated abnormal returns of the affiliated versus non-affiliated analysts. The market interprets these initiations of analyst coverage as positive news, regardless of the analyst providing the recommendation.

Companies that receive the first analyst recommendation immediately upon expiration of the quiet period, experience a 4.1% abnormal return, compared to a 0.1% abnormal return among their counterparts with no coverage initiations.

James and Karceski (2006) attempt to shed further light on differences between affiliated versus nonaffiliated analysts through an investigation of both recommendations and target price estimates, where the latter shows more variation. Their results provide further evidence that analysts affiliated with the lead underwriter are more optimistic than other analysts. Similar to Michaely and Womack, they find that the differences between affiliated and non-affiliated analysts are concentrated within issues that performed poorly after the IPO, for example those with non-positive initial returns. However, while these 'booster shots' are presumably intended to bolster the price of the newly public firm, the authors find that the market discounts these affiliated recommendations.

The incentives of underwriter banks to provide positive recommendations are high. For example, Krigman, Shaw and Womack (2001) and Cliff and Denis (2004) show that companies are more prone to switch underwriters between the IPO and SEO if the bank did not provide extensive analyst coverage after the initial offering. Moreover, companies perceive these analyst recommendations as an important determinant in their selection of an underwriter. Dunbar (2000) finds that changes in investment bank market share year-to-year are positively related to changes in the reputation of the bank's analysts, particularly within the set of highly ranked investment banks.

In a study that includes both debt and equity offerings and both IPOs and SEOs, Ljungqvist, Marston and Wilhelm (2006) argue that the effects of analysts are limited to whether a bank has an all-star analyst within the issuer's industry; banks do not win more underwriting business through inflated analyst recommendations.[65] Their findings highlight the importance of long-term relations between the bank and the firm, for example whether the bank has underwritten past bond, loan, or equity offerings or has an equity investment in the firm, as determinants of bank selection.

The strategic upward bias in analyst recommendations harms market efficiency, and it predominantly affects the small investors who rely more on the information provided. The former New York State Attorney General, Eliot Spitzer, investigated the analyst activity of the largest investment banks. The investigation found that most banks directed their analysts to issue only bullish recommendations. The Global Analyst Research Settlement (Global Settlement) of April 28, 2003 is an enforcement agreement that was reached as an outcome of this investigation. Ten investment banks (Bear Stearns, Credit Suisse First Boston, Deutsche Bank, Goldman Sachs, J.P. Morgan Chase, Lehman Brothers, Merrill Lynch, Morgan Stanley, Salomon Smith Barney, UBS Warburg) cumulatively paid $1.4 billion in fines under the Global Settlement. Also, banks were required to isolate their banking and analyst departments with so-called "Chinese Walls". For instance, analysts were no longer allowed to participate in the IPO roadshows. As noted earlier, the Global Settlement also increased the length of the quiet period from 25 to 40 days and enforced the

[65] Ljungqvist, Marston and Wilhelm (2009), using a similar sample of IPOs, SEOs, and debt offerings, conclude that the selection of co-managers is positively related to analyst optimism.

disclosure of historic analyst rankings, allowing investors a better relative perspective on how bullish the analyst really is.

Kadan, Madureira, Wang, and Zach (2009) explore the changes in analyst behavior after the Global Settlement. They find that sanctioned banks switched from a five category ranking to a ranking with only three categories: optimistic, neutral and pessimistic. Moreover, the frequency of optimistic recommendations significantly decreased after the Global Settlement. Their results suggest that following the Global Settlement there is no longer a significant difference in the recommendations of affiliated versus unaffiliated analysts. Consistent with the notion that recommendations were biased prior to the GS, they find that following the implementation of the new ranking system, market reactions to optimistic recommendation became stronger while reactions to negative and neutral recommendations became more negative. In sum, their results indicate that the Global Settlement had some success in alleviating of conflicts of interests within underwriter banks.

More recently, the JOBS Act has again allowed for changes in the role of analysts. The JOBS Act aimed to increase the net benefits of going public for IPO issuers with less than $1 billion in pre-IPO annual revenue, and one portion of the Act was to increase the involvement of research analysts. Specifically, analysts affiliated with the underwriter are allowed to attend pitch meetings, to attend due diligence sessions, and to interact with potential investors prior to the IPO. Importantly, the JOBS Act did not relax the restrictions on analyst compensation, which were put in place as part of the Global Settlement. Dambra, Field, Gustafson, and Pisciotta (2016)

examine whether this involvement of affiliated analysts contributes to: (1) more accurate earnings forecasts, which would potentially benefit the company through the lower information asymmetry, or (2) more optimistically biased earnings, which would potentially help the bank through increased banking or trading revenues. Analyses of firm abnormal returns and of trading volume support the importance of the latter factor. In sum, the pre-IPO involvement of the research analysts appears to benefit the bank rather than the firm.

Going back to Rock (1986) and Benveniste and Spindt (1989) IPO underpricing theories have posited that institutional investors have an informational advantage and that as a result of this advantage they obtain greater allocations of underpriced shares. As discussed in Section 4, several papers have examined allocations to the IPO, as a way to better understand the ways in which the bookbuilding mechanism rewards institutional investors. In addition to these previously discussed studies, another stream of literature has examined institutions' behavior in the aftermarket, with a focus on the extent to which institutions play a supportive role for cold IPOs, the extent to which institutions' information advantage continues after the IPO, and the extent to which institutions profit from their allocations.

Underwriters who are trying to support the price of IPOs that received a cold shoulder by the market, (for example cases in which the underwriter engaged in price support to avoid a precipitous price drop after the IPO; see section 3 for a discussion), have an obvious preference that institutions hold on to their shares rather than quickly flip their shares. From the perspective of institutions, incentives are more nuanced.

Looking at the P&L for any given IPO, institutions would prefer to quickly sell their shares if they believe its price is going to go down, in an effort to limit losses. However, since underwriters potentially link allocations of subsequent IPOs to such flipping behavior, institutions may optimally elect to hold 'cold' shares longer. Both Aggarwal (2003) and Chemmanur, Hu and Huang (2010) find evidence to support the latter scenario. Using a sample of proprietary data on 193 IPOs managed by nine large investment banks over the May 1997 – June 1998 period, Aggarwal finds that approximately 15% of shares offered are flipped within the first two days, with flipping being higher among institutional investors and in hot IPOs. Using a combination of 13F data and proprietary transaction-level trading data from Abel/Noser Corporation to examine the trading of 419 large institutions across 909 IPOs between 1999 and 2004, Chemmanur, Huang and Hu (2010) find that underwriters reward those institutions that hold cold IPOs longer with higher allocations in subsequent underpriced IPOs. In addition to shedding insight on flipping behavior, an important conclusion from these findings is that flipping makes quarterly 13F holdings a very imperfect proxy for IPO allocations, a point that future researchers should bear in mind.

Field and Lowry (2009) investigate the relation between institutional holdings and post-IPO returns over longer intervals. Focusing on holdings at least six weeks after the offering (after the effects of price-support and flipping restrictions have wound down), they find that institutional ownership is significantly positively related to post-IPO performance. Institutions are significantly less likely to hold shares in those companies with especially poor post-IPO long-run performance. They conclude

that institutions' superior performance, compared to that of individuals, stems from a superior ability to analyze the publicly available data. Institutions disproportionately invest in the types of firms that earn significantly higher abnormal returns, for example firms that are venture backed, were backed by higher-ranked underwriters, etc.

Chemmanur, Hu, and Huang (2010) similarly conclude that institutions have an informational advantage during the months after the IPO, but unlike Field and Lowry they conclude that private information contributes to this advantage. They further find that only the trades of institutions that participated directly in the IPO (i.e., who were allocated shares) are predictive of subsequent returns, and they conclude that institutions' information advantage arises from participation in the IPO. However, the fact that participation in any IPO represents a choice makes it difficult to differentiate this interpretation from one driven by sample selection, where those institutions that choose to participate are those with incremental insight into firm value.

IPO cycles

As first documented by Ibbotson and Jaffe (1975) and Ibbotson, Sindelar and Ritter (1988, 1994) and as highlighted in Figures 3.1 and 3.2, the IPO market is characterized by dramatic fluctuations over time. Both the number of companies going public and average initial returns vary substantially, with the periods of highest initial returns being followed several months later by peaks in the number of IPOs. In addition, the figure also highlights the secular decrease in the number of IPOs starting in 2000 (which we discussed in previous sections). Cycles in the post-2000 period are

more muted, with 'hot markets' being 'less hot', compared to the hot markets of the late-1990s or mid-1980s. Finally, there is some evidence of cycles in post-IPO outcomes as well. For example, looking at Figure 3.14 we see that the percent of firms delisting for poor performance was substantially higher among those issued during the hot markets of the mid-1980s and late 1990s. Fama and French (2004) document that whereas 17% of firms going public in 1973 delisted for poor performance within ten years, this increased to 44% of firms going public between 1980 and 1991. Figure 3.14 indicates that this percentage has been lower in more recent years.

What is the reason for these cycles and for the empirical regularities associated with them? Similar to examinations of other patterns in IPO markets, the literature has debated whether these fluctuations are driven by irrationalities (e.g., investor optimism) or whether they are consistent with efficient markets. Posited explanations in the literature include:

- Fluctuations in investor sentiment, which cause investors to overvalue equity and to overpay for newly public companies during some periods
- Fluctuations in demands for capital, for example as driven by variation in marcroeconomic conditions
- Fluctuations in market-wide information asymmetry, which affect the costs of issuing equity
- Variation in the real option of staying private
- Product-market effects

In an attempt to understand why so many companies go public during some periods, combined with so few during others, Lowry (2003) focuses on the first three of these potential explanations: demands for capital, investor sentiment, and information asymmetry. In a series of regressions of IPO volume on proxies for each of these factors, combined with analyses of post-IPO returns of companies going public during different periods, she finds strong support for the first two factors, combined with minimal support for the third. Consistent with more companies going public when economy-wide conditions are favorable and thus firms' demands for capital higher, the number of IPOs is significantly positively related to the future sales growth of all publicly traded firms and to the change in the number of new companies incorporating, a measure of new business creation.[66] Investor sentiment also plays an important role, as evidenced by the finding that IPO trading volume is negatively related to both the closed-end fund discount and to future market returns. In economic terms, she concludes that variation in investor sentiment has an effect two times larger than demand for capital.

Pastor and Veronesi (2005) come to a different conclusion regarding the effects of mispricing. They present a real options model of the decision to go public, where mispricing plays no role. Rather, the decision is a function of expected market returns, expected aggregate profitability, and prior uncertainty. Variation in these factors causes variation in managers' decisions to exercise their options to go public.

[66] It is intriguing that the number of IPOs is positively related to future sales growth of publicly traded companies and future GDP growth, as shown by both Lowry (2003) and Gao, Ritter, and Zhao (2013), but negatively related to future market returns (as discussed in more detail below). This combination of findings is consistent with Pastor and Veronesi's model, which suggests that more companies tend to go public when growth opportunities have been priced into stocks; the realization of these growth opportunities is observed through subsequent sales and GDP growth.

The result is cycles in IPO volume that are generated without any mispricing. In a similar vein, Benninga, Helmantel and Sarig (2005) also consider the decision to go public as a trade-off: managers lose private benefits of control, but gain capital to grow the firm as well as the ability to diversify. When expected future cash flows are higher, for example as a result of a positive economic shock, the net benefits of going public are more likely to be positive. Because firms' cash flows are cross-sectionally correlated, we observe cycles in IPO volume.[67] These models however, are unable to explain the significantly higher failure rate among firms who go public during hot markets.

Beyond the cycles in the number of companies going public, perhaps even more puzzling is the strong autocorrelation in initial returns, combined with the fact that the periods of highest initial returns are followed several months later by the periods of highest number of IPOs. This simple statistical pattern appears to raise an interesting issue: why would companies choose to go public when underpricing is particularly high? Several explanations have been posed, though many share certain common features. Lowry and Schwert (2002) conclude that the serial correlation in initial returns is entirely driven by two factors: changes in the types of firms that go public over time (with certain types of firms tending to be more underpriced than others, see, e.g., Rock (1986), Beatty and Ritter (1986)), and by information that becomes available during the registration period but is only partially incorporated into

[67] Chemmanur and He (2011) argue that product market effects can cause cycles in IPO markets to arise in the absence of either productivity shocks or investor sentiment. If the proceeds raised through an IPO enable a company to compete more aggressively, then a company may decide to go public as a means to gain market share. However, the fact that a competitor plans to go public potentially causes other firms in the industry to also go public, as a means to avoid losing market share.

the offer price (with positive information learned during the filing period being associated with higher price updates and higher initial returns, see, e.g., Benveniste and Spindt)). In sum, the answer that this paper provides to the apparent puzzle posed at the beginning of this paragraph "why would companies choose to go public when underpricing is particularly high" is that high recent underpricing does *not* mean that a company will be more underpriced; rather, it indicates that high information asymmetry companies have been going public and it suggests that the company will be able to raise more money than previously expected. As discussed below, subsequent studies that have investigated whether these hot markets represent periods when the market fundamentally overvalues these IPO firms (for example through examinations of post-IPO returns) reach different conclusions.

Another possible explanation for this relation is related to Purnanandam and Swaminathan's (2004) findings. They show that while IPOs are priced relative to their trading peers (e.g., industry comparables), they are priced in comparison to the left tale of the trading peers' distribution. Thus when the market is over-valued, we see a phenomena of high first day returns, as we documented above. Also when the market is over-valued more firms go public because they receive high valuations. Thus the positive association between IPO volume and large first day returns is not causal but rather due to the omitted over-valuation of all firms in the economy or industry, which causes more firm to go public.

The conclusion that economic shocks in conjunction with information spillovers generate many of the observed cycles in IPOs, including both the numbers of IPOs and average initial returns, has also been shown empirically by Benveniste,

Ljungqvist, Wilhelm and Yu (2003) and theoretically by Alti (2005), who discuss the ways in which information learned by one company affects the decisions of subsequent companies to go public. Across this literature, there is a common consensus that at least a portion of cycles represent the effects of learning: if the first company learns that the market values it more highly than expected, then subsequent companies are more likely to go public. This conclusion is consistent with practitioner accounts of one company 'testing the waters', and other companies waiting to observe how that offering will be received by the market.

Finally, several papers have focused on the role of the underwriter in generating the observed cycles. On the one hand, if more information is produced when many companies go public, then underwriters have incentives to encourage clustering in the volume of companies going public (see, e.g., Benveniste, Ljungqvist, Wilhelm and Yu (2003); He (2007)). Alternatively, if the underwriter has certain constraints in labor supply, then it may be less able to accurately value companies when the number of IPOs is extremely high (see, e.g., Khanna, Noe and Sonti (2007)). Finally, if underwriters have greater market power during periods when more companies are going public (for example if companies are all competing for coverage from the highest profile analysts), this would similarly contribute toward a positive relation between underpricing and the number of companies going public (see, e.g., Liu and Ritter (2011)). Boeh and Dunbar (2016) find evidence in support of this last theory.[68]

[68] Specifically, Boeh and Dunbar use the number of companies that register to go public after the IPO of focus, to avoid endogeneity issues. They find that this pipeline measure is positively related to underpricing.

A common idea behind many of the above conclusions is that the type of firm going public varies over time. The 'efficient markets' explanation is that a technological innovation or economic shock causes certain firms to demand more capital to fund positive NPV projects, for example firms in certain industries or riskier firms whose prospects had previously been less certain. Alternatively, the 'investor sentiment' explanation is that lower quality firms will go public during hot markets, when the firms are able to raise equity at a price exceeding true value. Within the empirical literature, there is a lack of consensus on both the extent to which firm type varies over cycles and whether efficient markets versus investor sentiment explanations can better explain observed patterns. Our view is that both factors play significant roles. Macro-economic conditions that influence demand for capital almost certainly are important. However, beyond this, many patterns in the data suggest the influence of over-valuation: during hot markets, riskier firms are able to raise capital and first day returns are significantly higher, suggesting that investors view those firms' cost of capital lower than their underwriters and participating institutions. Finally, there is evidence that firms going public during hot market under-perform in absolute terms.

An alternative to examining firm characteristics directly is to focus on post-IPO performance. Yung, Colak and Wang (2008) find that companies going public in hot markets have both a higher *standard deviation* of post-IPO long-run abnormal returns (measured for example over the three to twelve months after the IPO) and are significantly more likely to have the extremely bad outcome of delisting for poor performance, as we also show in Figure 14. This evidence is consistent with greater

dispersion in the types of companies going public in hot markets, including more lower quality firms. However, it doesn't directly address the question of whether hot market IPOs are on average more overpriced, as the authors do not compare *average* abnormal returns.[69]

Lowry, Officer and Schwert (2010) examine variation in firm type through a very different avenue. They note that Beatty and Ritter's (1986) extension of Rock's (1986) model predicts that higher information asymmetry companies will tend to have both a higher level of initial returns and a lower precision of pricing. In other words, to the extent that certain periods are characterized by higher information asymmetry companies, we would expect both the average level and the volatility of underpricing (measured as average initial returns, and as the cross-sectional standard deviation of initial returns, respectively, across all IPOs in a month) to be higher. Consistent with this conjecture, they find a strong positive correlation between these series, leading to the conclusion that a substantial portion of the cycles in initial returns is driven by variation in the information asymmetry of the firms going public, combined with underwriters' challenges in accurately valuing these types of firms.

The evidence in Lowry et al (2010) is important but does not address the extent to which changing investor sentiment (and firms' associated abilities to capture over-valuation) contributes to cycles in IPO volume. That is do firms going public in hot

[69] Helwege and Liang (2004) examine variation in firm characteristics directly, over hot versus cold markets. They fail to find consistent evidence of hot market IPO firms being riskier, or more characteristic of young start-ups. For example, while hot market IPOs have lower operating income, they are similar to cold market IPOs in terms of firm age and industry-adjusted market-to-book ratios. It would be interesting to revisit this issue using more recent data, and perhaps data from around the globe.

markets perform worse. While clearly important, we discuss this issue last because there is not a clear answer in the literature. Early papers such as Ritter (1991) and Loughran and Ritter (1995) conclude that hot market IPOs perform significantly worse in the long-term. In a cross-sectional regression of post-IPO three year raw returns on market returns over the same period, IPO volume and various controls, Ritter (1991) finds a significantly negative coefficient on IPO volume. Using Fama-MacBeth regressions of monthly stock returns on firm size, book-to-market, and an issue dummy equal to one if the firm had an IPO or SEO over the past five years (1970 – 1990 period), Loughran and Ritter (1995) conclude that firms going public in hot markets underperformed by 60 basis points per month, compared to only 17 points per month for firms going public in cold markets.[70]

Lowry (2003) finds that this conclusion regarding the greater underperformance of hot market IPOs is sensitive to test specification. Looking at abnormal returns of IPO firms relative to matched size and book-to-market portfolio benchmarks (1973 – 1996 period), she confirms that firms going public in the lowest IPO volume quartile periods tend to perform the best, but finds little evidence that abnormal returns are monotonic across the other quartiles or that the highest IPO volume quartile periods tend to perform the worst. Further, the negative relation between IPO volume and post-IPO performance is strongest when using raw returns, and weakest (and insignificant) when using size and book-to-market abnormal returns.

[70] Specifically, for each of the 240 calendar months within the sample period, Loughran and Ritter estimate a cross-sectional regression of monthly returns across all stocks on firm size, market-to-book, and an issue dummy equal to one if the firm had an IPO or SEO within the past five years.

She concludes that firms are more likely to go public when they and also other similar firms are valued more highly by the market.

However, it is important to note that ALL researchers agree that firms that go public during hot cycles do not perform well and investing in those IPOs results in a negative return on investment. The debate is whether this under-performance is unique to IPOs or also common to other non-IPOs with similar characteristics.

Corporate Governance of IPO Firms

As noted by both Baker and Gompers (2003) and Field and Karpoff (2002), pre-IPO shareholders have strong incentives to implement a corporate governance structure that maximizes firm value. While the governance of mature firms generally represents the cumulative effects of many past decisions that may no longer be optimal for the firm, IPO firms start from a relatively blank slate; firms generally make many choices relative to governance shortly before going public. However, this is not to say that IPO firms are immune from agency issues. For example, powerful CEOs might strive to protect the control they wielded prior to the IPO, to ensure continued control after the firm goes public; or controlling shareholders may implement a structure that is not in the best interests of minority shareholders. The novelty of the corporate governance decisions of IPO firms combined their dynamics as firms mature makes IPO firms a particularly attractive setting in which to examine corporate governance.

As highlighted by Coles, Daniel and Naveen (2007), one-size-fits all formats for corporate governance are unlikely to be optimal. However, to the extent that the majority of research focuses on the same set of S&P1500 firms, our body of knowledge and associated regulatory changes are likely made based on one fairly

homogenous set of firms, a concern voiced by Hermalin and Weisbach (2003). In a related vein, there is growing evidence that proxy advisory firms both have broad influence and base their recommendations on one-size-fits-all policies (see, e.g., Iliev and Lowry, 2015). Such practices have potential to harm newly public firms if they push these firms to implement policies that do not maximize firm value. In light of such issues, we focus our discussion on papers that highlight differences between IPO firms and their more mature counterparts, including the economic reasons for the differences and they ways in which these differences are likely to affect governance structures.

Motivated by firms' strong incentives to establish optimal structures when raising equity for the first time, Baker and Gompers (2003) was one of the early papers to focus on the governance structure of IPO firms. Their results highlight the positive influence of a concentrated shareholder such as a venture capitalist. Venture capitalists actively influence Board structure, as evidenced by the fact that the Boards of VC-backed firms tend to have more outsider directors. More reputable VCs are particularly influential, for example being more likely to fire the CEO prior to the IPO. However, the paper also demonstrates that agency issues can play a role even at this early point in a firm's life cycle. More powerful CEOs successfully limit the influence of VCs, for example by limiting the number of Board seats they hold. Hellmann and Puri (2002) provide further evidence on the ways in which venture capitalists influence start-up firms, for example in influencing human resource policies and encouraging the adoption of stock option plans.

Field and Karpoff (2002) highlight the ways in which agency issues play a role, at the time the firm is setting up its governance in preparation to go public. Within their sample of over 1,000 IPOs between 1988 and 1992, over 50% have at least one takeover defense at the time of the IPO. Their body of evidence is consistent with managers implementing these defenses as a means to maintain their private benefits of control.

The interplay of pre-IPO investors' demands for optimal governance structures combined with managers' incentives to maintain private benefits of control raises questions regarding the ways in which governance varies cross-sectionally and evolves over time, for example across firms whose businesses yield different demands for governance and whose ownership structures imply different private benefits of control. In this vein, Boone, Field, Karpoff and Raheja (2007) find that demands for monitoring, agency issues, and the power of the CEO all influence Board structure. More complex firms demand larger Boards and more independent directors to perform the greater amount of monitoring. Firms in which there are more private benefits available to insiders also tend to have larger Boards to perform the necessary monitoring, but this relation is weaker in cases where the cost of monitoring is high, for example among firms with high return variance or high R&D. Finally, consistent with Hermalin and Weisbach (1998), CEO influence also plays an important role: CEO's with higher ownership and longer tenure have fewer independent directors on the Board, particularly in cases where there are fewer constraints on the CEO, for example when ownership of outside directors is low and there is no VC. As firms evolve over the years following the IPO, with firms generally becoming more complex

and ownership of pre-IPO shareholders decreasing, the structure of the Board evolves as well.

This evidence on the evolution of the Board suggests that the governance of IPO firms should differ from that of more mature firms, an issue that Field, Lowry, and Mkrtchyan (2013) examine directly. Broadly speaking, the Board is tasked with monitoring and advising management. Field et al argue that newly public firms differ both in their demands for monitoring and in their demands for advising (compared to their more mature counterparts): the inexperience of management in running a public firm contributes to a high demand for advising, whereas the high ownership of pre-IPO owners leads to lower agency costs and thus a relatively low demand for monitoring. As such, these firms should seek to hire directors that have an expertise in advising, focusing less on their monitoring capabilities. In particular, IPO firms should benefit from busy directors, defined as directors that serve on three or more Boards, because such directors likely have substantial experience and connections that increase their value as advisors. The fact that they also likely have less time to diligently monitor the firm should be less of a concern, because of the relatively low agency costs in these firms. Empirical tests focusing around the time of the IPO provide strong support for these conjectures. As firms mature, the type of director also changes in ways that are consistent with demands for monitoring increasing and demands for advising decreasing – specifically, firms choose far fewer busy directors as they mature.

Chahine and Goergen (2013, 2014) emphasize in several papers that IPO firms also likely differ in their access to high quality directors. Management is likely to

have a smaller network, compared to their counterparts in more mature, larger firms. While not highlighted in these papers, we would argue that these effects are likely concentrated in firms that are not backed by a venture-capitalist.

Johnson, Karpoff and Yi (2015) provide further evidence on the ways in which IPO firms' have unique demands for governance. To the extent that IPO firms are more likely to be taken over after going public, for example because the owners have less control, a firm's business partners have reasons to be concerned. Specifically, if the IPO firm is taken over, the pre-existing relationships become more uncertain. The IPO firm can protect the value of these relationships through the use of take-over defenses. Consistent with these arguments, Johnson et al find that among firms with such relationships, the use of takeover defenses is positively related to the longevity of these relationships and to post-IPO operating performance.

Johnson et al's findings are consistent with the more general argument that anti-takeover provisions can potentially provide a benefit, in addition to a cost. The benefit is that it allows the firm to pursue a longer-term growth strategy. A firm with lower risk of being subject to a takeover is less concerned with short-term results. This is beneficial if it gives managers the flexibility to pursue long-term positive NPV projects, but costly if it allows managers to enjoy the quiet life or otherwise overconsume perquisites.

Perhaps reflecting differences in these cost-benefit trade-offs, Field and Lowry (2017) show striking differences between IPO firms and more mature firms in the choice to have a classified board. The percent of IPO firms with classified boards has increased from 40% in 1990 to nearly 80% as of 2014. In stark contrast, the percent of

mature firms with classified boards has decreased from 60% to 40% over the same period. Coincident with these trends, the percent of IPOs firms incorporating in Delaware has also dramatically increased, from 57% to 88%, a decision that arguably decreases litigation-related uncertainty for firms (see, e.g., Romano, 1985). Field and Lowry conjecture that these trends in IPO firms' governance choices are related to an increase in activism, in particular by proxy advisory firms such as ISS. If entities such as ISS fail to appreciate the unique governance demands of IPOs, for example the directors who are best qualified to advise the newly public firms, then the firm might be at greater risk of suboptimal outcomes in shareholder votes. Firms can potentially protect themselves from such risks by only putting directors up for vote every three years, i.e., by having a classified board. An analysis of voting data provides support for these conjectures.

Field and Lowry also find cross-sectional differences in these time trends, with the trend toward classified board being particularly high among R&D intensive firms. This is consistent with Manso's (2011) hypothesis that that a long-term focus, as would be facilitated by a classified board, encourages innovation. In a similar vein, Baranchuk, Kieschnick, and Moussawi (2014) find that IPO firms focused on innovation tend to employ incentive compensation and long vesting periods.

The governance structure that provides the strongest protection to management is arguably a dual-class structure. Conditional on the B-shares having sufficient voting power, it is impossible to oust management. Consistent with this, Smart and Zutter (2003) find that firms that go public with a dual class structure experience far fewer control events. Moreover, consistent with agency costs being higher in such

firms, Smart and Zutter also find that the stock of dual-class firms trades at lower values, and top management receives higher compensation. Similarly, Arugaslan, Cook, and Kieschnick (2010) conclude that dual class structures are driven by private benefits of control, rather than an effort to focus managers on the long-term rather than short-term stock fluctuations. As with much of the earlier research in corporate governance, a potential concern relates to the possibility that dual class structures are concentrated within certain types of firms, and these firm typ

Aes tend to have offer higher compensation irrespective of whether they have dual-class stock. Future research that can better address these issues is important, particularly in light of the fact that while dual class structures are becoming less common in mature firms, Field and Lowry document no evidence of such a decline in IPO firms. In fact, many of the high-flying IPOs, such as Google, Facebook Twitter and more went public with dual-class share structure.

Consistent with theory, Kim and Michaely (2017) find that the benefits of dual class shares vary with firm age, where dual class structure is more beneficial on net for young firms. They find no evidence of a dual-class valuation discount for young firms, while there is a significant discount for old firms. In addition, young dual-class firms show marginally higher ROA and operating margins than young single-class firms, while old dual-class firms exhibit statistically indistinguishable performance from old single-class firms. In contrast to these findings on operating profitability, they find evidence that old dual-class firms use "assets-in-place" (capital and labor stocks) less efficiently than older single-class firms, but again, this is not the case for young firms. In particular, old dual-class firms have significantly lower asset turnover and labor

productivity, and their capital expenditures and employment changes are significantly less responsive to changes in Tobin's q, a proxy for investment opportunities, all relative to old single-class firms. These results suggest that old dual-class firms may face higher costs of capital due to higher capital and labor adjustment costs. Consistent with this explanation, they find that old dual-class firms' equities have significantly higher loadings on the Fama-French value factor and higher expected returns.

In a similar vein, Johnson, Karpoff and Yi (2016) find that the value of takeover defenses declines as firms age, where they examine the six provisions in the E-index: classified boards, poison pills, golden parachutes, and supermajority requirements to change firm bylaws, to change the firm charter, and to approve mergers. They argue that while companies would optimally remove such defenses as they progress through the life cycle, takeover defenses are sticky. As a result, older firms in many cases continue to have defenses that no longer contribute positively to firm value.

The underlying assumption of a strong corporate governance structure is that this positively affects the quality of management, for example because directors incur the greater costs of searching for higher quality management to hire and because they are more likely to fire underperforming managers. Chemmanur and Paeglis (2005) evaluate directly the effects of management quality in IPO firms.[71] In addition, to providing informative descriptives across this wide set of factors, the documented

[71] The authors characterize management quality as higher if: the firm has a greater number of officers of rank vice-president or higher adjusted for firm size; a greater percentage of firm management has an MBA degree; a higher percentage of the management team has past work experience as a vice-president or higher or past experience as a partner in a law or accounting firm; average tenure of the management team is higher, suggesting greater cohesion of the team; a greater number of non-profit Boards on which the management team sits. In addition, the authors also consider CEO dominance, measured as the percent of total management compensation earned by the CEO.

relations between these metrics and firm outcomes confirms the importance of a high quality management team. Specifically, all else equal, firms with higher quality management teams successfully hire more reputable underwriters, raise more equity in the IPO, and attract more institutional investors. In the long-run, there is some evidence of a positive relation between the quality of the management team and performance. The authors focus on non-VC backed firms in this paper, to ensure that they capture the effects of management per se, rather than the VC. In a more recent paper, Chemmanur, Simonyan and Tehranian (2014) find that the VC has a direct effect on management quality, and that within VC-backed firms both the venture capitalist and the quality of the management influence post-IPO outcomes of the firms.

In addition to choosing management, the Board of Directors also controls the compensation of top management. While there has not been a lot of research on compensation within IPO firms, Pukthuanthong, Roll, and Walker (2007) document that the average firm has a substantial number of options at the time of the IPO with options equal to 50% of shares offered in the IPO. They find that a balanced combination of equity ownership and options is positively related to post-IPO operating performance, which they argue is consistent with the options providing higher incentives but potentially encouraging excessive risk taking, where the latter influence can be mitigated through equity ownership.

Finally, one of the important aspects of studying the corporate governance of IPOs is that it can potentially inform us on issues beyond IPOs. For example, it can inform us on the importance of fitting the firm's governance to the firm's life cycle stage. Young firms may not have the same optimal governance structure as more

mature firms. For example, concentrated ownership (or equivalently dual class share structure) may be beneficial early on in the life of the firm. It may have a different effect on value for more mature firms. Examining these dynamics around the IPO is informative. Consistent with these ideas, the evidence on the evolution of the Board suggests that the governance of IPO firms should differ from that of more mature firms. Similar effects likely apply for takeover provisions.

Conclusion

Public markets are an essential element of well-functioning capital markets. Public markets can potentially lower firms' cost of capital, enable the general public as well as entrepreneurs to hold diversified portfolios, allow for liquidity at relatively low costs, and facilitate effective monitoring of firms. By implication, it is essential that private, typically young firms move from the private to the public market by offering their shares to the public. This process, the IPO process, is what we have attempted to describe and explain in this chapter.

This chapter both provides an overview of the many parties involved in bringing a firm public and highlights the ways in which the incentives of each influence the entire process. The IPO company's management, who in many cases represent the firm's founders, are generally motivated by a combination of maximizing shareholder value and retaining some private benefits of control that they may have enjoyed while the firm was private. However, this management also in many cases has limited experience with the IPO process, which potentially makes

them more dependent on intermediaries. Intermediaries are generally more experienced, but there exist the potential for agency costs within each: the venture capitalists and banks that provide funding to the firm in its more nascent stages, the underwriters that manage the firm's first public equity offering, and the institutions and analysts that potentially influence the stock price once the firm is public. Finally, layered on top of all of these various incentives, evidence suggests that behavioral biases within the public markets also influence the price at which companies' can raise capital.

In aggregate, all of these factors influence the costs and benefits of going public. It is important to remember that if going public was all good, i.e., that there were only benefits to going public, many more firms, would have gone public. There are costs involved in both the process and the outcome (being public); and these costs vary among firms. In the wake of the recent downturn in the number or companies going public, several recent papers have attempted to shed light on the costs versus benefits of being a publicly traded firm versus a private firm.

In a frictionless, Modigliani and Miller (1958, 1961) world, private and public firms should behave similarly: capital structure should be irrelevant, cost of capital should not vary across firms, and firms should take all positive NPV projects. However, once frictions are introduced, theory suggests various differences.

Consistent with theory, empirical evidence has found significant differences. For example, consistent with public listing lowering information asymmetry and increasing liquidity, Brav's (2009) examination of private and public firms in the United Kingdom leads him to conclude that private firms have a higher cost of capital.

Empirical literature regarding the effects of public listing on investment behavior are more nuanced. Together, findings from Gilje and Taillard (2016) and Asker, Farre-Mensa and Ljungqvist (2015) demonstrate that public listing can have both a positive and a negative effect. On the one hand, public firms' increased access to capital makes them better able to undertake positive NPV projects, an advantage that is particularly significant among capital-intensive positive projects. However, public firms also suffer from heightened agency-related issues such as managerial myopia, which causes more short-term managers to avoid some positive NPV projects. Bernstein (2015) and Gao, Harford and Li (2013) provide added evidence suggesting that agency costs influence the investment behavior of public firms relative to their private counterparts, causing them both to engage in less innovation and to hold substantially more cash.

In sum, a growing body of literature employs samples of private and public firms, combined with clever empirical specifications, to highlight both the benefits as well as the costs of public listing. While public listing confers benefits such as a lower cost of capital, it comes with the nontrivial cost of higher agency-related issues that can distort investment decisions. Further research along these dimensions is important, particularly in light of the decreasing numbers of companies going public.

As we highlighted throughout this chapter, there are other issues related to the IPO process where we feel further research is warranted. There are many potential reasons why firms may want to go public, but it is not clear we have a good understanding which are the dominant drivers behind the decision. This is of first order importance. The answer to this question is not only important in its own right

but can also help understand other phenomena such as why firms are underpriced at the time of the IPO and when firms choose to go public.

Another unresolved issue is the optimal going public mechanism. On the face of it, a mechanism that results in an average of 16.4% first day return and which has an opaque allocation mechanism that is subject to possible abuses is unlikely to be the optimal mechanism. We need a better understanding why bookbuilding is still the most common and dominant going public venue. And this issue may also be related to the high fees extracted by underwriters through the process.

Finally, how to structure the optimal corporate governance for young firms is another open question. For example, we are seeing a large number of IPOs coming out to the market with a anti-takeover devices such as a classified board and a dual share structure; which are generally viewed as suboptimal among mature firms. It is possible and quite likely that considering the dynamics of corporate governance and how it is related to firms' maturity will yield new and interesting insights

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