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The New Game in Town: Competitive Effects of IPOs

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ABSTRACT

We analyze the effect of initial public offerings (IPOs) on industry competitors and provide evidence that companies experience negative stock price reactions to completed IPOs in their industry and positive stock price reactions to their withdrawal. Following a successful IPO in their industry, they show significant deterioration in their operating performance. These results are consistent with the existence of IPO-related competitive advantages through the loosening of financial constraints, financial intermediary certification, and the presence of knowledge capital. These aspects of competitiveness are significant in explaining the cross-section of underperformance as well as survival probabilities for competing firms.

AN EXTENSIVE LITERATURE analyzes the performance of companies around their initial public offerings (IPOs). This literature focuses on returns on the first day of trading, as well as on returns and operating performance for the 5-year period after the IPO. For example, Ibbotson and Jaffe (1975) document a positive initial return for newly issued companies, while Ritter (1991) analyzes the long-run stock price performance of IPOs and Jain and Kini (1994) consider firms' post-IPO operating performance. Our article adds a new dimension to this literature by considering not only the stock market and operating performance of the issuing company, but also the impact of the IPO on the performance of industry competitors.

The competitive effects of IPOs have important implications for various agents including investors, industry competitors, and issuing firms. Issuing companies comprise a relatively small portion of portfolio value; in this article's sample, for instance, existing and publicly traded firms comprise 97.5% of the total post-IPO market capitalization of industries in which IPOs occur, while IPO firms comprise only 2.5%. It is therefore important for investors to know how an IPO affects the operating and stock market performance of

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existing firms when making portfolio allocation decisions. Similarly, firms that compete with IPO candidates need to understand how the new issuance affects their competitive environment and how they can strategically respond to it. Finally, Pagano, Panetta, and Zingales (1998) show for a sample of Italian companies that the likelihood of an IPO increases with the size of a company and the market-to-book ratio in the industry in which a company operates. The latter result suggests that market timing is an important determinant of a company's issuance decision. Another important determinant may be the substantial change and improvement in its competitive position from going public. While some private companies compete well with public companies in the same industry and thus stay private, other companies may decide to go public to gain additional competitive advantages.[1] In this article, we investigate the returns and operating performance of publicly traded firms around the time of large IPOs in their industry. Our results are consistent with the view that issuing firms have competitive advantages over their publicly traded industry peers, advantages that are related to the IPO itself.

This article has two goals. The first is to measure the performance of publicly traded firms around IPOs in their industries. If IPO firms can successfully compete against publicly traded firms, then we would expect these competitors to perform worse after the IPO. We show that, indeed, industry competitors experience negative stock price reactions around IPOs and a significant deterioration in their operating performance after these IPOs. Moreover, as further evidence that IPOs are responsible for this underperformance, we show that withdrawn IPOs have the opposite effect: publicly traded firms respond positively to the withdrawal of an IPO in their industry.

Our second goal is to explain the underperformance of publicly traded firms by examining the relation of cross-sectional differences in performance and survival to firm competitiveness. We identify several possible determinants of the competitive advantage of IPOs over industry peers, including lower leverage, recent certification by financial intermediaries, and operational differences such as higher levels of knowledge capital. We find that the performance and survival of publicly traded competitors are both related to all three of these determinants. In what follows, we briefly describe each determinant.

First, as a direct consequence of the IPO, the offering recapitalizes the issuing firm in a way that generally results in a low debt-to-equity ratio. Low leverage may give issuing firms an advantage over their more highly leveraged competitors by allowing them more flexibility in their investments. This effect has been documented empirically in papers outside the IPO literature. For example, Chevalier (1995) finds an increased incidence of exits of highly leveraged supermarkets; similarly, Phillips (1995) finds that output is negatively associated with debt levels in three industries.[2] To the extent that IPO firms

[1]The descriptive statistics in Table II show that the IPO sample firms are on average 23.41 years old at the point of the IPO and have thus competed as private firms for a considerable period of time before the IPO.

[2]Zingales (1998) shows that a company's leverage and profitability are significant determinants of its continued existence. Campello (2003) similarly analyzes the impact of leverage on companies'

are less highly leveraged than their industry competitors, leverage differences are expected to be an advantage for these issuers.

Second, issuing firms have the advantage of being recently certified by investment banks. Although the market certifies firm value as shares are traded, Chemmanur and Fulghieri (1994) suggest that highly regarded investment banks play an important role in certifying new issues.[3] To the extent that the certification effect is stronger for new issues, the certification role of investment banks affects investors' willingness to purchase new issues as opposed to shares of other firms in the same industry. Investors rely on the repeated interactions of these banks with issuers and on the banks' ability to reject underwritings for low-quality issues. In other words, firms underwritten by top investment banks have been selected because of their potential for success, and this can convey an advantage for issuing firms.

Third, new entrants may have some nonfinancial advantage over their industry competitors and a nonfinancial advantage may make issuing firms more attractive to investors. Higher quality firms are more likely to go public than lower quality firms, as Stoughton, Wong, and Zechner (2001) suggest. One example of a nonfinancial business advantage is knowledge capital, as described in Cockburn and Griliches (1988). These researchers study the effectiveness of patents in protecting knowledge capital developed through research and development—knowledge capital that gives firms a competitive advantage. A nonfinancial advantage can be thought of more generally as any product, marketing scheme, or innovation that gives the new issuing firm some advantage over industry competitors.

The results in this article are consistent with all three of these determinants. Controlling for a number of factors such as market timing and the hotness of the IPO environment, we document that competing companies show relatively better operating performance after large IPOs in their industry if they have less leverage, if their IPO has been underwritten by a highly ranked investment bank, and if they spend more on research and development. In addition, we find empirical evidence that these factors also affect a competitor's probability of survival for the 3-year period after the IPO.

The remainder of this article proceeds as follows. In Section I, we provide the setting for our study. In Section II, we develop the hypotheses for our empirical tests. Section III describes our data sources and sample construction, and in Section IV we characterize our findings. Section V provides robustness tests, and Section VI concludes.

I. The Setting

This study is related to branches of the IPO and, more generally, corporate finance literatures that analyze the determinants of the long-run performance and competitiveness of companies after their IPOs. Ritter (1991) and Loughran

competitiveness across different business cycles. In that paper and also in Campello (2006), competitiveness is measured by the change in sales over time, which is also used as one of the key variables in this study.

[3]The next section provides a brief overview of the empirical evidence for the certification effect.

and Ritter (1995) document significant underperformance for IPO and seasoned equity offering (SEO) companies over the post-issuing period. These results have been the starting point for a lively academic debate that focuses on the determinants of firms' long-run performance.[4] Jain and Kini (1994), Mikkelson, Partch, and Shah (1997), and Loughran and Ritter (1997) document a corresponding decline in the operating performance of IPO and SEO companies after the issuance, and this evidence is confirmed and extended in a recent study by Pástor, Taylor, and Veronesi (2009). Chemmanur, He, and Nandy (2007) show further that IPO companies' factor productivity peaks at the IPO, decreasing steadily thereafter. However, Carter and Manaster (1990) and Carter, Dark, and Singh (1998) provide evidence that companies experience less underpricing and better long-term performance if their IPO is underwritten by a highly ranked investment bank.[5] Similarly, Barry et al. (1990) and Megginson and Weiss (1991) find that venture-backed IPOs are less underpriced, while Jain and Kini (1995) show that venture-backed firms also exhibit superior operating performance after they go public.[6] Nonetheless, each of these studies has focused on the performance of issuing companies. Our article, in contrast, focuses on the impact of IPOs on the performance of competing companies in the same industry.

From a methodological perspective, our article is related to the literature that considers the valuation effects of capital market transactions on companies in the same industry. Slovin, Sushka, and Polonchek (1992) analyze the industry-wide impact of the release of adverse information by investigating competitors' share price reactions to SEOs in their industry.[7] Our study is distinct in that it focuses on the competitive advantage of IPOs, which create exactly opposite outcomes for existing and issuing firms in the same industry. More similarly to our article, Lang and Stulz (1992) consider the effect of bankruptcy announcements on industry rivals and distinguish between contagion and competitive effects.

Most similar to our article, Akhigbe, Borde, and Whyte (2003) analyze the impact of IPOs on rival firms. The article finds no significant valuation effect. This difference in findings is likely the result of two substantive differences in the approach of the two papers. First, Akhigbe et al. (2003) use all 2,493 IPOs between 1989 and 2000 that have at least one publicly traded competitor. This approach captures the effect of small IPOs as well as large IPOs. However, as

[4]See, for example, Barber and Lyon (1996), Brav and Gompers (1997), Teoh, Welch, and Wong (1998), Brav (2000), and Loughran and Ritter (2000). A more extensive review of the debate is provided in Ritter and Welch (2002).

[5]Note that underwriting costs have also been studied in the literature (e.g., Chen and Ritter (2000)). In a sense, this paper also describes a cost of public issues, namely, the cost borne by existing firms due to increased competition.

[6]More recently, Ljungqvist and Wilhelm (2003) find that underpricing decreases with the level of venture capital (VC) ownership in a firm.

[7]Similarly, Slovin, Sushka, and Ferraro (1995) analyze the stock price effect on incumbents in different types of corporate restructuring to test for managerial information advantages, while Slovin, Sushka, and Bendeck (1991) focus on the information effects of going-private transactions. Goldman et al. (2008) examine how the fraudulent earning manipulation of a firm affects the performance of the rival firms.

we argue in this article, the measurement of each IPO's effect on its competitors is likely contaminated by other IPOs in the same industry. In other words, Akhigbe et al. (2003) focus on the average effect of all IPOs, whereas we employ a selection criterion that reduces the possible effects of contamination by focusing only on large, and presumably important, IPOs. Second, while Akhigbe et al.'s (2003) event window starts on the event date, which is meant to capture posttrading competitive effects, we allow market participants to respond to predicted events before the event by starting our event window up to 10 days before the event date. The subsequent analysis shows that there is a substantial price reaction before the event, with the pre-event reaction depending on the predictability of the event, and thus confirms the need to use an approach that allows for pre-event price reactions.

In addition to these primary differences in approach, there are several differences in scope. Unlike Akhigbe et al. (2003), we identify three theoretically motivated determinants for the competitive advantage of IPOs: leverage, recent certification, and knowledge capital. Furthermore, whereas Akhigbe et al. (2003) focus exclusively on stock returns, we analyze the cross-sectional operating performance (and likelihood of survival) of competing firms, based on the theoretically motivated determinants. Similarly, Akhigbe et al. (2003) analyze returns around the IPO filing and issuance dates, whereas we add the withdrawal date to shed further light on whether IPOs are indeed responsible for the event returns.

Evidence on valuation effects in less integrated markets is reported by Braun and Larrain (2009), who show that the cross-section of performance is related to the supply of new assets from IPOs. Our study examines stock price reactions in the United States, where individual financial assets' supply and demand are far more elastic. We argue that performance differences are related to identify sources of competitive advantages, as opposed to a supply effect.[8]

II. Hypothesis Development

The key question in this article is whether IPOs have an impact on the performance of competing companies in the same industry. This performance impact can be measured in different ways. Accordingly, we develop several hypotheses that form the basis for the empirical tests in the subsequent sections of the article.

Our first main hypothesis relates to how the stock prices of competing companies react to a large IPO in their industry. While an IPO is announced and registered some time before the intended first day of trading, there is substantial uncertainty at that point about whether the IPO will in fact be completed.[9] The IPO announcement and its subsequent completion or withdrawal is thus expected to have an impact on rivals' stock returns:

[8]In a recent study, Chod and Lyandres (2008) propose a theory of a firm's incentives to go public in the presence of product market competition. Consistent with our findings, they predict that going public is expected to adversely affect the values of the IPO firm's product market rivals.

[9]Busaba, Benveniste, and Guo (2001) and Dunbar and Foerster (2008) find that about 20% of IPOs are withdrawn before the first day of trading.

Hypothesis 1 (Short-Term Price Reaction): Stock prices of publicly traded firms react to IPOs in their industry.

This main hypothesis is tested in three different ways. First, as the IPO is expected to allow the issuing firm to compete more successfully against industry rivals, the successful completion of an IPO should have a negative impact on rivals' stock prices:

Hypothesis 1a (Returns around Completed IPOs): The completion of an IPO has a negative price impact on publicly traded firms in the same industry.

However, if it is bad news for rival firms to face a completed IPO in their industry, it should be good news for them if an expected and announced IPO does not succeed:

Hypothesis 1b (Returns around Withdrawn IPOs): The withdrawal of an IPO has a positive price impact on publicly traded firms in the same industry.

While Hypotheses 1a and 1b focus on the completion and withdrawal of a large IPO in a specific industry, the next hypothesis relates to the initial filing of that IPO. The initial filing is the earliest event in the IPO process used in this study and thus applies to IPOs that will eventually succeed as well as to IPOs that will eventually be withdrawn. The initial filing should have a similar effect as the completion of an IPO, since it is likely that the IPO firm will eventually compete successfully against the existing firms in the industry. More formally:

Hypothesis 1c (Returns around IPO Filings): The initial filing of an IPO has a negative price impact on existing firms in the same industry.

Along with the impact on the stock price, an IPO should also have an impact on the operating performance of competing firms in the same industry. In particular, the completion of an IPO is expected to give the IPO company a competitive advantage over its competitors and thus to negatively affect their operating performance.

Hypothesis 2 (Pre-IPO and Post-IPO Operating Performance): The operating performance of existing firms will deteriorate after an IPO.

Hypotheses 1 and 2 focus on the price reaction of firms to IPOs in their industry and the development of their operating performance around the time of the IPO, respectively.[10] The next set of hypotheses turns to differences in the magnitude of those reactions across firms. Based on the discussion above on the existing literature, we expect leverage, certification, and knowledge to

[10]These two hypotheses are subsequently analyzed in univariate tests (Table III and Table IV) as well as in a panel regression (Table V).

all be factors in explaining cross-sectional variation in the underperformance of existing firms:

Hypothesis 3 (Cross-Sectional Differences among Publicly Listed Firms): Leverage, certification, and knowledge are significant determinants of cross-sectional variation in firm performance around IPOs.

In particular, competitors with low leverage may have more flexibility in their investments to compete with the recently recapitalized issuing firms, competitors with better certification by investment banks may fare better against recently certified issuing firms, and competitors with more knowledge capital may perform better against new entrants with nonfinancial advantages.

Finally, one may argue that the most critical measure of a company's operating performance is its ability to survive. Thus, if, indeed, the variables above have an impact on firm performance, then we also expect them to have an impact on publicly listed firms' survival probability around IPOs.

Hypothesis 4 (Survival of Publicly Listed Firms): Leverage, certification, and knowledge are significant determinants of a firm's ability to survive following an IPO in its industry.

In this case, the same economic justifications for the determinants of performance outlined in Hypothesis 3 apply to a different context: the probability of firm survival.

III. Data and Methodology

The IPO data used in this study come from the SDC New Issues Database. Our sample comprises all nonfinancial firms that went public between 1980 and 2001 for which we could obtain both CRSP and Compustat data.[11] The final sample includes 4,188 IPO firms in 62 two-digit SIC industries. In many cases there is more than one IPO in a given year in an industry. To study the effect of IPOs on their publicly traded competitors, we face the challenge of only selecting those IPOs for which the results are not contaminated by the impact of other IPOs in the same industry in the same time period. In most industries, we cannot use all IPOs because IPOs are not isolated in time; the fact that IPOs can occur in control periods makes it important to identify IPOs with the lowest potential of other IPOs contaminating the results. We therefore identify IPO events by choosing only those IPOs that are not preceded or followed by a larger IPO in the same industry in the surrounding 6 years.[12] We use IPO proceeds as our measure of size in order to minimize cross-IPO contamination of the results.

[11] Since the literature documents some data issues with the SDC database, we follow Ljungqvist and Wilhelm (2003) in validating key variables, such as the date of the IPO and the SIC code, using the CRSP and Compustat databases.

[12] In the robustness tests, we repeat our tests using windows of 8 and 4 years, respectively. In addition, as the risk of contaminated results is much smaller for the short-term stock return measures than for the long-run operating performance measures, we compute these stock returns for a variety of samples with a much larger sample size.

Table I
Variable Definitions

Variable	Definition
Asset	Book value of assets.
Sales	Book value of sales.
Underwriter ranking	The Carter and Manaster (1990) underwriter ranking, ranging from 1 to 10.
Firm age since trading	The age of the firm (in years) from the first trading day in CRSP to the date of the IPO event.
Firm age since founding	The age of the firm from the founding date to the date of the IPO event. The founding date data come from Jay Ritter's website (http://bear.warrington.ufl.edu/ritter/). The data were also used in Loughran and Ritter (2004).
VC backing	An indicator variable equal to one if the firm is venture-backed.
ROA1	The ratio of net income to assets.
ROA2	The ratio of operating income to assets.
Leverage ratio	The ratio of long-term debt to the market-adjusted value of assets (book value of debt plus market capitalization).
Interest coverage ratio	The sum of interest expense and pre-tax income divided by interest expense.
K-Z financial constraint index	The Kaplan and Zingales financial constraint index. Kaplan and Zingales (1997) construct a linear combination of five financial ratios that measure a firm's level of financial constraint. In this article, we follow Lamont, Polk, and Saa-Requejo (2001) and construct the K-Z index as: $-1.002 *$ (cash flow/ lagged net capital) + 0.283* (market-to-book ratio) + $3.139 *$ (long-term and short-term debt/total assets) – $39.368 *$ (dividends/lagged net capital) – $1.315 *$ (slack/lagged net capital). Higher levels of the K-Z index indicate a higher likelihood that a firm is financially constrained.
Annual underpricing	The average level of IPO underpricing in a given year as reported in Ritter (2007).
Industry underpricing	The median issue-day underpricing of IPOs in the industry over the year prior to the IPO event.
Industry M/B ratio	The median industry market-to-book ratio in the previous year.
High UW ranking	An indicator variable equal to one if the firm's Carter and Manaster (1990) underwriter ranking is at least nine.
High research intensity	An indicator variable equal to one if the ratio of research and development expenses to assets is in the top quartile of the sample.
High HH	An indicator variable equal to one if the firm's Herfindahl-Hirschman index of industry concentration is greater than 1,800.
Bondrankyes	An indicator variable equal to one if the firm has a Standard & Poor's long-term domestic issuer credit rating in the Compustat Database.
Good bondrank	An indicator variable equal to one if the firm has a Standard & Poor's long-term domestic issuer credit rating of BBB or above.

As an illustration, assume we choose a relatively small IPO as an event. If a larger firm then goes public during our measurement period, the effect of our chosen event on existing firms would be difficult to measure, because it would be dominated by the effect of the larger IPO. A noisy measurement could then

lead to mixed results, as described by Akhigbe et al. (2003), who do not find significant event returns. Following our selection criterion, we obtain 134 IPO events.[13]

Our identification of IPO events has advantages and disadvantages. One advantage is the maximum use of data. By selecting IPOs without larger IPOs in the surrounding years, we utilize all IPOs that have a minimally contaminated measurement period. Similarly, by selecting IPOs based on relative size, we avoid bias that could arise from the selection of IPOs based on arbitrarily defined periods of time. Even though the value of IPOs has increased over time, IPOs that are large relative to the IPOs in surrounding years can be found throughout the time span. The IPO events chosen using this method are spread relatively evenly across the sample years, and there are at most 14 IPO events in any given sample year.[14] The selection methodology generates a sample of IPO events that is mildly clustered in "hot" IPO markets as defined by Ibbotson, Sindelar, and Ritter (1994) and Loughran and Ritter (1995).[15]

We identify existing firms in the same industry as the IPO events using two digit SIC codes, and we define them as incumbent firms.[16] We further restrict incumbent firms in our sample to those that were publicly listed at least 3 years before the IPO event year so that we can clearly observe the difference in performance before and after the IPO event. The final sample contains 9,494 incumbent firms, and after merging with CRSP, we are left with 8,966 incumbent firms. In some experiments, we include withdrawn IPOs, and in these cases, the sample of completed and withdrawn IPOs includes 11,105 firms around 158 filing date events.[17]

The accounting information on both the IPO event firms and the incumbent firms comes from Compustat. In order to investigate the impact of the IPO events on the survival of the incumbent firms, we obtain firm delisting information from CRSP, including delisting dates and reasons for delisting. We define incumbent firms as "nonsurviving" if the firm is delisted within 3 years after the IPO event for reasons other than merger or acquisition. The exact definition is provided in Section IV.D. Finally, we obtain the identity of

[13]The distribution of the IPO events is shown in the Internet Appendix available at http://www.afajof.org/supplements.asp.

[14]Furthermore, IPOs are also fairly evenly distributed between early years and later years; there are 58 IPO events from 1981 to 1991 and 76 events from 1992 to 2001.

[15]Using the measure of hotness defined in these papers, we find that the hottest IPO years in our study, 1983, 1986, and 1996, have a relatively large number of IPO benchmark events, but there are also a large number of IPO benchmark events in the "cold" IPO markets of 1988 to 1990 and 2001. The time-series correlation between this study's IPO events and the total number of IPOs is significantly positive despite the relatively small sample of 134 events. However, there is no significant time-series correlation between our sample and indicators of IPO market hotness from Baker and Wurgler (2000), Ritter (2007), and Helwege and Liang (2004).

[16]Similar results obtain for Fama-French 48 industry classifications, and for finer SIC code-based industry classifications in the IT industry, both of which are available in the Internet Appendix.

[17]Filing dates are missing for nine withdrawn IPOs. This leaves 28 withdrawal events, among which 24 events have CRSP daily stock data for the event study analysis. So there are 158 IPO events in the filing date analysis.

Table II
Descriptive Statistics

In this table we report descriptive statistics for the sample IPO firms and associated incumbent firms. Data for founding dates come from both Jay Ritter's and Boyan Jovanovic's website. From these data sets, we obtain firm age since founding for 128 IPO events and 6,208 incumbent firms. VC Backing is the proportion of firms that are venture-backed. *Assets*, *Sales,* and *Market Capitalization* are reported at the end of the IPO event year, inflation-adjusted in 2003 dollars. All other variables are defined in Table I. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	IPO Firms ($n = 134$)	Incumbent Firms ($n = 9{,}494$)	Wilcoxon
	Mean (Median)	Mean (Median)	Significance
Assets ($MM)	1,536.08	946.53	
	(112.51)	(80.84)	
Sales ($MM)	1,292.78	772.85	*
	(74.21)	(72.70)	
Underwriter ranking	7.53	6.84	***
	(8.10)	(8.00)	
Market capitalization ($MM)	1,745.00	1,000.70	
	(101.90)	(95.55)	
Firm age since trading (years)	0.00	6.85	***
		(3.39)	
Firm age since founding (years)	23.41	26.00	***
	(8.00)	(14.00)	
VC backing (%)	0.24	0.31	

underwriters in the incumbent firms' most recent equity issuance and venture backing data from both the SDC New Issues and Venture Xpert databases. We obtain underwriter ranking data from Jay Ritter's website.

In Table II, we report descriptive statistics for both IPO and incumbent firms. The results suggest that our sample IPO firms have significantly larger sales than incumbent firms and are brought to market by underwriters with a higher reputation. These results are a consequence of our sample selection criterion, which focuses on IPOs that are large relative to other industry IPOs. Assets and market capitalization are also larger for the IPOs than for the incumbent firms, but the difference is not statistically significant. Finally, the IPO firms are on average 23.41 years old when they go public, and are about 2.6 years younger than incumbent firms. This means that IPO firms have successfully competed with incumbent firms for a considerable amount of time before going public, and thus they are not new competitors after the IPO, but rather existing competitors with new characteristics.

IV. Empirical Results

As outlined in Section II, we measure the effect of large IPOs on incumbent industry competitors in several ways. In this section, we present evidence on the incumbents' short-term price reactions around IPOs, univariate results for the comparison of the incumbents' pre-IPO and post-IPO operating

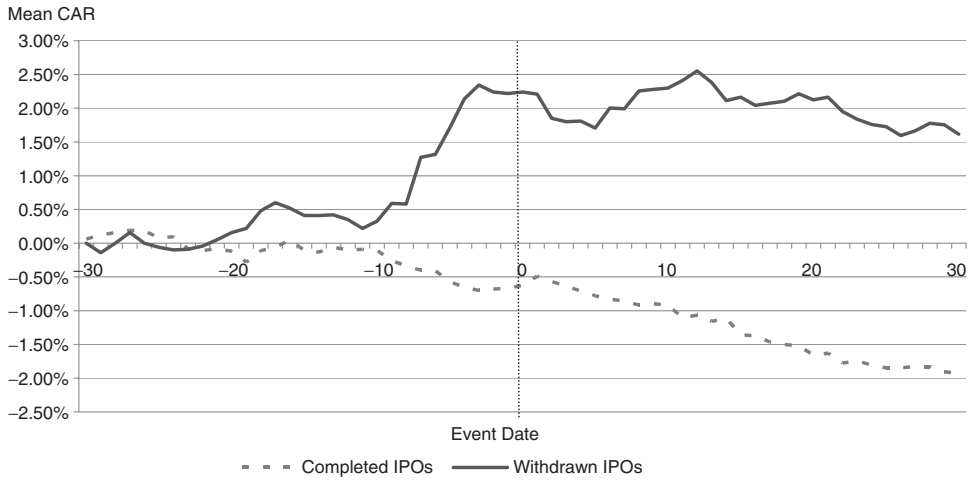

Figure 1. Incumbent firm abnormal returns around completed and withdrawn IPOs. The IPO sample includes 4,188 completed IPOs and 1,630 withdrawn IPOs from the SDC New Issues Database between 1980 and 2001. Sample IPOs are those IPOs for which there is no IPO in the same industry in the six surrounding years that has a larger issuing volume. Using these selection criteria, we identify 134 completed IPO events and 37 withdrawn IPO events. Incumbent firms share the same two-digit SIC industry as the completed or withdrawn IPO firms. The timeline (in days) around an IPO event is shown on the x-axis, where date zero depicts the date of the completion/withdrawal of the IPO. The cumulative abnormal return (CAR) on the y-axis is the equally weighted market model excess return (in %) across each firm in an IPO event industry.

performance, and multivariate results for the incumbents' operating performance and likelihood of survival after the IPO.

A. Short-Term Price Reaction

The first hypothesis states that one key piece of evidence on the competitive effect of large IPOs can be obtained by analyzing the stock returns of industry incumbents at and around the completion date (Hypothesis 1a) or withdrawal date (Hypothesis 1b) of a competitor's IPO.[18] Using the same methodology as for the identification of large completed IPOs, we find that there are 37 large withdrawn IPOs in the sample period.

In Figure 1 we show the cumulative abnormal returns of incumbent firms around the completion and withdrawal of IPOs in their industry. As one can see from the figure, incumbents in industries with completed and withdrawn IPOs show opposite return patterns around the announcement of the completion or withdrawal. While their cumulative abnormal returns are very similar until 20 days before the IPO event, the returns of incumbents in industries with

[18]For this analysis, the incumbents are again defined as those companies that operate in the same two-digit SIC industry as the IPO firm and were publicly listed at least 3 years before the IPO date.

withdrawn IPOs become slightly positive over the next 10 days, while the returns of incumbents in industries with completed IPOs are indistinguishable from zero.

The major difference then arises in the period that starts 10 days before the event. The returns of the firms in the withdrawn IPO industries show a significantly positive reaction that continues for a substantial period of time after the IPO, but the returns of the companies in the completed IPO industries exhibit a significantly negative reaction that also continues for a considerable period of time. It is important to point out that the stock prices of incumbents start reacting to the completion or withdrawal of an IPO before the event day. This suggests that the uncertainty about the completion success of an IPO already starts to decrease up to 10 days before the IPO.[19] Busaba, Benveniste, and Guo (2001) argue that withdrawals can occur at any point in time during the filing period. In the case of both a withdrawal and a completion of an IPO, more information about the prospects of an IPO becomes available before the respective event, which, in turn, affects competitors' stock prices. One potential information source is the road-show, during which the underwriter and the issuer meet institutional investors—the underwriter learns more about the demand for the prospective IPO (See Benveniste and Spindt (1989)), while institutional investors gain additional information on overall demand and thus the completion chances of an issue.

The above result provides a first piece of evidence for Hypotheses 1a and 1b; incumbent firms suffer a drop in their stock price when a large IPO in their industry is completed, while they experience an increase in their stock price when a large IPO in their industry is withdrawn. We analyze this evidence more formally by calculating the stock returns of incumbents in industries in which an IPO is completed and in industries in which an IPO is withdrawn. The choice of the event window for these analyses is motivated by the evidence from Figure 1, and the results are presented in the next two subsections, that is, Sections IV.A.1 and IV.A.2.

A.1. Returns around Completed IPOs

To formally test the returns of incumbent firms upon the announcement of an IPO in their industry (Hypothesis 1a), we analyze market-adjusted stock price responses for the sample of 8,966 firms that operate in the same industry as the IPO completing firms (Table III, Panel A).

The results for individual firms on the left-hand side of Panel A suggest that stock prices for these firms drop significantly when a large IPO occurs in the same industry. This holds not only for the immediate days surrounding the IPO, but also for a number of days after the IPO. The mean cumulative

[19]This observation is important for the design of the event study and in particular for the choice of the appropriate event window. There could be no significant effect in an event window starting only with the event day. This could explain the insignificant results in Akhigbe, Borde, and Whyte (2003), whose event window starts on the event day.

Table III

Abnormal Returns of the Industry Competitors for All IPOs on Completion Dates, Withdrawal Dates, and Filing Dates

In this table we report the cumulative abnormal return (CAR) of industry competitors around IPO dates both for individual firms and for the portfolio of IPO events. IPOs are selected as events if they are not preceded or followed by a larger IPO in the same two-digit SIC industry in the surrounding 6 years. Panel A reports the CAR of 8,966 industry competitors (representing 134 IPO events) around completed IPO dates. Panel B reports the CAR of 3,903 industry competitors (representing 37 IPO events) around completed IPO dates. Panel C reports the CAR of industry competitors around the filing dates of the 134 completed IPOs and the 37 withdrawn IPOs. Information on the filing date of 13 withdrawn IPOs is not available in the SDC New Issues Database; this yields a final sample of 158 IPOs and 11,105 industry competitors. Abnormal returns are computed as the difference between the actual stock price return and the expected market model return over each indicated window. The market model is estimated using 255 days of daily returns ending 42 days prior to the IPO event. We report both the Patell Z-statistic and the corresponding p-value.

	Panel A: Completed IPOs						Panel B: Withdrawn IPOs						Panel C: Complete + Withdrawn IPOs on Filing Dates					
	Individual Firms			Portfolio Based on IPO Events			Individual Firms			Portfolio Based on IPO Events			Individual Firms			PortFolio Based on IPO Events		
Days	Mean CAR	Patell Z	P-Value	Mean CAR	Patell Z	P-Value	Mean CAR	Patell Z	P-Value	Mean CAR	Patell Z	P-Value	Mean CAR	Patell Z	P-Value	Mean CAR	Patell Z	P-Value
(−10,1)	−0.40%	−2.22	0.026	−0.68%	−1.38	0.168	1.97%	4.45	<0.001	1.36%	2.64	0.008	−0.59%	−4.60	<0.001	−0.24%	−2.24	0.025
(−10,5)	−0.69%	−3.32	0.001	−0.84%	−1.98	0.048	1.48%	2.74	0.006	1.02%	1.56	0.119	−0.78%	−4.42	<0.001	−0.24%	−2.00	0.046
(−10,7)	−0.77%	−4.42	<0.001	−0.88%	−2.02	0.043	1.77%	4.38	<0.001	0.83%	1.50	0.134	−0.58%	−2.62	0.009	−0.12%	−1.38	0.168
(−10,10)	−0.82%	−5.22	<0.001	−1.00%	−2.33	0.020	2.06%	5.96	<0.001	1.35%	1.97	0.049	−0.75%	−3.50	0.001	0.00%	−1.63	0.103
(−10,15)	−1.26%	−6.78	<0.001	−1.61%	−3.52	0.000	1.93%	4.01	<0.001	0.71%	1.17	0.242	−0.95%	−3.20	0.001	−0.30%	−2.05	0.040
(−10,20)	−1.58%	−7.56	<0.001	−1.87%	−3.78	0.000	1.89%	3.50	0.001	0.62%	0.99	0.322	−1.19%	−3.55	<0.001	−0.45%	−2.05	0.040
(−5,1)	−0.07%	−0.66	0.509	−0.31%	−0.75	0.453	0.88%	3.44	0.001	1.18%	2.11	0.035	−0.42%	−4.68	<0.001	−0.25%	−2.27	0.023
(−5,5)	−0.36%	−2.21	0.027	−0.47%	−1.54	0.124	0.17%	1.40	0.162	0.83%	0.81	0.418	−0.60%	−4.25	<0.001	−0.25%	−1.90	0.057

abnormal return (CAR) in the period between 10 days before and 1 day after the IPO amounts to −0.40% and is significant at the 5% level. This negative stock price response can also be observed in longer time periods. CARs in the period between 10 days before and 10 days after the IPO are equal to −0.82% and are significant at the 1% level. The returns remain negative and (statistically and economically) significant for longer event windows, the last of which ends 20 days after the IPO day. The negative performance of incumbents in industries with a large IPO starts about 10 days before the IPO (Figure 1), but their performance does not show any clear tendency in the immediate days before the IPO. Thus, it is not surprising that the CAR in the event window that starts 5 days before the IPO and lasts until 1 day after the IPO is only slightly negative and fails to be significant. It becomes more negative and once again significant if the event period is extended to 5 days after the IPO. Overall, the results indicate that industry incumbents suffer a drop in their share price when a large IPO in their industry occurs.

The results reported in Table III, Panel A do not take into account the possibility that returns could be correlated. While there are a large number of sample companies, the maximum number of incumbents in a given industry is 1,558 and hence, we cannot rule out the possibility that returns around IPOs are highly correlated within each industry. We mitigate this concern by first forming a portfolio of incumbent firms for each of the given IPOs and then averaging these portfolio returns across IPOs. The results, reported on the right-hand side of Panel A, suggest that the returns remain negative and both economically and statistically significant. The CARs are negative for all of the event windows and fail to achieve statistical significance only in the event period between 10 days before and 1 day after the IPO event and (partly consistent with the previous results) for the event periods that start 5 days before the IPO. In all other event windows, the CARs of the incumbents are significantly negative at least at the 5% level. This portfolio approach rules out the possibility that the results are driven by IPO-specific determinants. It also stresses the generality of the observed pattern.

A related question is whether short-term returns depend on the level of competition in the industry in which the IPO firm operates. In order to shed more light on this question, we follow the methodology of the U.S. Department of Justice and the Federal Trade Commission and sort IPOs by the Herfindahl–Hirschman index (HHI) in their industry at the IPO date. We form three groups. The first group comprises IPOs in industries with a HHI above 1,800, the second group contains those IPOs in industries with a HHI between 1,000 and 1,800, and the third group includes IPOs in industries with a HHI below 1,000.[20] The results show that returns of incumbent firms for these three groups of IPOs show no particular pattern. While the CARs for IPOs in concentrated industries are equal to −0.76% in the period between 10 days before

[20]The Department of Justice considers industries to be concentrated if the Herfindahl-Hirschman index is greater than 1,800 and to be moderately concentrated if the Herfindahl-Hirschman index is between 1,000 and 1,800. For more information, please see: http://www.usdoj.gov/atr/public/testimony/hhi.htm.

and 1 day after the completion of an IPO and tend to be more negative than in moderately concentrated (−0.41%) and nonconcentrated industries (−0.35%), these differences fail to be significant and even change signs for longer event windows. More importantly for the purpose of this article, the returns are negative and significantly different from zero for each of the different groups and event windows. In other words, they do not seem to be driven by the specific level of competition in a given industry.

Taken together, the results provide evidence in support of Hypothesis 1a and suggest that incumbent firms suffer stock price drops at and around the completion of large IPOs in their industry.

A.2. Returns around Withdrawn IPOs

We repeat the methodology above to analyze the price reaction of incumbent firms to the announcement of a withdrawal of a large IPO in their industry. Recall that we expect a positive stock price reaction (Hypothesis 1b). The results, reported on the left-hand side of Table III, Panel B show that incumbent firms experience a positive and significant return in their stock price around a withdrawal announcement. The average CAR across all incumbent firms is equal to 1.97% for the window of 10 days before to 1 day after the announcement. This return remains positive and both statistically and economically significant for all of the event windows, except for the shorter event window that starts 5 days before the IPO and ends 5 days after the IPO. Withdrawal stock returns thus show a pattern exactly opposite to the stock returns of incumbents in industries with completed IPOs. As before, we test for the robustness of these results by first averaging across all incumbent firms in each withdrawn IPO firm's industry and then averaging across all withdrawn IPO events. The results on the right-hand side of Table III, Panel B show that the CARs in the period between 10 days before and 1 day after the withdrawal announcement are again economically and statistically significant. The CARs for the other event windows remain positive, but for the most part fail to be significant. Note, however, that the sample size of 37 withdrawn IPO events is relatively small.

In principle, IPOs can be withdrawn for different reasons, for example, due to bad market conditions or bad firm-specific news, which might have a different impact on the price reaction of incumbents. We thus order withdrawn IPOs by the overall market return between the IPO filing and the withdrawal date and use the median market return in this period as the cutoff to sort the IPOs into two groups. If the market return in this period is above the median, then an IPO is expected to be withdrawn due to firm-specific news; on the other hand, the IPO is expected to be withdrawn due to bad market conditions if the market return in this period is below the median. We find that incumbents experience a positive stock price reaction of 4% if the withdrawal of an IPO is due to bad market conditions, while they experience a reaction of only 0.50% if the withdrawal of an IPO is due to firm-specific news. One possible interpretation of these results is that competition induces more "pain" in bad times and that the reduction of competition is thus perceived more favorably. In any case, it is

important to point out that the withdrawal returns for incumbents are positive and significant even in good market conditions. These results are consistent with Hypothesis 1b and suggest that incumbent firms benefit if a large IPO in their industry is withdrawn.

A.3. Returns around IPO Filings

So far our analyses of the short-term price reaction of incumbent firms have focused on the date of the completion or withdrawal of a large IPO in their industry. Hypothesis 1c posits that the initial filing of the IPO also has a negative price impact on incumbents. To test this conjecture we repeat the previous event return analyses for the filing dates of all large IPOs that subsequently completed or withdrew their IPO. As it is not known ex ante whether an IPO candidate will eventually complete its listing, the incumbents, which are considered separately in the previous two analyses, are considered as an aggregate group for this analysis.

The results, presented in Table III, Panel C provide empirical evidence consistent with Hypothesis 1c. The event returns for incumbent firms are negative both for the individual firms and for the portfolios, which are constructed in the same way as in the previous analyses. The event returns for the analysis of the individual firms are statistically significant at the 1% level for all of the chosen event windows. They are also significant for most of the event windows in the portfolio analysis. Given that the market may be less able to anticipate the exact filing date of an IPO than the IPO's subsequent completion or withdrawal date, it is not surprising to find that the event returns around the filing date are negative and consistently significant even for the shorter event periods that start 5 days before the IPO.

The results in this subsection (Section IV.A.3) provide evidence that the returns of incumbent firms around the filing day are negative. The results in the previous subsection (Section IV.A.2) show the exactly opposite reaction for incumbent firms around the subsequent withdrawal date. But the withdrawal of an IPO should only be accompanied by positive stock price reactions by incumbents if the initial filing was indeed a credible threat, that is, if the IPO's initial filing was accompanied by negative stock price reactions by incumbents. We test this relation by considering the correlation of stock returns of incumbent firms around the IPO filing date and the IPO withdrawal date. The results show that the filing and withdrawal returns are indeed significantly negatively correlated, with a p-value of less than 1% for each of the different event windows.

A.4. Economic Significance

As shown above, incumbents experience an average stock price reaction of -0.40% in the period between 10 days before and 1 day after the completion of an IPO in their industry. While this result is statistically significant at conventional levels, it is also important to analyze its economic significance.

As reported in Table III, the analysis draws on a total of 8,966 incumbents. The value loss for each incumbent is calculated by multiplying the incumbent's CAR in the event window by its market capitalization at the beginning of the event window. For the $(-10, 1)$ event window, an incumbent loses on average \$3.271 million around the IPO, and the total loss of all incumbents amounts to \$29.307 billion.[21] This is the lower bound for the given event windows, as the returns become even more negative for the longer event windows. And for a given IPO event, the average total loss of all incumbents amounts to \$218 million for the $(10, -1)$ event window and is even higher for the longer event windows. These figures suggest that the losses experienced by incumbents are substantial and economically important. As a final consideration, we divide the aggregate loss of a given IPO by the market capitalization of the S&P500 just before the IPO. This provides a relative estimate of the losses in comparison to a broad market index. The average aggregate loss amounts to 1.81% of the S&P500's market capitalization.

In summary, the results on the short-term returns reported in Section IV.A are consistent with the view that IPO firms successfully compete against incumbent firms. In the next section, we consider the effect of IPOs on industry incumbents' operating performance.

B. Pre-IPO and Post-IPO Operating Performance

The return evidence reported in Section IV.A suggests that the market perceives IPOs as bad news for industry competitors. According to Hypothesis 2, we should expect to obtain similarly negative evidence in regard to the operating performance of incumbents. Specifically, Hypothesis 2 posits that the market anticipates that IPO firms compete successfully against industry incumbents and, as a consequence, key performance variables of incumbents deteriorate after these IPOs.

B.1. Univariate Results

We find that the performance of incumbent firms is significantly lower after IPO events (Table IV, Panel A). First, the results suggest that firms earn less on existing assets. The ratio of net income to assets, *ROA*1, declines significantly from 3.18% to 0.73% after the IPO event, and the ratio of operating income to assets, *ROA*2, declines significantly from 11.61% to 8.87%. Firms also invest less with *Asset Growth* declining significantly from 18.02% to 9.59%, whereas leverage increases for incumbent firms: *Interest Coverage Ratio* decreases from 2.92 to 2.04, and the ratio of debt to assets, *Leverage Ratio*, increases from 0.12 to 0.13. Finally, there is a significant increase in the Kaplan and Zingales (1997)

[21]These figures are adjusted for inflation and expressed in 2003 \$ terms. Data on market capitalization are missing for seven incumbents so that the sample is slightly reduced to 8,959 firms.

Table IV
Univariate Statistics

In this table, we report univariate statistics for several performance ratios for different groups of companies. Panel A reports the median ratios for 9,494 incumbent firms on Compustat before and after the IPO events; Panel B separates the incumbent firms into surviving and nonsurviving firms and reports their median ratios separately. *Sales growth* is the annual percentage change of sales in 2003 dollars. *Asset growth* is the annual percentage change of assets in 2003 dollars. All other variables are defined in Table I. *** indicates significance at the 1% level.

Period	ROA1	ROA2	Sales Growth	Asset Growth	Interest Coverage Ratio	Leverage Ratio	K-Z Financial Constraint Index
Panel A: Performance Measures for All Firms							
Four-year average before the IPO	3.18%	11.61%	14.01%	18.02%	2.92	0.12	−1.21
Four-year average after the IPO	0.73%	8.87%	10.76%	9.59%	2.04	0.13	−0.55
Wilcoxon test significance	***	***	***	***	***	***	***
Panel B: Comparisons of Performance Measures between Surviving and Nonsurviving Firms							
Surviving Firms							
Four-year average before the IPO	4.17%	12.90%	13.07%	16.10%	3.60	0.12	−1.42
Four-year average after the IPO	2.28%	10.56%	11.27%	11.13%	2.91	0.12	−0.94
Wilcoxon test significance	***	***	***	***	***	***	***
Nonsurviving Firms							
Four-year average before the IPO	−7.21%	0.10%	22.42%	34.04%	−0.87	0.10	−0.19
Four-year average after the IPO	−22.44%	−8.43%	6.96%	−2.32%	−3.65	0.18	1.43
Wilcoxon test significance	***	***	***	***	***	***	***

index of financial constraints.[22] Incumbent firms thus face stricter financial constraints after the IPO than before the IPO.

Next, we go one step further by exploring the performance of firms that are delisted within 3 years of an IPO event. Because one effect of IPOs is the eventual failure of some incumbent firms, it is important to rule out the possibility that our results are driven solely by nonsurviving firms. We find that nonsurviving firms show patterns similar to those described above, but the magnitude of the measured performance decreases is larger for these companies (Table IV, Panel B). The variable *ROA*1, for example, decreases from 4.17% to 2.28% for surviving firms, and decreases from −7.21% to −22.44% for firms that are

[22]The increase in the Kaplan and Zingales (1997) index of financial constraints is particularly driven by the change in the following three ratios: debt to total capital increases by 34.78%, cash flow to total capital decreases by 55.82%, and dividends to total capital decreases by 46.30%.

eventually delisted. The key insight from the results is that performance ratios deteriorate for both surviving and nonsurviving firms. While the magnitude of the change is more pronounced for nonsurviving firms, the change is still significant for surviving firms for almost all of the performance measures. The only exception is the leverage ratio, which shows no significant increase for surviving firms, but a significant increase for nonsurviving firms (from 0.10 to 0.18).

The overall results are consistent with Hypothesis 2 and suggest that a large-scale IPO in an industry has a negative effect on the performance of incumbents. In what follows, we will attempt to describe the cross-sectional characteristics of declines in incumbent performance in a regression setting that allows us to control for mitigating factors.

B.2. Multivariate Results

The univariate results so far suggest that IPOs affect the performance of industry incumbents, but one might question whether there are other factors that explain the results. In what follows, we look at performance over time to determine whether performance declines are significantly affected by large IPOs even after controlling for a number of factors that are known to predict performance. Our approach is to model performance as a function of firm age, firm size, industry underpricing, industry valuation, and past performance. In other words, we would like to test Hypothesis 2 by measuring abnormal performance, controlling for a number of factors that are known to predict performance. Specifically, we estimate the following panel regression:

$$Performance_{i,t} = \alpha + \beta * IPO_{i,t} + \gamma * controls_{i,t} + \varepsilon_{i,t}. \quad (1)$$

Performance is measured as sales growth, capital expenditure growth, operating income growth, and abnormal stock return in each year t for every firm i. The indicator variable $IPO_{i,t}$ is equal to one if year t is within the 3 years of a large IPO in firm i's industry, and zero otherwise. The sample comprises as many years as possible for each firm and thus we have a panel regression in which each firm has data from both IPO years and non-IPO years. Note that we estimate the model using fixed effects; we thus have a separate constant term for each IPO event's industry.[23]

In Table V, Model 1 we see that sales growth is significantly affected by age, size, underpricing, and the market-to-book ratio. In particular, older firms perform worse than younger firms, as indicated by the negative coefficient on the age variable in most of the models. These relationships hold throughout the sample, but there is a statistically significant decline in sales growth in IPO years (Model 2). In other words, incumbent firms face a 3.3% decline in sales growth in the years in which a large IPO occurs in the same industry.

[23]The IPO-event fixed effects are similar to industry fixed effects, but there are differences that arise from exits, entries, and industry changes. Replacing IPO-event fixed effects with industry fixed effects does not materially change the results.

Table V

The Effect of IPO Events on Incumbent Firms

In this table, we report estimates from a panel regression of incumbent firms' sales growth, growth in capital expenditure, growth in operating income, and abnormal stock return on an IPO indicator and control variables from 1977 to 2005. *Sales Growth* is the difference between current log sales and log sales in the previous year. *Capital Expenditure Growth* is the difference between the log of current-year capital expenditure and the log of capital expenditure in the previous year. *Operating Income Growth* is the difference between the log of current-year operating income and the log of operating income in the previous year. *Abnormal Stock Return* is the difference between daily stock returns and the value-weighted market portfolio return, compounded to an annual frequency based on fiscal years. *IPO Dummy* is an indicator variable equal to one in the IPO event year and the three following years. *Log(Age)* is the log of the number of years between the incumbent firm's IPO year and the observation year. *Log(Assets)* is the log of firm assets in the previous year. All other variables are defined in Table I. Standard errors are adjusted for clustering by IPO event. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Sales Growth		Capital Expenditure Growth		Operating Income Growth		Abnormal Stock Return	
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IPO dummy		−0.033***		−0.106***		−0.029***		−0.042***
		(−4.52)		(−4.37)		(−5.36)		(−2.63)
Lag dependent variable	0.043*	0.042*	−0.195***	−0.196***	−0.194***	−0.194***	−0.021***	−0.021***
	(1.69)	(1.67)	(−27.39)	(−29.12)	(−17.80)	(−17.79)	(−3.45)	(−3.64)
Log (Age)	−0.083***	−0.086***	−0.108***	−0.116***	−0.045***	−0.047***	0.002	0.002
	(−12.19)	(−12.05)	(−8.83)	(−8.60)	(−8.91)	(−8.96)	(0.32)	(0.26)
Log (Assets)	0.005***	0.005***	0.006***	0.006***	−0.005***	−0.005***	0.009***	0.009***
	(3.13)	(3.12)	(2.65)	(2.68)	(−3.41)	(−3.39)	(5.68)	(5.55)
Annual underpricing	0.066*	0.059*	0.031	0.011	−0.006	−0.012	0.312***	0.305***
	(1.88)	(1.81)	(0.51)	(0.20)	(−0.22)	(−0.44)	(4.65)	(4.42)
Industry M/B ratio	0.068***	0.070***	0.228***	0.234***	0.070***	0.072***	0.021**	0.020**
	(4.34)	(4.65)	(6.96)	(7.46)	(6.19)	(6.39)	(2.49)	(2.45)
Intercept	0.135***	0.148***	−0.131**	−0.087**	0.126***	0.137***	−0.089***	−0.075***
	(4.63)	(5.57)	(−2.56)	(−2.07)	(5.79)	(6.38)	(−3.38)	(−2.64)
IPO events fixed effect?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,00,635	1,00,635	97,733	97,733	71,925	71,925	83,932	83,932
R^2	0.029	0.030	0.039	0.0416	0.040	0.0403	0.005	0.006

Similarly, capital expenditure declines by a statistically significant 10.6% in IPO years (Model 4), and operating income declines by a statistically significant 2.9% in IPO years (Model 6). Overall, measures of performance based on firm profitability decline in IPO years after age, size, and industry valuation are taken into account.[24]

To further reinforce the event study results of Section IV.A.1, we verify whether the effect of IPOs on incumbents' stock prices is confounded by factors apart from the IPO. Using the panel regression framework, we model annual stock price performance as a function of age, size, and industry valuation and find that IPOs are associated with a statistically significant 4.2% decline in CARs (Table V, Model 8). Taking these results together, we conclude that incumbent firms' sales growth, capital expenditure, operating income, and stock price are all significantly weakened by the presence of a large IPO.

C. Cross-sectional Differences among Publicly Listed Firms

The previous subsection (Section IV.B.2) establishes that IPOs lead to significant performance deterioration for incumbent firms, even after controlling for factors that affect performance. In this subsection we investigate whether declines in performance in IPO years are related to specific competitive advantages of IPO-issuing firms. In particular, we test Hypothesis 3 and analyze whether cross-sectional differences in IPO-period incumbent performance can be explained by three factors previously recognized as influencing IPO performance, namely, leverage, certification, and knowledge. Specifically, we run the following cross-sectional regression

$$\begin{aligned} Performance_{i,e} = \alpha + \beta * leverage_{i,e} + \gamma * certification_{i,e} + \delta * knowledge_{i,e} \\ + \phi * controls_{i,e} + \varepsilon_{i,e}. \end{aligned} \tag{2}$$

We measure performance as the difference in 3-year average sales growth around IPO event e in incumbent firm i's industry. We test our three main hypothesized determinants of performance using measures of leverage, certification, and knowledge around the time of the IPO event. In contrast to the previous approach, this cross-sectional test uses only one observation per firm in order to capture any cross-sectional pattern in abnormal performance around IPO events.

The following subsections are organized as follows. The first three subsections (Section IV.C.1 to IV.C.3) describe the relationship between sales growth and the three hypothesized sources of competitive advantage (leverage, certification, and knowledge capital). The next subsection, Section IV.C.4, describes the effect of valuation cycles, and Section IV.C.5 analyzes the effect of the control variables. Finally, Sections IV.C.6 and IV.C.7 describe the results for

[24]The results are very similar when age is defined by the log of the number of years since founding as well as when the original age definition and the log of the number of years between founding and listing are used simultaneously.

two alternate measures of performance: operating income growth and capital expenditure.

C.1. Leverage

One of the potential mechanisms behind poor incumbent performance is leverage. We define *Leverage Ratio* as the average debt-to-assets ratio in the 4 years preceding the IPO. We find that there is a negative and statistically significant coefficient of −0.521 on *Leverage Ratio* (Table VI, Model 1), which indicates that incumbent firms with high levels of leverage have poor performance around the introduction of IPOs. The fact that highly leveraged incumbents perform poorly with respect to their less leveraged counterparts is consistent with the conclusions of Chevalier (1995) and Phillips (1995), and helps explain why IPOs perform better than their incumbent industry counterparts.

In addition to measuring leverage directly, we can also look at the availability of public debt financing for incumbent firms. Some firms may be highly leveraged because they have optimally chosen to take advantage of high debt capacity; thus, we need to look at firms' ability to repay debt, in addition to their level of debt. We use the existence of bond ratings as a proxy for debt capacity: *Bondrankyes* is a dummy variable that takes the value one if an incumbent firm has a bond ranking, and zero otherwise. The existence of a bond ranking has a positive and statistically significant coefficient of 0.264 (Table VI, Model 1). This coefficient estimate indicates that firms rated by the ratings agencies perform significantly better than their unrated peers. Since we know that the existence of a rating is correlated with size, the existence of a bond rating may be serving as a measure of financial flexibility, with this flexibility allowing rated firms to perform better than other firms. Overall, the results indicate that leverage and/or difficulty in obtaining credit contribute to incumbent underperformance.

C.2. Certification

To test whether certification plays a role in the performance of incumbent firms, we must measure the certification quality difference between IPO firms and their incumbent competitors. We construct the variable *High UW Ranking* as an indicator variable that takes the value one if an incumbent firm's equity is underwritten by an investment bank with a Carter and Manaster (1990) ranking of nine or above. The statistically significant coefficient estimate of 0.135 (Table VI, Model 2) indicates that incumbent firms underwritten by top investment banks perform better than other firms. This result is consistent with the view that firms underwritten by top investment banks obtain certification, which results in a performance advantage over other firms. We also use venture capital backing as an alternate means of measuring the certification effect arising when firms are chosen by financial institutions. We find that incumbent firms that are backed by venture capital perform significantly better than their competitors. The statistically significant coefficient estimate of 0.071

Table VI

The Effect of Leverage, Certification, and Industry Structure on Post-IPO Event Performance

In this table we report estimates from a regression of sales growth, operating income growth, and capital expenditure growth on determinants of incumbent performance and control variables. Sales growth is the difference between log firm sales in the 4 years after and the 4 years before the IPO event. Operating income growth is the difference between log operating income in the 4 years after and the 4 years before the IPO event. Capital expenditure growth is the log change of capital expenditure from before IPO events to after IPO events. *Log(Age since trading)* is the log of firm age since trading as defined in Table I. All other variables are defined in Table I. Standard errors are adjusted for clustering by IPO event. *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Sales Growth				Operating Income Growth				Capital Expenditure Growth			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Leverage ratio	−0.521***	−0.647***	−0.732***	−0.821***	−0.068	−0.154	−0.282**	−0.336***	−1.051***	−1.082***	−1.162***	1.174***
	(−3.93)	(−6.63)	(−5.81)	(−8.59)	(−0.55)	(−1.34)	(−2.26)	(−3.11)	(−6.74)	(−9.35)	(−7.93)	(−10.59)
Bondrankyes	0.264***	0.261***	0.240***	0.246***	0.371***	0.347***	0.330***	0.317***	0.249***	0.245***	0.227***	0.232***
	(6.97)	(7.53)	(6.24)	(−6.56)	(8.60)	(9.96)	(7.34)	(8.12)	(5.16)	(6.06)	(4.61)	(5.17)
VC backing	0.071*		0.102**		0.116**		0.137***		0.144***		0.171***	
	(1.77)		(2.53)		(2.00)		(2.71)		(3.15)		(3.89)	
High UW ranking		0.135***		0.137***		0.110***		0.112***		0.131***		0.137***
		(3.63)		(3.74)		(3.67)		(4.20)		(3.00)		(2.97)
High research intensity	0.312***	0.333***	0.390***	0.419***	0.561**	0.606***	0.580**	0.608**	−0.105	−0.170*	−0.019	−0.081
	(5.61)	(5.00)	(6.60)	(6.53)	(2.30)	(2.78)	(2.11)	(2.34)	(−1.01)	(−1.84)	(−0.17)	(−0.80)
High HH	0.072	0.102*			0.0185	0.081			0.079	0.034		
	(1.21)	(1.80)			(0.28)	(1.35)			(0.79)	(0.44)		
Log (Age since trading)	−0.221***	−0.215***	−0.191***	−0.165***	−0.124***	−0.128***	−0.077***	−0.079***	−0.212***	−0.178***	−0.186***	−0.143***
	(−9.67)	(−13.40)	(−7.30)	(−9.49)	(−4.43)	(−4.76)	(−2.73)	(−2.87)	(−8.26)	(−8.15)	(−5.89)	(−5.49)
Log (Assets)	−0.042***	−0.048***	−0.052***	−0.053***	−0.070***	−0.069***	−0.076***	−0.073***	−0.001	−0.134	−0.009	−0.019
	(−3.29)	(−4.61)	(−4.08)	(−5.78)	(−5.03)	(−5.25)	(−5.22)	(−6.25)	(−0.05)	(−1.04)	(−0.45)	(−1.36)
Industry underpricing	0.296*	0.289*			−0.012	−0.014			0.236	0.322**		
	(1.82)	(1.72)			(−0.07)	(−0.08)			(1.24)	(1.76)		
Industry M/B ratio	0.054	0.036	0.323*	0.102	0.118**	0.127**	0.633**	0.233	−0.026	−0.013	−0.364*	−0.549**
	(1.62)	(0.84)	(1.87)	(0.71)	(2.18)	(2.14)	(2.31)	(0.90)	(−0.47)	(−1.04)	(−1.70)	(−2.00)
Intercept	0.931***	0.937***	0.458	0.801**	0.585***	0.538***	−0.340	0.326	0.826***	0.742***	1.502***	1.736***
	(10.47)	(9.85)	(1.30)	(3.02)	(5.67)	(5.29)	(−0.71)	(0.71)	(6.74)	(6.54)	(3.56)	(3.36)
IPO events fixed effect?	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
N	4,376	6,866	4,376	6,866	3,101	4,796	3,101	4,796	4,359	6,850	4,359	6,850
R^2	0.1695	0.1583	0.1534	0.1517	0.0691	0.0692	0.0496	0.0646	0.0658	0.0575	0.0281	0.0041

(Table VI, Model 1) indicates that venture capital–backed firms perform better than other incumbent firms around IPO events.

C.3. Knowledge

Another possible reason for incumbent performance differences around IPOs relates to differences in knowledge capital. We use a measure of research intensity that indicates whether incumbent firms are in the top quartile of expenditure on research and development. The statistically significant coefficient of 0.312 (Table VI, Model 1) indicates that incumbent firms with *High Research Intensity* perform better than other incumbent firms.

As Spence (1984) suggests, industry concentration may be related to knowledge capital, so it is reasonable to think that industry concentration may also play a role in creating the competitive effects of IPOs. Furthermore, Lang and Stulz (1992) find evidence of a stronger competitive effect of bankruptcy announcements in industries with low levels of competition. We measure industry concentration with an indicator variable, *High HH*, that takes the value one if the industry HHI exceeds 1,800 and zero otherwise. The variable makes a significant contribution to performance only in Model 2 when sales growth is used, but other performance measures indicate the effect is not robust.

We also find that concentration has an interactive effect with leverage and research intensity. We create an interactive variable by multiplying *High HH* with *Leverage Ratio*, and we find that this variable has a significantly negative effect on sales growth.[25] The effect of leverage on firm competitiveness is thus especially strong in highly concentrated industries. Similarly, we find that firms with high research intensity perform particularly well in concentrated industries. However, while we find that concentration has these interactive effects, concentration has no robust explanatory power when interacted with measures of certification.

C.4. Valuation Cycles

Past returns could be an important part of the story if IPOs are more likely to happen when industries have relatively high market valuations. If, as proposed by Baker and Wurgler (2002), managers are more likely to issue new equity when industries have high valuations, then we could find an increased likelihood of IPOs at the top of the valuation cycle to the extent that valuation cycles are industry-wide. If IPOs are most likely at the top of the valuation cycle, incumbent firms would tend to have better performance before the IPO than after the IPO, and this difference would not necessarily be related to the competition of IPO firms with the incumbent firms.

We control for industry valuation cycles in the regressions by including two proxies for valuation. The first proxy, *Industry Underpricing*, is defined as the

[25]The coefficient on the interaction variable is −0.397 and has a t-value of −2.08.

median industry first-day IPO return over the year preceding the IPO event. The significant coefficient estimates indicate that the sales growth of incumbent firms is higher after IPOs when market valuations are relatively high (Table VI, Model 1 and Model 2). Our second proxy, *Industry M/B Ratio*, is defined as the median market-to-book ratio of all of the firms in an industry over the year preceding the IPO. We find that *Industry M/B Ratio* is not consistently related to sales growth. For the purposes of this article, the important thing is to rule out the possibility that industry cycles coincide with IPO cycles and thus confound the results. We find that the effect of IPOs on industry performance is not explained by industry valuation cycles.

C.5. Other Controls

In all of the regressions we include size and firm age. These variables may affect firm performance in a way that could confound the effect of IPO firms on their incumbent competitors. Our first control, size, proves to be a significant predictor of returns. The statistically significant coefficient estimates in the various models show that larger firms, as measured by the log of book assets, have larger decreases in performance during IPO events. However, while this relationship is statistically significant, it does not replace our main explanations for decreased incumbent performance described above.

We also control for firm age. As shown in Spence (1977), firms have life cycles in which operating performance tends to increase shortly at the beginning of a firm's life span and then increase less, or even decrease, at later stages. The concern for this article is that incumbent firms' performance may be declining in the years measured in our study. We control for firms' life cycles by including the variable *Log*(*Age since trading*), which is defined as the number of years a firm has been publicly traded. We find firm age to be a significant predictor of firm performance. Again, however, after controlling for firm age we find that the explanations described above are still important predictors of performance.

C.6. Operating Income Growth

In the previous subsection (Section IV.C.5), we follow Opler and Titman (1994) and Campello (2003) by measuring firm performance as the change in log sales (Models 1–4 of Table VI). Of course, other performance measures could provide additional evidence on Hypothesis 3. In this subsection we provide the results for the change in log operating income (e.g., Opler and Titman (1994)). With some notable exceptions, the results for this alternate performance measure are very similar to the sales growth results.

In particular, the operating income results are consistent with our finding that incumbent competitiveness is a function of leverage, certification, and research intensity. Consistent with previous results, *Leverage Ratio* has a negative and statistically significant coefficient in models 7 and 8 in which IPO-event fixed effects are taken into account. Similarly, *Bondrankyes* has positive and statistically significant coefficient estimates. Furthermore, our two

certification variables, *VC backing* and *High UW ranking*, have the same effect when this alternative performance measure is used. Finally, firms in high research intensity industries are shown to have significantly better performance around IPOs under this alternate performance measure. Our three hypothesized determinants of incumbent underperformance are therefore supported by these results, that is, operating income growth supports our earlier finding that leverage, certification, and research intensity affect the competitiveness of incumbent firms around IPOs.

While this alternative performance measure supports Hypothesis 3, it also exhibits certain differences. First, the effect of industry concentration, *High HH*, is not significant when performance is measured by operating income growth. Overall, performance appears to be a weak function of industry concentration; it is only significant when performance is measured with sales growth. Another difference between the performance measures is apparent in the underpricing variable. When performance is measured with sales growth, *Industry Underpricing* has positive and statistically significant coefficient estimates. This indicates that incumbents in high market valuation industries perform better than other incumbent firms. However, when performance is measured with operating income, we find that *Industry Underpricing* has no statistically significant coefficient estimates.

C.7. Capital Expenditure

In addition to describing how measures of leverage explain industry performance, we can provide more direct evidence on the importance of leverage by looking at its impact on changes in capital expenditure. If incumbents have less financial flexibility after the IPO, we should see that cross-sectional differences in capital expenditures are related to incumbent characteristics such as leverage ratio and bond market access. In Models 9 to 12 of Table VI we present estimates of a regression of the change in incumbent capital expenditure on these characteristics. Consistent with our results above, there is a negative and statistically significant coefficient on *Leverage Ratio* in each of these models. This indicates that incumbent firms with high levels of leverage have lower growth in capital expenditure around the IPO period. Similarly, firms with available bond rankings have higher growth in capital expenditure (Table VI, Models 9 to 12). The cross-sectional determinants of low capital expenditure growth largely match cross-sectional determinants of underperformance, as the results reported earlier in Table VI indicate that leverage is an important determinant of incumbent firm underperformance. These two results, taken together, support the view that leverage, through a decrease in capital expenditure, contributes to poor incumbent performance.

Overall, the results provide consistent empirical support for Hypothesis 3. We find that leverage, certification, and knowledge are significant determinants of the operating performance of incumbent firms and in particular of their growth in sales, operating income, and capital expenditure.

D. Survival of Publicly Listed Firms

The previous subsection (Section IV.C) analyzes the impact of large IPOs on industry competitors' operating performance and shows that a number of variables have a significant influence on the performance after the IPO. According to Hypothesis 4, the same variables are also expected to have a significant influence on what is arguably the most critical benchmark for a company's operating performance: its probability of survival.

We conduct a probit analysis to determine the effect of leverage, certification, knowledge capital, and control variables on incumbents' probability of survival in the first 3 years after the IPO.[26] The probit estimation takes the following form:

$$\Pr\text{ob}(Y_{i,e}=1)=\int_{-\infty}^{\beta' x}\phi(t)\,dt=\Phi(\alpha+\beta*leverage_{i,e}+\gamma*certification_{i,e}+\delta*knowledge_{i,e}+\phi*controls_{i,e}+\varepsilon_{i,e}). \tag{3}$$

The dependent variable is equal to one if the incumbent firm i still exists 3 years after its competitor's IPO event e, and zero if the company has been delisted for reasons of failure.[27] The final sample comprises 8,559 companies, although limited information availability on venture capital backing and other variables reduces the number of observations in some estimations. The explanatory variables are first tested separately and then jointly. The estimation also controls for return on assets to take into account the fact that operating performance may influence survival probability.

In general the results suggest that the same variables that determine a firm's operating performance also determine a firm's likelihood of surviving the public listing of a major competitor. Firms are more likely to survive if they have a lower leverage ratio at the point of the IPO (Table VII, Model 1). They are also more likely to survive if they have a bond rating, particularly, a good bond rating. Both results suggest that financial flexibility is important to firms when they are faced with an IPO in their industry.

The likelihood of survival also significantly increases for companies that have the backing of venture capitalists before the IPO, as shown in Table VII, Model 4. The same holds for firms whose IPO is underwritten by an investment bank with a high reputation. This is consistent with a certification story according to which top financial intermediaries only underwrite the equity offerings

[26]For the choice of the probit model, we conduct the test of the normality assumption as in Bera, Jarque, and Lee (1984). The test cannot reject the normality assumption for our main model. For robustness, we also run the estimation as a logit model, and the results do not materially differ.

[27]We determine failure by analyzing the delisting reasons given for these companies. In particular, companies are defined to fail if their CRSP delisting code is larger than or equal to 300. This results in a total number of 1,280 failed companies. In an alternative specification, companies are defined to fail if their delisting code is larger than or equal to 400 (500). This reduces the total number of failed companies to 1,215 (1,183). The empirical results from the probit estimations for these specifications do not differ materially.

Table VII

The Effect of Leverage, Certification and Industry Structure on Firm Survival after IPO Events

In this table we report estimates from a probit regression of firm survival on determinants of incumbent competitiveness. *Return on Assets* is the ratio of operating income to assets. *Log(Age since trading)* is the log of firm age since trading defined in Table I. All other variables are reported in Table I. Standard errors are adjusted for clustering by IPO event. *Z*-values are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Model									
Explanatory Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leverage ratio	−0.261***								−0.203***	−0.224***
	(−9.50)								(−7.25)	(−8.70)
Bondrankyes		0.140***							0.137***	0.133***
		(5.83)							(3.88)	(5.07)
Good bondrank			0.186***							
			(3.15)							
VC backing				0.049***					0.024***	
				(6.35)					(3.60)	
High UW ranking					0.048***					0.018
					(3.57)					(1.49)
Hightech						0.048***			0.025**	0.028**
						(3.59)			(2.14)	(2.29)
High research intensity							0.049***		0.007	0.013
							(5.07)		(0.53)	(1.08)
High HH								−0.030	−0.020	−0.017
								(−1.62)	(−1.55)	(−1.33)
Return on assets	0.070***	0.054***	0.053***	0.052***	0.056***	0.053***	0.070***	0.055***	0.057***	0.073***
	(5.74)	(4.82)	(4.81)	(5.67)	(4.90)	(4.32)	(5.47)	(4.76)	(5.50)	(6.01)
Log (Age since trading)	0.025***	−0.001	−0.002	0.003	0.002	−0.000	−0.001	−0.001	0.027***	0.025***
	(4.76)	(−0.11)	(−0.34)	(0.43)	(0.32)	(−0.08)	(−0.20)	(−0.25)	(4.52)	(5.24)
Log (Assets)	0.038***	0.024***	0.028***	0.025***	0.027***	0.032***	0.032***	0.031***	0.023***	0.029***
	(13.05)	(8.43)	(10.17)	(9.28)	(8.85)	(11.39)	(11.89)	(11.42)	(6.23)	(9.28)
Industry underpricing	−0.209***	−0.206***	−0.202***	−0.205***	−0.224***	−0.228***	−0.212***	−0.215***	−0.181***	−0.208***
	(−4.15)	(−3.78)	(−3.79)	(−4.87)	(−4.00)	(−4.16)	(−4.00)	(−4.06)	(−5.06)	(−4.47)
Industry M/B ratio	0.007	0.018*	0.018*	0.009	0.017	0.013	0.014	0.017*	−0.002	0.003
	(0.88)	(1.84)	(1.73)	(1.48)	(1.51)	(1.35)	(1.35)	(1.65)	(−0.47)	(0.49)
Intercept	0.066***	0.098***	0.095***	0.101***	0.010***	0.085***	0.093***	0.100***	0.065***	0.072***
	(3.34)	(4.29)	(3.99)	(5.21)	(3.83)	(3.85)	(3.99)	(4.04)	(3.47)	(4.20)
Pseudo R^2	0.1258	0.0923	0.0867	0.0896	0.0864	0.0891	0.0867	0.0843	0.1531	0.1392
N	7,143	8,559	8,559	5,630	8,559	8,559	8,559	8,559	4,514	7,143

of those companies for which they have performed careful due diligence and that they have found to be of high quality.[28]

In addition, we test whether a company's survival likelihood increases in its research intensity (Table VII, Model 7). We find that firms that are more research intensive have a significantly greater chance of surviving than less research intensive firms. This suggests that innovative firms with a high share of new products are hit less severely by the intensified market presence of a potential competitor. In contrast, the results show no significant impact of market concentration on survival probability (Model 8). Finally, we use the different explanatory variables simultaneously in Models 9 and 10 and find that all of the results from the separate regressions remain significant, with two notable exceptions. While underwriter ranking and research intensity matter for the performance of incumbent firms, they become less important for determining whether these firms survive. The results, taken together, indicate that a low underwriter rank and low research intensity contribute to the poor performance of incumbent firms, but they do not directly influence their survival probability.

The overall results from the probit estimations provide evidence for Hypothesis 4 and confirm the earlier results on the impact of a large IPO on its industry competitors' operating performance. Incumbent firms are more likely to survive following an IPO in their industry if they have a lower leverage ratio, if they have a bond ranking, if they have the backing of venture capitalists, and if they operate in high tech industries.

V. Robustness Tests

The methodology for the choice of sample companies in this article is motivated by the desire to avoid any contamination of the measurement period, in particular with respect to the cross-sectional analysis of the performance of incumbent firms over a period of 6 years. The robustness tests below examine whether the results are sample specific or whether they also hold for different and more broadly selected samples.

A. Short-Term Price Reaction Using a Larger Sample

The observation period for the analysis of the short-term price reaction of incumbent firms comprises a maximum of 31 days for each IPO. It thus overlaps much less with the observation periods of other IPOs than in the cross-sectional analysis of long-term performance. This allows us to consider alternative selection criteria of IPOs and test their impact on the stock prices of incumbent firms. The first alternative selection criterion is whether the market capitalization of an IPO is above the top 10% of the market capitalization of all publicly

[28]This result is also consistent with the notion that venture capitalists help a start-up firm to improve its operational, product market, and financial decisions. This argument is in line with the reasoning in Hellmann and Puri (2002).

traded firms in the same industry at the time of the IPO. The second alternative selection criterion is whether the market capitalization of an IPO is above the top 10% of the market capitalization of all IPOs in the same industry.[29] We repeat the analysis of the short-term price reactions for these two alternative samples and find similar results as before.[30] The evidence thus suggests that the results are robust to other selection criteria and larger samples and are thus not due to our specific selection methodology.

B. Short-Term Price Reaction Using Different Rolling Windows

Even with the given selection methodology, we have discretion about the length of the rolling window that we use to analyze the cross-sectional performance of incumbent firms before and after an IPO in their industry. While we use a 3-year rolling window in our main analyses in this article, we test the robustness of the results by using in addition both a 2-year and a 4-year rolling window around the IPO, that is, a total period of 4 and 8 years, respectively. We find that the stock returns of incumbent firms are negative and significant in both windows, for the analysis of both individual firms and the portfolio of firms.[31] These results thus suggest that the evidence is robust to the choice of observation period.

C. Short-Term Price Reaction Using Specific Industries

The selection methodology used in this paper concentrates on large IPOs. This may give rise to a bias towards firms in low tech and heavy industries and not truly represent the universe of IPOs and firms in a given industry. This concern is alleviated by the first robustness test, which shows that the short-term event results are negative and significant for different samples that explicitly take into account the industry in which an IPO firm operates. We nonetheless rerun our analysis by excluding IPOs for those firms that operate in the following two-digit SIC industries: 10, 12, 13, 14, 15, 16, and 17. The stock returns are negative and significant at the 1% level or better.[32] Thus, in line with the results in the first robustness test, the evidence suggests that even if an industry bias is induced by our sample methodology, the event returns remain robust to different selection criteria.

D. Results Using a Differently Selected Sample

The IPO data in this article come from the SDC New Issues Database and are subsequently matched with CRSP and Compustat data. In order to further

[29]These criteria result in samples of 150 IPOs and 433 IPOs, respectively.

[30]The results are presented in the Internet Appendix.

[31]This selection criterion results in a sample of 161 firms for the 2-year rolling window and a sample of 110 firms for the 4-year rolling window; the empirical results are presented in the Internet Appendix.

[32]These results are presented in the Internet Appendix.

rule out the possibility that the results in this article are sample specific, all the analyses in this article are repeated with a different underlying sample of IPOs, but with the same methodology. The underlying sample of 5,747 IPOs from 1980 to 2001 for this robustness test comes from the data set provided by Jay Ritter.[33] As before, the selection methodology with 6-year rolling windows is applied to Jay Ritter's IPO sample. This results in a total sample size of 137 IPOs, which is comparable to the sample size of 134 IPOs used in the main body of this paper.[34] All the analyses for the main sample, including the short-term event studies as well as the cross-sectional performance and survival estimations, are then repeated for this sample. The results do not materially differ from the results for the original sample.[35] The robustness tests suggest that the results in this article are not sample specific, but hold as well for different and more broadly selected samples.

VI. Conclusion

In this article, we analyze the stock price, operating performance, and survival probabilities of publicly traded companies after a large IPO in their industry. We find that industry competitors experience negative stock returns when an IPO is filed and thus initially announced as well as when an IPO is completed. Further, reinforcing the conclusion that IPOs are driving the results, we show that withdrawn IPOs have the opposite effect on industry incumbents: The withdrawal of an IPO is associated with positive industry performance.

We also provide evidence of a significant deterioration in the operating performance of industry competitors after the IPO. We find in the cross-sectional analyses that companies perform better, and are more likely to survive, if they are less leveraged and thus have more financial flexibility, if their IPO has been underwritten and thereby certified by a top investment bank or by a venture capitalist, and if they spend more on research and development and as a consequence possess a competitive advantage through the accumulation of knowledge capital. Furthermore, when we control in our cross-sectional results for the effect of industry valuation cycles on incumbent performance, we find that while valuation cycles matter, the competitive aspects of IPOs have large and significant effects on industry incumbents.

These results suggest that IPOs have competitive effects on other companies that operate in the same industry. The evidence we present has implications for investors, particularly in the assessment of the expected risk and return of companies in industries in which there is a high probability of new IPO

[33]The information is provided on Jay Ritter's webpage at http://bear.cba.ufl.edu/ritter.

[34]Twenty six percent (36/137) of the IPO events selected from Jay Ritter's sample are also among the events in the sample used in the main body of this paper. Using post-IPO market capitalization for size in the original selection technique, 37% (51/137) of the IPOs are shared in the two samples. Jay Ritter's sample differs from our original sample in that it comprises a larger number of IPOs. However, it does not provide the proceeds for each of these IPOs, so we have to use the end-of-IPO month market capitalization as the measure of IPO size for this sample.

[35]The results are presented in the Internet Appendix.

entrants. Similarly, competitor companies need to understand how an IPO affects their competitive position and how they can respond to it. The article also sheds new light on the analysis conducted by companies considering whether to raise capital through an equity offering. While the previous literature has primarily focused on market timing as well as direct and indirect issuing costs such as underwriting fees and underpricing, we provide evidence of a beneficial competitive effect for certain IPOs. An open question for future research is to what extent competitive effects can also be found for other capital market transactions such as secondary offerings and delistings.

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