Institutional investors and firm performance: Evidence from IPOs

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ABSTRACT

We investigate the determinants of institutional investors' holdings in IPO firms and the post-issue relation between these holdings and operating performance. We find that institutions' initial holdings strongly depend on IPO characteristics, in particular, the public float. After controlling for public float, initial institutional holdings are unrelated to pre-IPO operating performance. During the first year after the IPO, average institutional holdings increase from 24% to 36% of shares outstanding and stabilize at about 42% by the end of the second year. Furthermore, post-IPO operating performance is positively related to institutional holdings. This relation holds also when either variable is lagged, but diminishes towards the third year after the IPO. Overall, our findings indicate that institutional ownership is a valid indicator of the firm's operating performance in its initial years as a public company.

Keywords: IPO, institutional investors, public float, ownership structure, operating performance, equity issuance, agency.

JEL Classification Codes: G30, G32

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I. Introduction

The IPO is a defining event in a firm's life. It provides successful young firms with funds to grow further and leverages the scale of operations. IPOs enable the public to share in the firm's success while letting entrepreneurs alleviate risks. They are generally associated with a substantial change in the firm's ownership structure, giving voting power to new investors. There is also great variability in the post-IPO operating performance of IPO firms. Some perform spectacularly well after the IPO (Microsoft, Apple, Google). Others perform very poorly and even go bankrupt and disappear within a short period of time after the IPO (Netscape, TheGlobe.com, Pets.com). IPOs have demonstrated strongly increasing economic significance. Companies globally raised $133 billion in 2016, up from $1.3 billion in 1980.[1] It is therefore not surprising that IPOs have been of great interest to researchers of corporate finance. Indeed, various aspects of IPOs, including short-term and long-term price and operating performance, have been investigated extensively.

One important investor group that intensively engages in IPOs, and has also grown dramatically over recent decades, consists of institutional investors (pension and mutual funds, insurance companies, etc.).[2] Institutional investors are deeply involved in the book-building process, they are given priority in allocations, and their allocations have been shown to be related to first-day returns (Ritter and Welch (2002), Aggarwal, Prabhala, and Puri (2002), Jenkinson and Jones (2004), Brown and Kovbasyuk (2017)). They also trade aggressively in the stock right after the IPO (Hanley and Wilhelm (1995), Krigman, Shaw, and Womack (1999), Aggarwal (2003), Boehmer, Boehmer, and Fishe (2006)). They have, moreover, been shown to affect

[1] See, for example, EY Global IPO Trends 2016-Q4 report.
[2] Institutional investor ownership grew from 8% in 1950 to 67% in 2010 (Blume and Keim (2012)).

numerous corporate policies such as compensation (Hartzell and Starks (2003), Hamdani and Yaffe (2013)), payout policy (Grinstein and Michaely (2005), Gaspar, Massa, Matos, Patgiri, and Rehman (2013), and Crane, Michenaud, and Weston (2016)), and R&D investment (Bushee (1998)). It is also generally the investor group that takes the lead in shareholder activism and monitoring of the firm (Smith (1996), Stoughton and Zechner (1998), Gillan and Starks (2000), Cornett, Marcus, Saunders, and Tehranian (2007), and Aggarwal, Saffi, and Sturgess (2015)).

Given the documented power and governance skills of institutional investors, one important question is how institutional investors' involvement in IPOs is related to the operating performance of these firms. The main purpose of this study is to answer this question. Earlier studies on institutional investors and IPOs consider the manner in which institutional investors exploit private information through their IPO allocations, their trades in the financial markets right after the IPO, and their gains based on stock price performance. However, to our knowledge, there has not been an earlier systematic inquiry into the relation between institutional ownership and IPO firm operating performance. Given the economic significance of these investors, we believe it is important to study the nature of their holdings in newly public firms and the characteristics of the IPO firms in which they tend to invest for the long run, and whether the great variability documented in an IPO's firm post-IPO operating performance can be related to institutional investors' presence.

In this study, we investigate how institutional investors' holdings (henceforth "II holdings" or "institutional holdings") are related to IPO characteristics and firm operating performance. Accordingly, our investigation of institutional holdings starts right after the IPO, and thus in this study we are not interested in the dynamics of II holdings before and around the

IPO. In particular, we focus on II holdings after most flipping ends.[3] We first investigate the manner in which ownership of institutional investors in newly public firms immediately following the IPO is related to IPO characteristics and pre-IPO firm characteristics. The IPO characteristics we consider are the ratio of shares sold to shares outstanding (henceforth the "public float ratio", or the "public float") and the primary-to-total shares sold ratio. The firm characteristics we consider are firm size, leverage, and operating performance in the year prior to the IPO. Here we find that right after the IPO, institutional holdings as a fraction of outstanding shares is positively related to the public float and to firm size and leverage. However, after controlling for the public float ratio, institutional holdings are unrelated to operating performance prior to the IPO or to the primary-to-total shares issued ratio.

We next track the evolution of institutional ownership following the IPO. Our variable of interest is institutions as a shareholder group regardless of when they acquired their shares. We first document that institutional holdings increase dramatically in the first few years of the newly public firm. The average holdings of institutional investors immediately following the IPO is at 24%, but by the end of the first year it reaches 36%. It then stabilizes at 42% by the end of the second year, and remains at the same level onwards. This result complements findings of earlier studies that focus on the holdings of institutional investors prior to an IPO and studies describing how these original investors alter (sell) their holdings after the IPO. Chemmanur, Hu, and Huang (2010), for example, consider the evolution of original institutional investors' holdings and find that they sell 70% of their holdings within the first year after the IPO. Our findings suggest that original institutional investors are actually replaced by new institutional investors. As we show, the dramatic increase in total institutional holdings after the IPO that we find here cannot be

[3] Most flipping (the practice of buying shares at the IPO and selling them in the market right afterwards) happens within the first few days after the IPO; see, for example, Aggarwal (2003), and Chemmanur, Hu, and Huang (2010).

attributed merely to the general growth in institutional holdings over time documented in the literature (e.g. Gaspar, Massa, and Matos (2005)).

Next, we investigate how institutional holdings and operating performance interact over the first three years following the IPO. We consider the contemporaneous relation, the relation between institutional holdings and lagged performance, and also between operating performance and lagged holdings. In this analysis, we first measure operating performance according to standard measures. However, we also measure abnormal operating performance relative to industry average and median, which is to our knowledge novel (see Section III on the measurement of standard and abnormal operating performance). Last, we repeat the above analysis for the relation between the change in operating performance and the change in institutional holdings.

We find that regardless of the way we measure operating performance and whether we look at levels or changes, institutional holdings and operating performance are generally related. Institutional holdings are also positively related to lagged operating performance, and operating performance is positively related to lagged institutional holdings. The relation is strong in the first and second year following the IPO. However, it is less significant in the third year after the IPO and often completely disappears. Because this relation is robust for levels and changes and also in lags, we suggest that in the initial period after the IPO, higher institutional holdings improve operating performance and at the same time better operating performance attracts institutional holdings. This positive relation between institutional holdings and operating performance thus implies that institutional investors' involvement in IPOs is not only information-advantage driven, as suggested in earlier studies on IPOs and II holdings. Rather, it is also related to institutional investors' skills in alleviating agency problems and enhancing

governance through their impact on corporate policies (e.g. through monitoring and shareholder activism).

Furthermore, the analysis of abnormal performance rather than naïve performance at times provides more significant findings. This paper's contribution is thus not only in documenting the relation between aggregate institutional holdings and performance, but also in suggesting that the use of abnormal operating performance, in addition to naïve operating performance, can enrich robustness in operating performance investigations.

The rest of this paper is organized as follows. Section II reviews the literature. Section III describes data summary statistics and methodology. Section IV reports results on the relation between institutional holdings immediately after the IPO and IPO characteristics as well as pre-IPO operating performance. Section V reports results on the long run relation between levels of institutional holdings and operating performance, and Section VI reports our findings on the relation between changes in institutional holdings and operating performance. Section VII considers extensions and robustness tests. Section VIII concludes.

II. Related Literature

A. Institutional Ownership and Performance in General

There is a vast body of literature on the relation between institutional investors' holdings and operating performance in general (unrelated to IPOs). The focus of this literature is on monitoring and governance. The reasoning behind the hypothesis that institutional investment will be associated with better performance is that the holdings of institutional investors tend to be large, and hence they have the voting power to influence decisions, while at the same time they have enough shares to benefit from their (costly) monitoring and governance activity (Jensen and

Meckling (1976), Jensen (1986)). Indeed, the size of institutional investors' holdings is important. Shleifer and Vishny (1986) show that the willingness of shareholders to intervene in corporate affairs increases with the size of their stake and the value creation stemming from such intervention.

As mentioned earlier, institutional investors are generally the investor group that takes the lead in shareholder activism and monitoring of the firm (Smith (1996), Gillan and Starks (2000), Cornett et al. (2007)). More recently, Aggarwal et al. (2015) find that institutional investors value the right to vote and use the proxy process as an important channel for affecting corporate governance (see also McCahery, Sautner, and Starks (2016)). Other studies show that institutional holdings also enhance performance in mutual funds (e.g. Pan, Wang, and Zykaj (2015)).

Gompers and Metricks (2001) show that institutional investors prefer large, liquid, and high book-to-market stocks and that their preferences affect stock returns. Gaspar et al. (2005) suggest that it is the investment horizon of institutional investors that is positively related to the firm's stock price performance. Smith (1996), however, does not find an impact of institutional shareholders' activism on operating performance, but Cornett et al. (2007) find that Tobin's Q is positively related to institutional holdings. Their interpretation of this finding is that institutional investors improve operating performance. Harford, Kecskes, and Mansi (2015) find that firms with more long-term institutional investors tend to have more shareholder-friendly corporate governance. Cheng, Hong, and Scheinkman (2015) find that the presence of institutional investors reduces managers' risk taking.

B. Institutional Investors and IPOs

Earlier literature mostly considers the manner in which institutional investors exploit private information to benefit from their holdings in the IPO. Aggarwal et al. (2002) investigate allocations to institutional investors in IPOs and find they are positively correlated with first-day returns, and that institutional allocation in underpriced issues is in excess of that explained by book-building theories alone. Jenkinson and Jones (2004) find that this ability to receive superior allocations in good IPOs is the result of institutional investors' good relations with the investment banks. Aggarwal (2003) documents the involvement of institutional investors in flipping activity immediately after the IPO. Fernando, Krishnamurthy, and Spindt (2004) find that higher priced IPOs show a higher fraction of institutional investment. Boehmer et al. (2006) further show that institutions are able to get better allocations of IPOs with superior long-run stock market performance. Kale et al. (2012) find that the smaller the IPO firm's level of institutional ownership, the greater is the probability that the firm will initiate dividends.

Field and Lowry (2009) consider the evolution of the stock price after the IPO in relation to initial institutional investor holdings. They show that institutions are able to get higher returns on their investment in IPOs. They find that this is mainly due to institutions being able to avoid the worst performers. Field and Lowry relate this qualification to the institutions' access to private information through their involvement in the book-building process. They also document the evolution of aggregate institutional holdings after the IPO and show it increases over time. Chemmanur, Hu, and Huang (2010) explore information aspects of the trading of original institutional holdings after the IPO. Specifically, they show that institutional investors utilize private information to benefit from their holdings (selling shares) when they trade after the IPO. They show this by analyzing the relation between the original institutional trade and long-run

stock returns. Their data includes all firms subscribing to Abel/Noser. Our paper uses the complete population of institutional investors reporting to the SEC on 13F forms, and also investigates the evolution of institutional investors' holdings in relation to operating performance after the IPO.

C. Post-IPO Operating Performance

There are also studies that look at post-IPO operating performance in general (unrelated to institutional investors' holdings). The general findings here are deterioration in operating performance. Indeed, a decline in firms' profitability is documented in Degeorge and Zekhauser (1993), Jain and Kini (1994), Mikkelson, Parch, and Shah (1997), Teoh, Welch, and Wong (1998), Pagano, Panetta, and Zingales (1998), Pastor, Taylor, and Veronesi (2009), and Chemmanur, He, and Nandy (2010). Krishnan, Ivanov, Masulis, and Singh (2011), however, find that this performance depends on venture capitalists' reputations.[4] Brau, Couch, and Sutton (2012) find that post-IPO performance is negatively related to the tendency of the IPO firm to engage in acquisition activity. Kao et al. (2007) suggest that the deterioration in operating performance observed after the IPO may be the result of earnings management in the IPO pricing period.

D. Public Float and Primary vs. Secondary Shares Issued

Our study finds that initial institutional holdings are related to the public float defined as the post-issue ratio between shares sold to the public in the IPO and outstanding shares

[4] Furthermore, Wang (2005) documents a non-linear relation between non-state (i.e. non-government) ownership and performance changes. Firms with low and high levels of non-government ownership exhibit a positive relation between non-government ownership and performance changes, whereas firms with intermediate levels of non-government ownership experience a negative relation between non-government ownership and performance changes.

immediately following the IPO. While we are unaware of earlier documentation of this relation, there are also earlier investigations into public float, and into share overhang, which in principle is a variant of the reciprocal of the public float ratio (see, for example, Habib and Ljungqvist (2001) and Bradley and Jordan (2002)). This literature documents that first-day IPO returns are negatively related to the public float. Brau, Li, and Shi (2007) and Michel, Oded, and Shaked (2014) find that long-run returns are also related to this ratio. While we find that institutional investors' initial holdings are not related to the ratio of primary-to-total shares sold, the literature does show that this ratio is important. For example, Ljungqvist and Wilhelm (2003) find that this ratio is related to short-run returns.

III. Data and Methodology

Our initial firm-level data comes from the merger of four databases. The IPO sample was obtained from the SDC database for the period January 1, 1996 through December 31, 2008.[5] Data for calculating IPO characteristics (primary and secondary shares issued, number of outstanding shares before and after the IPO) is taken from the SDC database, and from filings with the SEC (424B filings and their updates, and first financial statements to the SEC, i.e. 10Q and 10K forms). Price data is taken from CRSP, and operating performance data is taken from Compustat. Institutional investor holdings data is obtained from 13F filings to the SEC, obtained from Thompson Reuters. CRSP, Compustat, and Thompson Reuters data is obtained through the WRDS platform.

[5] We start in 1996 because before then data availability for this study is limited. 2008 was used as the final year of the sample because in the years immediately following 2008 there were very few IPOs and also because we required three years of data following the IPOs to measure long-run performance.

From the initial sample of all IPOs in the SDC for the period of study we removed all utility and financial firms (see, for example, Field and Karpoff (2002)), resulting in a sample size of 2119 firms. Of this sample, 52 firms were missing price data on CRSP and 39 firms were missing Compustat data. Following earlier studies (e.g. Loughran and Ritter (1995), Eckbo, Masulis, and Norly (2007)), 74 ADRs were also dropped, resulting in 1954 firms. Due to missing and erroneous institutional investor data, 47 additional firms were dropped, resulting in the final sample of 1907 firms.[6]

A. IPO Characteristics

We first measure two characteristics of all the IPOs in our sample. The first is the public float (*PF*), which is the ratio of the number of shares sold to the public in the IPO to the number of shares outstanding right after the issue, that is, the fraction of shares that is transferred to the public in the IPO (e.g. Bradley and Jordan (2002)).[7] The second IPO characteristic we consider is the ratio of primary shares issued to total shares sold in the IPO (*PRIM*). Primary shares are new shares that are issued to the public in the IPO. The proceeds from the sale of primary shares become part of the firm's cash assets. The rest of the shares sold are secondary shares, which are existing shares that are sold in the IPO by pre-IPO shareholders (the entrepreneur, angel investors, institutions, etc.). Unlike primary shares, the sale of secondary shares does not raise funds for the company. Both primary and secondary share sales, however, reduce original shareholder ownership (e.g. Habib and Ljungqvist (2001), Ljungqvist and Wilhelm (2003), Brau

[6] The analysis around the IPO date is based on this sample of 1907 firms. Due to missing data, the sample for the long-run analysis ranges between 1,907 and 1,073 firms, depending on the horizon of the analysis.
[7] Bradley and Jordan (2002) consider share overhang, which is the ratio of retained-to-sold shares. Share overhang is, closely, the reciprocal of the public float (specifically, overhang is (1-*PF*)/*PF*).

et al. (2007)).[8] Thus, the variable *PRIM* measures the nature of the funds involved in the IPO in terms of raising funds for the firm versus transferring funds to pre-issue shareholders.[9]

SDC's New Issue database reports intended number of shares for sale as filed with the SEC, but we have found this data to be erroneous. Moreover, it does not distinguish between primary and secondary shares (see Habib and Ljungqvist (2001)). Thus, after obtaining the sample of IPO firms for the sample period, we turned to retrieving data on shares from the prospectus and registration forms directly (424B4 and S1 filings, respectively). These filings include pre-IPO information and the firm's intentions regarding the sale of primary and secondary shares (see also Loughran and Ritter (2004) on retrieving primary and secondary shares from 424B4 forms). However, when we cross-checked this data with the first financial reports published after the issue (10Q and 10K forms), we learned that often the intentions declared in the prospectus and registration statement do not reflect what eventually happened. That is, firms often increase or reduce the number of primary and secondary shares sold after they have filed the 424B4 and S1 forms. Thus, we have corrected the registration forms' data using the 10Q and 10K forms (the first report after the issue) to reflect what actually happened.[10]

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[8] Habib and Ljungqvist (2001) and Ljungqvist and Wilhelm (2003) consider the "participation ratio" and "dilution ratio" of the secondary/pre-IPO and primary/pre-IPO shares, respectively. Most firms, however, sell both primary and secondary shares, and both ratios reflect reduction of original shareholder ownership (though the sale of secondary shares is more ownership reducing). Given that our focus is ownership structure and operating performance, we prefer instead to consider public float, which captures reduction in original shareholder ownership, and primary/total sold, which captures the fund-raising nature of the IPO.

[9] The variables *PF* and *PRIM* include overallotment shares. Excluding overallotment shares does not alter our qualitative findings.

[10] The 424B4 filings are updated several times before the offering. In fact, we found that even the last form filed often reports intended primary and secondary share figures that are significantly different from what was eventually sold. Thus, our understanding is that earlier studies of IPO characteristics (e.g. Bradley and Jordan (2002), Benveniste et al. (2003), Loughran and Ritter (2004), and Brau et al. (2007)) that relied in their analysis on the 424B4 and S1 do not use the actual values of primary and secondary shares. These non-final values are likely adequate for the pre-IPO analysis and for the information-motivated analysis performed in these studies. However, for our long-run operating performance focus, what the firm actually sold is more important than what it initially announced or intended to sell. That is, for informational effects around the IPO, it is likely better to use the 424B4 forms, but for a post-IPO investigation, the figure reflecting actual shares issued is more important. Nevertheless, we still use the prospectus to get information such as pre-issue shares, which is sometimes missing in the financial reports (10Q and 10K) and which we need for calculating the IPO characteristics.

[Insert Table 1 Panel A and B about here]

Panel A of **Table 1** reports summary statistics of the IPO sample by year and for the complete sample (bottom row). Column (1) reports the number of IPOs per year over the sample period 1996–2008, and Column (2) reports these as a fraction of the total sample. Columns (3) and (4) report the average primary and secondary shares issued as a fraction of the post-IPO outstanding shares, respectively. Column (5) reports averages of *PF*, the public float, defined as the ratio of shares sold in the IPO to total post-issue outstanding shares. This is the sum of Columns (3) and (4). Column (6) reports averages of *PRIM*, which is the ratio of primary shares issued to total shares sold. *PRIM* is also the complement to unity of the fraction of secondary shares sold out of total shares sold (that is, *PRIM* + secondary divided by total = 1). Column (5) indicates that the public float has been stable at about 30% over the years. Column (6) suggests that the vast majority of shares issued are primary shares, although over the years the fraction of primary shares issued has decreased slightly from about 95% to about 90%, and the fraction of secondary shares issued has increased accordingly.

B. Measuring Institutional Investor Holdings

The main institutional investor holdings variable we are interested in is the fraction of shares held by institutional investors immediately following the IPO, and the evolution of this variable after the IPO over time.[11] Following Grinstein and Michaely (2005) and Cornett et al. (2007), we obtain institutional holdings data for all the IPOs in our sample using 13F forms from

[11] We focus on total institutional ownership. Excluding institutions that are not likely to respond to performance is only likely to strengthen our findings. Focusing on total ownership will be appropriate for the endogeneity tests performed in Section VII (as in Bird and Karolyi (2016), and Crane et al. (2016)).

Thompson Reuters (available through the WRDS platform) for the period 1996-2011. This is the IPO sample period 1996–2008 plus 12 quarters (three years) after the IPO. Institutions that file 13Fs are mutual funds, pension funds, bank trusts, insurance companies, large brokerage firms, and endowments. The 13F forms are filed on a quarterly basis.[12] It is the institutions (managers) that file, and Thompson Reuters aggregates the filings by the firm in which the investment is reported and the quarter of reporting. The institutional holdings' data retrieved for the IPO sample consists of about 1.5 million rows, each row reporting end-of-quarter holdings in a firm by a manager (institutional investor). See Appendix A for an example. For every firm-quarter, we then aggregate the number of shares held reported by the institutions (managers) to get the aggregate number of shares held by institutions per firm.

We obtain total shares outstanding data per firm by end of quarter from Compustat.[13] Then, for every firm-quarter, we divide the aggregate number of shares held by institutions (which is calculated based on the 13F forms data) by the number of outstanding shares from Compustat, to obtain the fraction of shares held by institutional investors per firm-quarter. In calculating the fraction of II ownership of outstanding shares, we ensure II holdings and shares outstanding are adjusted for stock splits.

Institutional investors are required to report on a quarterly basis: a) the number of shares they hold, and b) the change in holdings during the quarter. However, the data retrieved from Thompson Reuters is often missing and inconsistent. Although institutions are required to report holdings continuously, some institutions report their holdings in a firm only when their holdings in that firm change. Also, reported shares held and changes in holdings are often inconsistent.

[12] Only institutions with holdings of $100 million or more have to file the 13F form. They are required to report holdings in all U.S. firms, for all holdings that are more than $200,000 or 10,000 shares.
[13] The Thompson Reuters Institutional Investor data set also includes shares outstanding, but for the period prior to 2001 the data is inaccurate and often missing, and hence was not used for this study.

Generally, whenever we had inconsistencies in the data, first, we gave priority to later data. Second, we gave priority to the shares held report over the net change report since we noticed that firms are more accurate and cautious about reporting the former. Appendix A describes in detail the construction process of the II holdings variable from the raw reported data.

[Insert Figure 1 about here]

Figure 1 illustrates the evolution of average institutional investor holdings relative to the IPO date over time.

In the top chart (Figure 1A), the solid line plots the average institutional holdings of the complete sample of 1907 firms. It can be observed that in the first quarter following the IPO, average institutional holdings are at approximately 24%. The average holdings increase gradually but consistently over the first few quarters after the IPO and reach about 36% by the end of the first year (Q4). By the end of the second year following the IPO (Q8), they reach about 41%, remaining stable afterwards, and reaching about 42% by the end of Q12 after the IPO. This result provides an interesting complement to the findings in Chemmanur, Hu, and Huang (2010) on the holdings of original institutional investors who own shares at the time of the IPO. They show that these original institutions sell about 70% of their shares within one year after the IPO. The findings here suggest that total institutional holdings (original and new) do not fall after the IPO as a result of original institutions selling their shares. Instead, they suggest that the original institutions are replaced by new institutional investors, and overall institutional holdings actually increase over time. We note, however, that three years after the IPO, the average holdings of institutional investors in IPO firms is low relative to the average holdings

suggested in footnote 2 in the introduction (67% in 2010). This is consistent with the findings in Boehmer et al. (2006) that institutions have preferences for size, liquidity, and book-to-market. This is, in turn, because IPO firms tend to be small and are growth-oriented firms. We argue, however, that given the tendency of institutional investors to invest in large firms, and in particular in firms that are included in indices, the initial investment (24%) and the rapid growth to 42% within three years should not be regarded as low.

The literature documents a continuous increase in institutional holdings in the stock market over the last decades (e.g. Gaspar et al. (2005)). It is thus important to verify that the increase in institutional holdings in the first three years after the IPO reflected in Figure 1 is not a simple artifact of this trend. Therefore, we split the IPO sample into two sub-periods: 1996–2001 and 2002–2008, and plot the average institutional holdings for each of these sub-samples. The dotted line in the chart plots the average institutional holdings over the early years of the sample (1996–2001) and indicates that they increase over the first two years following the IPO from 21% to 30%. The dashed line plots the average institutional holdings over the later years of the sample (2002–2008) and indicates that the average holdings increase over the first two years after the IPO from 27% to about 50%. Thus, the dashed line starts and ends above the dotted line, consistent with the overall increase in institutional holdings over time, documented in the literature. The dramatic increase in holdings within the first two years, in each of the two sub-samples (about 9% and 23%, respectively), and the flattening afterwards cannot be explained by the general increase in II holdings over time. However, the higher starting and ending points for the earlier period relative to the later period is consistent with this trend.

The bottom chart in the figure (Figure 1B) includes the split of institutional holdings over cold and hot market years where 2001–2003 and 2008 are the cold market years in our sample

and the rest are hot market years. Here, too, the solid line plots the average institutional holdings over time relative to the IPO for the complete sample as in Figure 1A. The dotted line plots the average of the cold years in the sample, while the dashed line plots average institutional holdings over the hot years of the sample. As can be observed from the figure, the dotted line starts and ends substantially higher than the dashed line, indicating that institutions tend to hold a larger fraction of IPO firm shares in the years following the IPO in cold market years relative to hot market years. This gap is consistent with the findings of Chemmanur, Hu, and Huang (2010) that in cold market years original institutional investors are slower to sell their shares.

In Panel B of Table 1 (top of left column) summary statistics of institutional holdings are reported for the end of the first quarter and the end of the first three years following the IPO.

C. Measuring Operating Performance

We measure operating performance using four different common measures.[14] The first three are operating income based measures: operating return on assets, *ROA*, measured as operating income before depreciation divided by end-of-year total assets, calculated using Compustat data items *OIBDPQ* and *ATQ*; operating return on assets-less-cash, *RO_ALC*, calculated using Compustat data items *OIBDPQ*, *ATQ*, and *CHEQ*; and the ratio of operating performance to revenue, *ROS*, calculated using Compustat data items *OIBDPQ* and *REVQ*. Here we use quarterly Compustat data for the construction of these variables for better resolution relative to the IPO date (see also Lie (2005)). That is, Compustat quarterly variables *OIBDPQ* and *REVQ* are aggregated yearly relative to the quarter of the IPO.

[14] The literature commonly uses these measures or similar variations. See, for example, Jain and Kini (1994), Mikkelson et al. (1997), Grullon and Michaely (2004), Cornett et al. (2007), and Gu and Hackbarth (2013).

In addition, for each of the above variables we calculate abnormal values as follows. We first calculate industry benchmarks for each of the three performance variables based on value-weighted average, and industry median.[15] Then, for each firm we calculate abnormal performance relative to the two benchmarks. Level of abnormal performance is calculated for years 0, 1, 2, 3 relative to the IPO, and changes in operating performance are calculated between pairs of subsequent years. Year 0 (*Y0*) is the year ending in the last fiscal quarter immediately preceding the IPO, year 1 (*Y1*) is the year ending in the fourth quarter after the IPO, and so on.

Barber and Lyon (1996) recommend using changes instead of levels to examine unexpected or abnormal performance because the test statistics based on changes are more powerful than those based on levels. Accordingly, for each of the above variables we use both levels and changes from year to year.

The fourth operating performance measure is market-to-book (*MtoB*), which is the ratio of the market value of the firm's equity to the book value of the firm's equity. Here, market value is calculated as number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*), and for book value we use Compustat data item *SEQQ*.[16],[17]

We include two control variables in the analysis, size and leverage, as follows: For size we use *lnMV*, the natural log of the firm's equity calculated as number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). Leverage

[15] We also calculated abnormal operating performance relative to equally weighted averages. The results here were weaker than the results under value-weighted average and median, suggesting that the findings are stronger for the larger firms. The results were, however, generally significant also under the equally weighted average benchmark.
[16] Our definition of *MtoB* follows that used in Jain and Kini (1994). Other studies calculate *MtoB* as market value of equity plus book value of debt divided by book assets (e.g. Lie (2005)).
[17] For more on our four measures and their applicability see, for example, Barber and Lyon (1996), Jain and Kini (1994), Grullon and Michaely (2004), and Lie (2001, 2005).

(*LEVER*) is calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) at the last quarter of the relevant year.[18]

In the literature, *MtoB* is often used as a control variable. Accordingly, we also ran all the regressions that have the other three performance variables as explanatory variables, including *MtoB* as a control variable. All results are qualitatively the same when *MtoB* was included as a control variable. For compactness we do not include this analysis in the paper. All variables are winsorized at 0.5% (on each side, high and low values).

Table 1 Panel B, reports summary statistics of performance and control variables (left columns) and of the components used to construct them (right columns). The statistics are reported for the end of the last year before the IPO (*Y0*), except for market value and variables that are constructed using market value, for which the statistics are reported at the end of the first quarter after the IPO (*Q1*). For all variables the statistics are also reported for the end of each of the first three years after the IPO. As described in the table, the average performance is negative (though the median is positive). This is consistent with earlier findings that IPO firms underperform after the IPO, as discussed above in related literature.

Appendix B describes, in detail, the construction process from Compustat data of operating performance variables, abnormal operating performance and the benchmarks used to calculate this abnormal performance, as well as the construction process of the two control variables. The benchmarks used for calculating abnormal performance for the variables *ROA* (return on assets), *RO_ALC* (return on assets-less-cash), and *ROS* (return on sales) are available from the authors upon request.

[18] Some studies include the current portion of long-term debt when calculating leverage. This variable is similar to the one we use because current liabilities tend to be small relative to long-term debt.

IV. Determinants of Initial Post-Issue Institutional Investor Holdings in the First Quarter Following the IPO

In this section we consider the determinants of institutional holdings right after the IPO. Specifically, we use regression analysis to investigate the manner in which institutional holdings by the end of the first reported quarter following the IPO are related to IPO characteristics and operating performance just prior to the IPO.

[Insert Table 2 about here]

Table 2 reports results of regression analysis, where the dependent variable is institutional holdings as a fraction of shares outstanding at the end of the first quarter after the IPO (*Q1*), and the independent variables are IPO characteristics, and pre-IPO operating performance. Here, "pre-IPO" is defined as the year ending in the last reported quarter immediately prior to the IPO (*Y0*). Regression 1 considers the relation between II holdings by the end of the IPO quarter and IPO characteristics, *PF* (public float, the ratio of shares sold in the IPO to shares outstanding after the IPO) and *PRIM* (the ratio of primary shares to total shares sold to the public in the IPO). Regression 1 indicates that *PF* is positive and strongly significant in explaining institutional holdings by the end of *Q1*, while *PRIM* is negative and significant. However, in Regression 2, where we add controls for leverage and firm size,[19] only *PF* remains significant, while *PRIM* is not. Both controls are positive and highly significant. Overall, this

[19] We calculate leverage based on data from the last quarter prior to the IPO. For size, we use the log of the market value of equity at the end of the first quarter after the IPO because market value is not available before the IPO. Controlling for book value at end of the last quarter before the IPO yields the same qualitative results. The qualitative results also do not change if leverage is measured at *Q1*, or book value at the end of Q1 is used as a proxy for firm size.

suggests that after controlling for size and leverage, institutions hold more stock in firms that issue a larger fraction of their shares to the public. We note that this is after flipping and after sales of pre-IPO holdings by institutional investors, as their holdings are obtained from the first report following the IPO.[20] Furthermore, it seems that *PRIM* is a size effect. That is, larger firms prefer (and can afford) to issue secondary shares rather than primary shares, and institutions prefer larger firms. Institutional holdings in the newly issued firms are also positively correlated with leverage. This could be because of the tendency of institutional investors to invest in value firms rather than growth firms. Value firms tend to be more levered than growth firms as they tend to have lower business risk.

In the next regressions we investigate whether pre-IPO operating performance affects institutional holdings in the newly issued firm. Regressions 3–5 report results on the relation between institutional holdings at the end of *Q1* and operating performance in *Y0*. When *PF* and *PRIM* are excluded, holdings are positively and significantly related to all performance in *Y0* measures (*ROA*, *RO_ALC*, *ROS*). However, once the IPO variables *PF* and *PRIM* are included in Regressions 6–8, all pre-IPO operating performance variables become completely insignificant.[21] Lastly, in Regressions 9–10 the explanatory variable is market-to-book (*MtoB*) which is often used in the literature as a proxy for growth opportunities (e.g. Grullon and Michaely (2004), Lie (2005)). In both regressions *MtoB* is negative and strongly significant. This, in turn, suggests that institutions prefer to invest in value IPO firms rather than growth IPO firms. Earlier literature indicates that, in general, firms with a low market-to-book ratio provide higher market return than firms with a high market-to-book ratio (see, for example, Fama and

[20] See Chemmanur, He, and Huang (2010) on institutional investor trading in the first days after the IPO.
[21] We rule out the possibility that the decrease in significance of the operating performance variables is the result of multicollinearity. This is because we calculated the correlation between IPO characteristics and the performance variables, and while we find it to be positive, it is never above 20%.

French (1992)). It also suggests that institutional investors favor low market-to-book firms over high market-to-book firms (see, for example, Boehmer et al. (2006)). The latter finding is consistent with what we find here for IPO firms.

In the literature, market-to-book is used extensively as a performance variable, but it is also used as a control variable. While not tabulated, we also added *MtoB* to Regressions 3–8 respectively, as a third control variable in addition to size and leverage. Adding *MtoB* as a control variable does not change our findings: without IPO variables, operating performance variables are significant, while with IPO variables they are not.

Next, in **Table 3** we assess whether II holdings at the end of *Q1* after the IPO are determined by pre-IPO abnormal operating performance, where "pre-IPO" is defined as the year ending in the last reported quarter just prior to the IPO (*Y0*). Here, the performance variables we consider for abnormal performance are *ROA*, *RO_ALC*, and *ROS*, but not *MtoB*, because of the negative correlation found between *MtoB* and II holdings, which suggests an interpretation of value vs. growth for this variable in our analysis. The calculation of abnormal operating performance is described in detail in Section III.C.

[Insert Table 3 about here]

Regressions 1–3 of Table 3 use abnormal operating performance measured relative to value-weighted industry average as the explanatory variable, controlling for the IPO variables, size and leverage. Similarly, Regressions 4–6 use abnormal operating performance measured relative to the industry median. The results in Table 3 suggest that abnormal operating

performance is never significant in explaining institutional holdings in *Q1*, regardless of the performance benchmark (weighted average or median).[22]

Overall, the analysis in Tables 2 and 3 suggests that end-of-*Q1* II holdings are related to the public float, leverage, and size. After controlling for the public float variables, institutional holdings are unrelated to operating performance or abnormal operating performance prior to the IPO (*Y0*). It seems, however, that institutional investors prefer to have their initial investment in value IPO firms rather than growth IPO firms.[23]

As will be shown in the next sections, unlike our finding here for the initial holdings, the evolution of II holdings in subsequent years is related to operating performance.

V. The Long-Run Relation between Institutional Investor Holdings and Operating Performance

In this section we use regression analysis to investigate the manner in which institutional investor holdings (II holdings) and operating performance interact in the first three years following the IPO. For operating performance we consider both naïve performance (Section V.A) and abnormal performance relative to industry averages and medians (Section V.B). If institutional investors change their holdings in response to changes in operating performance, the change in holdings may lag the change in operating performance as it can take time to respond to the changes (e.g. they may meet only once in a while to make investment decisions). At the same

[22] While not reported in Table 3, we repeated all regressions in Table 3 adding *MtoB* as a third control variable in addition to size and leverage. Adding *MtoB* as a control variable does not change the qualitative results. We also repeated the analysis without including the IPO variables in the regressions (i.e. as in Regressions 3–5 of Table 2). In this analysis, abnormal operating performance is significant in explaining institutional holdings in *Q1* only when operating performance is measured relative to value-weighted industry average.

[23] All regressions reported in this section and in subsequent sections include year fixed effects. Results without year fixed effects are statistically more significant.

time, if institutional investors have the skills and power to affect operating performance, it will take time for operating performance to respond to the level of institutional holdings. Accordingly, in the analysis in Section V, we consider not only the contemporaneous relation between II holdings and performance, but also the relation between institutional holdings and 1-year lags of operating performance, and vice versa.

Our findings here generally show a positive and significant relation between institutional holdings and operating performance, both in the contemporaneous analysis and the lagged analysis. This relation holds in both sets of lagged regressions, that is, both when institutional holdings is the dependent variable and when operating performance is the dependent variable. The relation is strong in the first and second year but is weaker in the third year.

A. Institutional Investor Holdings and Operating Performance over Time

In this sub-section we use regression analysis to investigate the relation between institutional holdings and operating performance in the first three years after the IPO. We start with dependence of II holdings on contemporaneous operating performance (Table 4). Then we consider the dependence of II holdings on the 1-year lagged operating performance (Table 5). Last, we consider the dependence of operating performance on the 1-year lag of II holdings level (Table 6).

Table 4 describes regression results on the contemporaneous relation between II holdings and operating performance over time. Columns (1)–(4) report regression results for the first year following the IPO, where the dependent variable is II holdings and the explanatory variables are the performance variables *ROA*, *RO*_ALC, and *ROS*, respectively, controlling for size and leverage. As shown in the table, all operating variables are statistically significant at the 1%

level. In Regression 4, the explanatory variable is *MtoB*. This regression indicates that the negative correlation between II holdings and *MtoB* also persists at the end of the first year after the IPO, suggesting institutions maintain their preferences for value firms vs. growth firms.[24]

Columns (5)–(8), and (9)–(12) report regression results on the relation of II holdings with operating performance and *MtoB* at the end of the second and third year following the IPO, respectively. These regressions report similar results as in *Y1*. The coefficients of the three operating performance variables are positive and generally significant in explaining II holdings in *Y2* and *Y3*, but the level of significance fades over time. In *Y3*, only *ROA* and *RO_ALC* are significant, while *ROS* is not. *MtoB* remains negative and significant in *Y2* and *Y3*. Overall, the findings in Columns (5)–(8) and (9)–(12) of Table 4 suggest that while the relation between operating performance and II holdings fades over time, institutions' preference for value firms over growth firms is persistent over time. The findings for *ROA* and *RO_ALC* are also economically significant. For example, a 10% increase in *ROA* is associated with a 2.9% increase in II holdings.[25]

[Insert Table 4 about here]

[24] Some earlier investigations in the literature utilize the market-to-book ratio as a measure for operating performance (e.g. Krishnan et al. (2011)). Under this interpretation of *MtoB* our findings here suggest that institutions prefer poorly performing firms because the correlation between *MtoB* and II holdings is negative, in contrast to our results with the three natural operating performance measures (*ROA*, *RO_ALC*, *ROS*). However, other studies use *MtoB* as a measure of growth opportunity (e.g. Jain and Kini (1994)). Given our findings about the natural operating performance variables, our interpretation is that II prefer value over growth. Indeed, this preference also persists immediately following the IPO (*Q1*), when II holdings are unrelated to the pure operating performance variable.

[25] Regression (1) of Table 4 indicates that a 10% increase in *ROA* results in a 1.01% increase in II holdings. In addition, the summary statistics (Table 1, Panel B) indicate that the average II holdings in year 1 (*Y1*) is 34.9%. Thus, at the average II holdings of 34.9%, a 10% increase in ROA is associated with an increase in II holdings from 34.9% to 34.9% + 1.01% = 35.91% which is a 2.9% (=1.01%/34.91%) increase in II holdings.

Next, in **Table 5**, we repeat the analysis in Table 4, but now lag the explanatory variables (operating performance and *MtoB*) and control variables one year behind the dependent variable (II holdings). That is, we regress institutional holdings in *Yt* on operating performance in *Yt-1* for $t = 1, 2, 3$, where *Y0* is the year that ends in the last reported quarter prior to the IPO, *Y1* is the year ending in the fourth quarter following the IPO, and so on. Columns (1)–(3) report the findings for the performance variables *ROA*, *RO_ALC*, and *ROS*, respectively, controlling only for size and leverage. As in the contemporaneous analysis (Table 4), all three performance variables are significant. In Regression 4, the explanatory variable is *MtoB*. However, because market value does not exist in *Y0*, we use the earliest available value – the end of *Q1* – for the variable *MtoB*. While the coefficient of *MtoB* is negative as in the contemporaneous analysis (Table 4, Column (4)), it is statistically insignificant, suggesting that II holdings in *Y1* is unrelated to *MtoB* at the end of *Q1*.

Columns (5)–(8) and (9)–(12) of Table 5 report regression results on II holdings in *Y2* as a function of operating performance in *Y1*, and II holdings in *Y3* as a function of operating performance in *Y2*, respectively. Regressions 5–8 indicate that operating performance variables in *Y1* are significant in explaining II holdings in *Y2*, but that *MtoB* in *Y1* is insignificant in explaining II holdings in *Y2*. Regressions 9–12 indicate that operating performance variables in *Y2* are somewhat less significant in explaining II holdings in *Y3* (*RO_ALC* and *ROS* are significant only at the 10% level). The coefficient of lagged *MtoB* is negative in both *Y2* and *Y3*, but is significant only in explaining II holdings in *Y3*. Overall, the analysis in Table 5 indicates that the impact of operating performance on II holdings also persists in lags. The impact, however, is weaker in *Y3* as we have seen in the analysis without lags (i.e. in Table 4 Regressions 9–12).

[Insert Table 5 about here]

In **Table 6**, we use regression analysis to investigate how operating performance in *Yt* depends on II holdings in *Yt-1* for t = 1, 2, 3. That is, as described at the beginning of this section, we reverse the dependent and explanatory variables of the analysis in Table 5. Thus, the dependent variables are now operating performance and the explanatory variables (and control variables) are now lagged one year. Columns (1)–(3) of Table 6 report regression results of operating performance in *Y1* as a function of II holdings at the end of the first reported quarter following the IPO (*Q1*). *Y1* is the end of the fourth quarter following the IPO and *Q1* is the first reported quarter right after the IPO (the IPO quarter).[26] The results here indicate that at the end of the first quarter after the IPO, II holdings are highly significant in explaining all operating performance variables. Column (4), however, suggests that end-of-*Q1* II holdings are negative and significant in explaining *MtoB* at the end of *Y1*. Columns (5)–(8) and (9)–(12) report regression results of operating performance in *Y2* as a function of II holdings at the end of *Y1*, and operating performance in *Y3* as a function of II holdings at the end of *Y2*, respectively. Results here are similar to those in Columns (1)–(4). The results suggest that lagged II holdings are positive and significant in explaining all operating performance variables except for *ROS* in *Y3* and are negative and significant in explaining *MtoB*.

[Insert Table 6 about here]

[26] Institutional investors are not required to report their holdings before the firm becomes public. Thus, in the lagged regressions, we use the first reported II holdings, that is, the holdings in the first quarter following the IPO. This quarter is included in the operating performance of *Y1*. The overlap exists only in lagged regressions for *Y1*, and is only over one quarter.

In the previous section we reported that once IPO characteristics are included, the significance of operating performance variables in explaining II holdings in *Q1* disappears. Therefore, we repeated the analysis in Tables 4–6, also controlling for *PF* and *PRIM*. Unlike in the previous analysis, the qualitative results (not tabulated) are unchanged. That is, all operating variables remain positive and significant in explaining II holdings.[27] Given that in the literature *MtoB* is often controlled for, in an untabulated analysis we also repeated the analysis in this section, including *MtoB* as a control variable in the regressions where *MtoB* is not the explanatory variable. Here, too, results are qualitatively unchanged.

Overall, based on the findings in Tables 4 through 6, it is argued that a positive relation between II holdings and operating performance exists not only contemporaneously, but also in lags. The negative correlation between II holdings and *MtoB* is also persistent. Thus, while in Section IV we saw that pre-IPO operating performance has no impact on initial II holdings right after the IPO, the results in Section V.A (Tables 4 through 6) indicate that after the IPO, II holdings are correlated with operating performance. In fact, the evidence that initial II holdings are unrelated to pre-IPO performance but that afterwards correlation exists, suggests that institutional investors do adjust their holdings according to post-IPO operating performance.

B. Institutional Holdings and *Abnormal* Operating Performance over Time

We now repeat the analysis in Section V.A, replacing the three operating performance measures *ROA*, *RO_ALC*, and *ROS* with their *abnormal* levels. As in Section IV (page 22) we do

[27] Interestingly, in this analysis, *PF* was positive and statistically significant, suggesting that *PF* has a long-lasting impact on the level of II holdings.

not consider abnormal *MtoB*. This is because the negative correlation found between *MtoB* and II holdings suggests an interpretation of value vs. growth for this variable in our analysis.

Table 7 reports regression results for II holdings as a function of contemporaneous *abnormal* operating performance in the first, second, and third years following the IPO. The abnormal levels are calculated as described in Section III.C, relative to industry value-weighted average and industry median.[28] In Panel A, abnormal operating performance variables *AbnROA*, *AbnRO_ALC*, and *AbnROS* are measured relative to industry value-weighted average. Regressions 1–3 report the findings in *Y1* for these variables, respectively, controlling for size and leverage. As can be observed, all three performance variables are significant at the 1% level. Regressions 4–6 and 7–9 repeat the analysis in Regressions 1–3 for *Y2* and *Y3*, respectively. Here the results remain statistically significant at the 1% level, except for *AbnROS* in *Y3*. Panel B of Table 7 reports regression results on the relation between II holdings and abnormal operating performance at the end of the *Y1*, *Y2* and *Y3*, respectively, where the benchmark is now industry median (Med). The findings are similar to those reported in Panel A (the value-weighted benchmark). The coefficients of the three operating performance variables are positive and significant at the 1% level except for *AbnROS* in *Y3*. Overall, the findings in Table 7 suggest that the relation between II holdings and abnormal operating performance is positive and significant.

[Insert Table 7 about here]

Next, in **Table 8** we investigate the dependence of II holdings in year *t* as a function of 1-year lagged abnormal operating performance, that is, in year *t-1*, for *t* = 1, 2, 3. Panel A reports

[28] As stated in Section III.C, we also calculated abnormal operating performance relative to equally weighted averages. The results under equally weighted averages were weaker than the results under value-weighted average and median, but were generally significant.

regression results when abnormal operating performance is measured relative to industry value-weighted average. Regressions 1–3 report the findings when II holdings in *Y1* are regressed on the abnormal performance variables *AbnROA*, *AbnRO_ALC*, and *AbnROS* in *Y0*, respectively, controlling for size and leverage. As can be observed, all three variables are positive and significant at the 1% level. Regressions 4–6 and 7–9 similarly report the results when II holdings in *Y2* and *Y3* are regressed on abnormal operating performance in *Y1* and *Y2*, respectively. Here, too, for all three performance variables considered, abnormal performance is strongly significant except for Regressions 8 and 9, in which *AbnRO_ALC*, and *AbnROS*, respectively, are statistically significant only at the 10% level. Panel B of Table 8 repeats the analysis in Panel A, with the benchmark for abnormal performance now being industry median. Here, the lagged abnormal operating performance variables are positive and significant in explaining II holdings except in Regression 8, where *AbnRO_ALC* in *Y*2 is insignificant in explaining II holdings in *Y*3, and in Regression 9, where *AbnROS* in *Y2* is only weakly significant in explaining II holdings in *Y3*. Overall, the analysis of the relation between lagged operating performance and II holdings suggests general significance.

[Insert Table 8 about here]

Next, in **Table 9** we regress abnormal operating performance in year *t* on II holdings in year *t-1* for *t* = 1, 2, 3. Panel A reports regression results when abnormal operating performance is measured relative to industry value-weighted average. Regressions 1–3 report the findings when II holdings in *Y1* are regressed on abnormal performance variables *AbnROA*, *AbnRO_ALC*, and *AbnROS* in *Y0*, controlling for size and leverage. As can be observed, II holdings are

significant at the 1% level for all variables. Regressions 4–6 and 7–9 report similar results when abnormal operating performance in *Y2* and *Y3* are regressed on II holdings in *Y1* and *Y2*, respectively. Here, too, the lagged II holdings are positive and statistically significant in explaining all three performance variables considered, except in *Y3* for *AbnROS* (Regression 9). Panel B of Table 9 repeats the analysis in Panel A, with the benchmark for abnormal performance now being industry median. Here, too, lagged II holdings are positive and statistically significant in explaining all three performance variables considered, except in *Y3* for *AbnROS* (Regression 9). The magnitude of the coefficients, however, again decreases over time. Overall, the analysis of the relation between II holdings and lagged operating performance suggests general significance. In both panels, the relation weakens over time.

Together, the results in Section V.B (Tables 7 through 9) indicate that the positive relation between II holdings and level of operating performance also holds for abnormal operating performance and is also robust in lags.[29]

[Insert Table 9 about here]

VI. The Long-Run Relation between Changes in Institutional Holdings and Operating Performance

In this section we repeat the analysis in Section V, but consider changes rather than levels. Specifically, we report regression results where the dependent variable is yearly *change* in

[29] As in the analysis in Section V.A, we repeated the analysis in Tables 7 through 9 controlling for *MtoB* in the regressions where the explanatory variables are operating performance measures, and also repeated all regressions controlling for the IPO variables *PF* and *PRIM*. The significance of the performance variables was unchanged. As in Section V.A, in this analysis *PF* was also positive and significant, suggesting that *PF* has a long-lasting effect on II holdings.

II holdings and the independent variable is yearly *change* in operating performance. As in Section V, we consider the contemporaneous and lagged regressions.

In Section VI.A the analysis uses naïve operating performance, whereas in Section VI.B we repeat the analysis done in Section VI.A using abnormal operating performance instead of naïve operating performance. However, while for naïve performance (VI.A) we investigate the relation between change in performance relative to change in II holdings, for abnormal performance (VI.B) we consider the relation between change in II holdings and the *level* of abnormal operating performance (rather than changes in *abnormal* operating performance). The reasoning is that abnormal performance is already a relative measure. Hence, economically, if institutional holdings affect or are affected by relative performance, *abnormal* performance should capture this positive effect and there is no need to go to a second order of relativity. Still, for completeness, in Section VI.B we also report without tabulating the results of the analysis that relates change in II holdings to change in abnormal performance. Similarly, in this section, for *MtoB*, we consider its level rather than the change, because as shown earlier, its interpretation as a value vs. growth proxy is well understood, whereas the change of this variable is less informative.

A. Change in Institutional Holdings and Change in Operating Performance over Time

We first consider the contemporaneous relation between change in institutional investor holdings and change in operating performance (Table 10). We also perform regressions where change in institutional holdings is regressed on lagged change in operating performance (Table 11), and regressions in which change in operating performance is regressed on lagged change in

institutional holdings (Table 12). We find a positive relation between change in II holdings and contemporaneous change in operating performance but no relation between change in II holdings and lagged change in operating performance or between change in operating performance and lagged change in II holdings. Changes in II holdings are positively related to contemporaneous *MtoB*, but are not related to lagged *MtoB*. However, we find some support for *MtoB* being positively related to lagged II holdings, suggesting that expected growth opportunities increase following increase in II holdings.

Table 10 reports the findings of the relation between *change* in II holdings and contemporaneous *change* in operating performance for year *t* where *t* = 1, 2, 3. Regressions 1–3 of Table 10 report results of regressions in which the dependent variable is *change* in II holdings over *Y1*, and the independent variables are *change* in measures of operating performance, controlling for size and leverage at the beginning of *Y1*.[30] As can be observed, a change in II holdings is positively and significantly related only to *RO_ALC*. Regression 4 reports the results of change in II holdings as a function of *MtoB level*, indicating that *MtoB* is positive and strongly significant. Thus, while we saw in the previous section that, initially, II prefer to invest in value IPO firms rather than growth IPO firms (they prefer low *MtoB* firms), we find here that in the years following the IPO, high *MtoB* is associated with increased II holdings. Columns (5)–(8) and (9)–(12) of Table 10 report regression results on the relation between *change* in II holdings and *change* in operating performance variables and year-end *MtoB level*, over the second and

[30] We are abusing notation here as the first year change in II holdings is actually nine months from the first report till the fourth report. This is because we have II holdings data only from the first report since II do not have to report earlier. Still, for continuity of the operating performance measure relative to the pre-IPO period, in the first year, when measuring change in performance, we also include the quarter of the IPO, while change in II holdings is calculated only over the last three quarters of the year.
Moreover, here we calculate leverage from the end of the first quarter after the IPO. For size we take the log of the market value of equity at the end of the first quarter after the IPO because market value is not available for the period prior to the IPO. Controlling for size and leverage using book values at the end of the last quarter before the IPO, instead, yields the same qualitative results.

third year after the IPO, respectively, controlling for size and leverage. Regressions 5–7 suggest that the relation is stronger in *Y2* relative to *Y1*, as it holds for both *ROA* and *RO_ALC*, but still does not hold only for *ROS*. Regression 8 suggests that in *Y2* as in *Y1*, *MtoB* remains positive and significant in explaining change in II holdings. Regressions 9–12 show similar but weaker results for the relation in *Y3* of change in II holdings with change in operating performance variables and *MtoB*.

[Insert Table 10 about here]

Table 11 reports results on the relation between *change* in II holdings and 1-year lag of *change* in operating performance and 1-year lag of level *MtoB*. Specifically, we regress the change in institutional holdings over *Yt* on the change in operating performance over *Yt-1* and the level of *MtoB* at the end of *Yt-1*, for t = 2, 3, controlling for firm size and leverage. The findings suggest that *changes* in II holdings are completely unrelated to the 1-year lag of *changes* in operating performance. They are also unrelated to 1-year lag *MtoB*.

[Insert Table 11 about here]

Lastly, **Table 12** reports results on the relation of *change* in operating performance and the level of *MtoB* with a 1-year lag of *change* in II holdings. Specifically, we regress the change in operating performance over *Yt* and the level of *MtoB* at the end of *Yt* on the change in institutional holdings over *Yt-1* for t= 2, 3, controlling for firm size and leverage. The findings indicate that changes in II holdings are completely unrelated to the 1-year lag of changes in

operating performance. However, the level of *MtoB* in *Yt* is positively related to changes in II holdings in *Yt-1* in *Y3* but not in *Y2*.

[Insert Table 12 about here]

Together, Tables 10 through 12 suggest that the *change* in II holdings is positively related to same-year *change* in operating performance in the first two years after the IPO, but that by the third year after the IPO the relation weakens. Generally, change in II holdings is not related to change in previous-year performance. Nor is change in performance related to previous-year change in II holdings. Change in II holdings is positively related to contemporaneous change in *MtoB*, but not to lagged *MtoB*. Unlike the results for operating performance variables, we do find support for change in *MtoB* being positively related to lagged II holdings. That is, an increase in II holdings implies higher expectations of growth opportunities in the following year.[31]

B. Change in Institutional Holdings and *Abnormal* Operating Performance over Time

In this sub-section we investigate the relation between change in II holdings and abnormal operating performance. We first consider the contemporaneous relation, but as discussed in Section V, we also perform regressions where change in institutional holdings is regressed on lagged abnormal operating performance, and regressions in which abnormal

[31] For robustness, as in the analysis in Section V.A, we repeated the analysis in Tables 10 through 12 controlling for *MtoB* in the regressions in which the explanatory variables are operating performance measures, and also repeated all regressions, controlling for the IPO variables *PF* and *PRIM*. The results are qualitatively similar. Unlike in the analysis of levels (end of Section V.A, and footnote 27 at the end of Section V.B), here neither *PF* nor *PRIM* were significant. This makes sense. Even if *PF* has a long-lasting impact on levels of institutional holdings, it should not have an impact on changes to II holdings *after* the IPO.

operating performance is regressed on lagged change in institutional holdings. We find that abnormal operating performance is positively related to change in II holdings in the same year, and also generally related to change in this variable during the previous year. However, change in II holdings is only weakly related to lagged abnormal performance. As in Section VI.A, the relation weakened over time (i.e. in the second and third year after the IPO), and as in Section V.B, we consider abnormal performance relative to both industry value-weighted average and industry median. When the benchmark is the industry median, the qualitative results are identical (same level of significance 1%, 5%, and 10%) for all performance variables. Hence, for brevity we report here the results only for value-weighted average.[32]

Table 13 reports results of regressions in which the dependent variable is the *change* in II holdings and the independent variable is *abnormal level* of operating performance, controlling for beginning of year size and leverage. Abnormal performance is measured relative to industry value-weighted average. Regressions 1–3 report the findings in *Y1*. As can be observed, *AbnROA*, *AbnRO_ALC* are significant at the 1% level, whereas *AbnROS* is significant only at the 10% level. Regressions 4–6 and 7–9 repeat the analysis in Regressions 1–3 for *Y2* and *Y3*, respectively. As can be observed, in *Y2* and in *Y3* only *AbnROA* is significant. Overall, the findings in Table 13 suggest that the relation between abnormal operating performance and change in II holdings is positive and significant in *Y1* but weakens in *Y2* and in *Y3*.

[Insert Table 13 about here]

[32] As stated in Section III.C, we also calculated abnormal operating performance relative to equally weighted averages. The results under equally weighted averages were weaker than the results under value-weighted average and median, but generally significant.

Next, in **Table 14** we report results of regressions in which the dependent variable is the *change* in II holdings and the independent variable is *abnormal level* of operating performance in the previous year, controlling for beginning of year size and leverage. Abnormal operating performance is measured relative to industry value-weighted average. Regressions 1–3 consider change in II holdings in the first year after the IPO. The results indicate that the 1-year lagged (*Y0*) abnormal performance is positively related to change in II holdings for all operating performance variables. Regressions 4–6 and Regressions 7–9, however, show that only lagged *AbnROA* is significant in explaining *Y2* and *Y3* change in II holdings. Overall, the findings in Table 14 suggest that the relation between abnormal operating performance and change in II holdings is positive and significant in *Y1* but weakens in *Y2* and in *Y3*.

[Insert Table 14 about here]

Lastly, **Table 15** reports results of regressions in which the dependent variable is the *abnormal level* of operating performance at the end of the second and third year following the IPO and the independent variable is *change* (growth) in II holdings over the previous year, respectively, controlling for beginning of year size and leverage. Abnormal operating performance is measured relative to industry value-weighted average. Regressions 1–3 indicate that 1-year lagged change in II holdings is statistically significant at the 1% level in explaining abnormal performance in *Y2* for both *AbnROA* and *AbnRO_ALC*, and weakly significant for *AbnROS*. Regressions 4–6 indicate that this relation weakens over the following year. Here, only change in II holdings is strongly significant for *AbnROA* and weakly significant for *AbnRO_ALC*, but insignificant for *AbnROS*. Thus, Table 15 suggests that abnormal performance

in both *Y2* and *Y3* following the IPO is generally related to previous-year change in II holdings, but that the relation is weaker in *Y3*.

[Insert Table 15 about here]

Overall, Tables 13 through 15 suggest that change in II holdings is positively related to contemporaneous abnormal operating performance (Table 13), but only weakly related to 1-year lagged abnormal operating performance (Table 14) relative to both industry value-weighted average and industry median benchmarks. However, change in abnormal operating performance is more significantly related to 1-year lagged change in II holdings (Table 15). This, in turn, suggests that it is more likely that change in II holdings drives change in operating performance than the other way around, and is consistent with institutional investors' presence enhancing operating performance.

Furthermore, recall that in Tables 9–12, where changes were measured using naïve performance rather than abnormal performance, only a weak relation was found between II holdings and operating performance in contemporaneous analysis and no relation was found in lags, while in Tables 13–15 the relation exists both contemporaneously and in lags. Our findings in Tables 13–15 thus suggest that measuring abnormal operating performance rather than naïve operating performance provides new insights not available in naïve performance. As in measuring stock returns, abnormal performance relative to the market/industry is probably more important to investors than naïve performance.

For robustness, as in the analysis in Section V.B, we repeated the analysis in Tables 13 through 15 controlling for *MtoB* in the regressions where the explanatory variables are operating

performance measures, and also repeated all regressions controlling for the IPO variables *PF* and *PRIM*. The results are qualitatively similar.[33]

We also repeated the analysis in Section VI.B replacing abnormal operating performance with *change* in abnormal operating performance. Here, the results are weaker. In the contemporaneous analysis, that is, when we regressed change in II holdings over change in abnormal operating performance in *Yt*, for $t = 1, 2, 3$, controlling for size and leverage, we found significance in *Y1*, and significance in *Y2* for abnormal *ROA* and *RO_ALC*, but not for *ROS* (both benchmarks). There was no significance at all in *Y3*. In the lagged analysis we did not find significant relations when we considered the change in II holdings as a function of lagged *abnormal* operating performance or when we considered change in abnormal operating performance as a function of lagged change in II holdings.

We add one concluding note about our performance measures *ROA, RO_ALC* and *ROS*. Our findings in the regression analysis generally give weaker results for the last measure, *ROS*, if a relation to II holdings is found at all, both for naïve performance and abnormal performance. This is consistent with the great variability of this variable documented in Table 1 (summary statistics). We believe that this reflects that while *ROS* could be a good performance measure for mature firms as has been shown in earlier studies (e.g. Grullon and Michaely (2004)), it is not a good measure for IPO firms, as there is great variability in their revenue and earnings since they are typically young and growth-oriented firms.

VII. Extensions and Robustness Tests

[33] Unlike in the analysis of naïve and abnormal levels (end of Section V.A, and footnote 27 at the end of Section V.B), and as in the analysis on naïve change in performance (footnote 31 at the end of Section VI.A), in this analysis *PF* is not significant. Using the reasoning suggested in footnote 31, this makes sense.

A. Institutional Holdings and Abnormal Stock Return

If institutional holdings are positively related to operating performance, they should also be positively related to stock returns, as stock prices respond to changes in operating performance. Furthermore, stock returns may reflect not only operating performance but also expectations for change in performance. In this section we consider the relation between institutional holdings and stock returns. While we find that the contemporaneous relation between institutional holdings and stock return is positive (like the relation to operating performance), the relation in lags is asymmetric: institutional holdings are positively related to lagged returns, but stock returns are unrelated or negatively related to lagged institutional holdings.

We first calculate buy-and-hold abnormal stock returns for all IPOs in the sample for 1-year, 2-years, and 3-years from the IPO, as well as 1-year abnormal returns for each of the three years after the IPO, based on CRSP data. Then we investigate the relation between these buy-and-hold returns and institutional holdings.

Table 16 reports our findings. Panel A considers the contemporaneous relation. In Columns (1)–(3) of the panel, the dependent variables are the 1-year, 2-year, and 3-year buy-and-hold abnormal stock return following the IPO, respectively. The independent variable in all three regressions is initial institutional holdings, that is, institutional holdings at the end of the first quarter after the IPO. In all regressions we control for firm size and leverage. As can be seen, the buy-and-hold returns are unrelated to the initial institutional holdings right after the IPO. In particular, the results in Regression 1 for stock returns are consistent with our findings in Table 2 that the first-year operating performance is unrelated to institutional holdings immediately following the IPO.

In Columns (4)–(6), the year-*t* buy-and-hold abnormal returns are regressed over end of year-*t* institutional holdings for years *t* = 1, 2, and 3 after the IPO, respectively. As can be seen, in each of the three years considered, institutional holdings are positive and significant in explaining buy-and-hold abnormal returns. In Regressions 7–9 we repeat the analysis performed in Regressions 4–6 replacing II holdings at the end of year *t* with *change* in institutional holdings over year *t*. The findings here suggest that buy-and-hold abnormal returns are also related to change in institutional holdings in each of the first three years after the IPO.

In Panel B of Table 16 we repeat the analysis in Regressions 4-9 of Panel A using lagged regressions. In Columns (1)–(2) of the panel the dependent variable is buy-and-hold abnormal stock returns over years 1 (*Y1*) and 2 (*Y2*), respectively, and the independent variables are the 1-year lagged institutional holdings. Regression 1 suggests that year 2 buy-and-hold abnormal returns are unrelated to year 1 institutional holdings, while Regression 2 suggests that year 3 abnormal returns are even negatively related to year 2 institutional holdings. In Regressions 3–4 of Panel B we swap the variables and the dependent variable is now institutional holdings in years 2 and 3, respectively, whereas the independent variable is the 1-year lagged buy-and-hold abnormal return. Both regressions suggest that the relation between institutional holdings and lagged abnormal return is positive.

In Columns (5)–(8) of Panel B we repeat the analysis performed in Columns (1)-(4) of this panel, with institutional holdings growth (change) replacing institutional holdings. The results here are similar: while abnormal returns are unrelated or negatively related to lagged change in institutional holdings, institutional holdings change is positively related to lagged abnormal stock return.

The results in Panel B provide interesting insights. Earlier studies clearly document that institutional investors have an information advantage in the IPO that they exploit in the IPO process (see literature review section). Our findings here suggest that once the firm is public, they no longer have an information advantage. This is because they are not able to buy before the price increases. In fact, they tend to buy after good stock market performance, not before. So while our analysis suggests that after the IPO, institutional investors' holdings are related to operating performance, we do not find that institutions have the ability to time the market after the firm becomes public. These findings are consistent with recent evidence that institutional investors are not good stock pickers; see, for example, Lowellen (2011) and Edelen, Ince and Kadlec (2016).

[Insert Table 16 about here]

B. Industry Analysis

In this section we consider whether the relation found between institutional holdings and operating performance is industry dependent. Our findings are reported in Table 17. We first consider the distribution of II holdings by industry. Panel A of Table 17 reports summary statistics of II holdings in the first quarter after the IPO for the 10 Fama-French industries. Fama-French industry 9 is not reported in the table because these are utility companies which are excluded from the sample. Column (1) reports the number of firms in each Fama-French industry in our sample. The industries with the largest and smallest number of IPOs in our sample are Hi-Tech and Durables, respectively. Column (2) reports the average II holdings at the end of the first quarter after the IPO. It indicates that the Fama-French industry with the highest average holdings is Energy, with 31.62% institutional holdings, and the industry with the lowest average

holdings is Hi-Tech, with 20.17%. This is consistent with the evidence in the literature that institutions prefer mature and lower-risk industries. The results for the median (Column (3)) are consistent with the results for the average holdings. That is, the industries with the highest and lowest median II holdings are Energy and Hi-Tech, respectively. Column (4) reports the standard deviation of II holdings in each industry.

Next, we added dummy variables for the Fama-French industries to all the regressions performed in Table 4 (naïve operating performance) and Table 7 (abnormal operating performance). The significance of the independent variables is not affected. For the sake of brevity we do not tabulate these results. We then used regression analysis to investigate whether there are industries where the relation between II holdings and performance is stronger than in others. For this, we repeated each of the regressions in Tables 4 and Table 7 for each of the Fama-French industries, separately. Specifically, we include an industry dummy variable *INDSi* which receives the value 1 for the tested industry i (i=1…10) and an interaction variable which is the industry dummy variable *INDSi* multiplied by the operating performance variable for each of the three performance variables *ROA*, *RO_ALC* and *ROS*, and re-run the regressions for each of the Fama-French industries, separately.

The results are reported in Panel B of Table 17. For brevity we report only the findings for abnormal operating performance (based on the analysis in Table 7) relative to industry value-weighted average, and only for the variable *AbnROA* (abnormal return on assets) in year 1.[34] As can be seen from the panel, for most industries the interaction term is insignificant. The exceptions are Industry 1 (NonDurables) where the relation is negative and Industry 6 (Telecom)

[34] The results are qualitatively similar when the benchmark is the median of the industry. As in most of our analysis, the results are also similar for the variable *RO_ALC* but are weaker for *ROS*. The results are weaker in years 2, 3 and are also weaker when we use naïve rather than abnormal operating performance (i.e. when the analysis is based on the analysis in Table 4).

where the coefficient of the interaction term is positive. That is, for firms in the Fama-French NonDurables industry, higher performance is associated with less institutional holdings relative to the other industries, while in the Fama-French Telecom industry, better performance is associated with higher II holdings relative to the other industries. Overall, the findings in Panel B suggest that in the Telecom industry the relation between performance and II holdings is stronger than in other industries and in the NonDurables it is weaker relative to the other industries.[35]

[Insert Table 17 about here]

C. Identification

To alleviate the concern of endogeneity we utilize a regression discontinuity design (RDD). The rationale behind RDD is that it can exploit exogenous characteristics of the intervention to elicit causal effects by considering subjects around some exogenous cut-off. Variation around the cut-off is less likely to stem from endogeneity. We follow the literature and look for shocks to institutional ownership associated with Russell index reconstitutions which are presumably exogenous. Specifically, because the reconstitutions are generally hard to predict, this shock in holdings is likely exogenous (see, for example, Chang, Hong, and Liskovitch (2015), Bird and Karolyi (2016), and Kahn, Srinivasan, and Tan (2017)). If a shock to institutional holdings that is caused by the index reconstitution is associated with a change in operating performance, then endogeneity is less likely.

The Russell 1000 index includes the largest 1000 public firms, while the next largest 2000 firms are in the Russell 2000 index. Together, they are the Russell 3000 index. The

[35] In an untabulated analysis, we also repeated the analysis in Panel B for each of the Fama-French 48 industries that have more than 25 firms in our sample. The only Fama-French industry where the interaction term was significant is the oil industry (Industry 30).

literature generally uses the 2000/1000 threshold to test for the shock for II holdings. This is because when a firm moves from the Russell 1000 down to the Russell 2000 around the 1000/2000 threshold, it moves from having a small weight in the Russell 1000 to a large weight in the Russell 2000 index. As a result, institutions that invest in indices will increase their holdings following the shock.

Because our sample consists of IPO firms, many of our firms are too small to be included in the Russell 3000 at all. Hence, most of them are too small to reach the 2000/1000 threshold. To adapt the RDD design to our sample, we thus consider all inclusions in the Russell 2000 index following the index reconstitutions; inclusions from below and from above. That is, we consider firms that move into and out of the Russell 3000, and firms that move into the Russell 2000 from the Russell 1000. The rationale is that both are associated with an increase in II holdings. Specifically, moving from Russell 1000 to Russell 2000 results in an increase in institutional holdings because the increase in the firms' weight in the index as explained above, while moving into the 2000 from below, is also associated with an increase in institutional holdings because the Russell indices are mimicked by many institutional investors (Kahn et al. (2017)) and, therefore, the annual reconstitution leads to changes in institutional holdings that are plausibly exogenous to the firm, not just when a firm moves around the 2000/1000 threshold, but also when it moves into the Russell 2000 from below (i.e. into the Russell 3000 index), as many institutions limit their investment to index-included firms.[36] The key to the RDD identification strategy is to show that a discontinuous jump in institutional ownership at the threshold is followed by a similar discontinuous jump in operating performance at the threshold.

[36] The 2000/1000 threshold provides a leaner test than entering the Russell 2000 from below because entering the Russell 2000 from below is associated with larger firm size, which is not the case for the 2000/1000. Because we control for firm size we do not view this as a major flaw in the research design.

We adapt the RDD in Bird and Karolyi (2016) to our IPO sample. That is, we use a two stage model. In the first step (Equation 1) we estimate II holdings

$$II_{i,t} = \alpha + \tau D_{i,t} + \pi X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $II_{i,t}$ is institutional holdings in firm i and year t. $D_{i,t}$ is an indicator variable that equals one if firm i is assigned to the Russell 2000 Index in year t and zero otherwise. $X_{i,t}$ represents controls, where controls are size (*lnMV*) and leverage (*LEVER*). Observations from all three years after the IPO are included in this regression, resulting in 6687 observations. The regression includes year fixed effects, and year relative to IPO fixed effects.

In the second step (Equation 2), we use the estimate from the first stage, *Est_II*, to estimate *OP*, the three operating performance measures (*ROA*, *RO_ALC*, and *ROS*).

$$OP_{i,t} = \beta_0 + \beta_1 Est\_II_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t} \quad (2)$$

Here, too, observations from all three years are included in the regression. Our results are reported in Table 18. Column (1) reports the results of the first-stage regression. It shows that τ, the coefficient of $D_{i,t}$, is indeed positive and significant. That is, firms in the Russell 2000 tend to have higher institutional ownership relative to firms outside the Russell 2000 (i.e. firms in the Russell 1000, and firms outside the Russell 3000). Columns (2)–(4) of Table 18 report the results of the second-stage regressions for *ROA*, *RO_ALC* and *ROS*, respectively. As can be seen, the coefficient of $Est\_II_{i,t}$ is positive and significant for all three operating performance variables. While not tabulated, results using abnormal operating performance are qualitatively

similar. The findings in Table 18 thus support institutional ownership affecting operating performance.

[Insert Table 18 about here]

VIII. Conclusion

We investigate the determinants of institutional investors' holdings in newly issued firms and the post-issue relation between these holdings and operating performance. We find that institutions' initial holdings strongly depend on IPO characteristics, in particular, the public float. After controlling for public float, initial institutional holdings are unrelated to pre-IPO operating performance. During the first year after the IPO, average institutional holdings increase from 24% to 36% of shares outstanding and stabilize at about 42% by the end of the second year. Furthermore, post-IPO operating performance is positively related to institutional holdings. This relation also holds in lags, but diminishes towards the third year after the IPO. Overall, our findings indicate that institutional ownership is a valid indicator of the firm's operating performance in its initial years as a public company. The analysis of abnormal performance in addition to naïve performance at times identifies relations that are not detected by naïve performance alone. This, in turn, suggests that the use of abnormal operating performance in addition to naïve operating performance can enrich robustness in operating performance investigations.

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Appendix A – Construction of the Institutional Holdings Variable

A.1. Example of institutional investor holdings raw data

Table A1 describes an example of the raw data of II holdings from Thompson Services for Source Data Services Corporation (Ticker: SRSV), which went public on July 30, 1996. The reporting in Table A-1 is for the quarter that ended March 31, 2002. This data is obtained through WRDS.

[Insert Table A1 about here]

A.2 Review of the institutional data problems and repairs performed

There were several problems associated with the raw data obtained from Thompson Reuters and accordingly we developed several rules to fix the data. The most frequent problem is that the reporting by managers (i.e. institutional investors) of change in institutional holdings is inconsistent with the prior period reporting (specifically the number of shares held reported in quarter *t+1* does not match the number of shares held in quarter *t* plus the change reported in quarter *t+1*). Another frequent problem is that some mangers do not start reporting in the first quarter, but a few months later. When a firm reports number of shares held by an institutional investor for the first time only in the third quarter after the IPO, for example, and does not report the change in number of shares held by this investor, we infer that the institutional investor also held this number of shares in the first quarter after the IPO. However, if the firm reports that the number of shares in the third quarter is 1000 and also reports a change of 500, we infer a holding of 500 shares in the first quarter that increased to 1000 in the third quarter, and so on. When there is a discrepancy between quarters, we give priority to the later quarter. Sometimes firms

skip several quarters and then show up with the same number of shares held. In such cases, we assume that their ownership did not change over the missing quarters. If they report a different number of shares in the first quarter in which they resume reporting, we assume that the change in the number of shares occurred in this reported quarter.[37] Other problems include manager name changes, which we can often identify when a manager stops reporting, and a new manager reports a number of shares held identical to the last number reported by the manager that stopped reporting. In this case, we verify the name change using other sources. The data is adjusted for splits and mergers. We also fix the rare cases in which the name of a company or institution changed and eliminate duplicate reporting by institutions. Often institutions that sell all their shares simply stop reporting (they do not report the sale). Thus, when a manager disappears completely from the sample we assume she sold all shares in the quarter after disappearing. We fix all these problems.

A.3 Institutional investor holdings raw data repair algorithm

A) First, remove obvious duplicates, and manually piece together firms that changed names or merged if it is apparent when capturing/organizing raw data.[38]

B) If a manager disappears completely from a firm, add a row of data to represent the manager selling all of her shares in the quarter after the last report.

C) Once that is set up, we have the following five scenarios remaining:

[37] However, if when they resume reporting they also report the change in that quarter, we use that reported change to infer the number of shares held in the quarter before, and so on.

[38] These were detected when a manager's name/number disappears in one quarter, and then a new one shows up in the next quarter with the exact same number of shares. Using the rules above, these cases were treated as if one manager sells all of her shares and then another one buys them up, even if in reality the shares were held by the same manager who simply changed her name.

Flag 1: Manager skips quarters, and when he shows up again, the numbers match up with the last report before the gap.

In this case we fill in the missing quarters with the data that the later report implies. Example: Q1=1000 shares, Q2 and Q3 are empty; Q4 is 1500 with net change 500. We add data for quarters 2 and 3 that both say shares held 1000, net change 0.

Flag 2: First manager occurrence, but net change is missing.

In this case we fill the empty net change cell with the shares held amount –we make the assumption that they are buying shares for the first time.

Flag 3: First manager occurrence, net change and shares held are both integers but they do not match.

In this case, we change the net change amount to match the shares held amount. We have no other information, and, therefore, we have to adjust this report to represent the manager buying shares for the first time, otherwise the overall net change calculations won't make any sense compared to the overall shares held calculations.

Flag 4: Not first manager occurrence, shares held minus net change does not equal previous shares held. Manager does not skip any quarters.

In this case we trust the reported shares held amount and adjust the net change amount of the later report to be consistent with the previous quarter reporting. Example: Q1 says 1000 shares held. Q2 says 1500 shares held; net change 200. We change the 200 to 500.

Flag 5: Not the first manager occurrence, shares held minus net change does not equal previous shares held. Manager skips quarters in between these reports too.

In this case we combine our solutions for Flags 1 and 4 by first filling the missing quarters with what the later quarter implies, then we change the new data added after the

last report before the gap to make the two ends of the gap match. Example: Q1 says 1000 shares held, Q2 and Q3 are missing, Q4 says 1500 shares held and net change 300. We would make Q3 data say 1200 shares held, 0 change, and Q2 data say 1200 shares held with net change of 200.

Appendix B – Construction of Operating Performance, Abnormal Operating Performance, and Control Variables

B.1 Measuring operating performance:

We utilize four measures of operating performance. The first three are based on operating income. For greater accuracy we do not use yearly data, but aggregate operating income from quarterly data relative to the quarter of the IPO. The first measure, *ROA*, is operating income (before depreciation and amortization) divided by total assets. We construct this variable from Compustat quarterly data relative to the quarter of the firm's IPO. For example, for operating income in the year before the IPO (*Y0*), we aggregate operating income in the four quarters before the IPO (Compustat data item *OIBDPQ*) and divide it by total assets in the last quarter before the IPO (Compustat data item *ATQ*).[39] *ROA* for the first year after the IPO (*Y1*) is constructed in a similar manner by aggregating the operating income in the first four quarters after the IPO date (including the IPO quarter), and dividing it by total assets in the fourth quarter after the IPO, and we do the same for *Y2*, *Y3* after the IPO. The second measure *RO_ALC* is operating income divided by total assets less cash. This measure differs from the first measure in that instead of dividing by end-of-year total assets, we divide by end-of-year assets less end-of-

[39] We follow Jain and Kini (1994), Mikkelson and Parch (1997) and Cornett et al. (2007) in using end of year assets rather than average assets over the year (e.g. Grullon and Michaely 2004 and Lie 2005). It is more appropriate for IPOs not to average.

year cash (Compustat data item *ATQ* less Compustat data item *CHEQ*). The third measure, *ROS*, is operating income divided by revenue, where revenue is aggregated over the four corresponding quarters relative to the IPO quarter from revenue quarterly data (Compustat data item *REVTQ*). The last measure, *MtoB*, is market value of equity divided by book value of equity, where market value of equity is calculated as number of shares outstanding (Compustat data item *CSHOQ*) multiplied by price (Compustat data item *PRCCQ)* at the last quarter of the relevant year relative to the IPO. Book value of equity is taken from the end of the same quarter (Compustat data item SEQQ).

Control Variables: *LeverQ* is the ratio of total long-term assets (Compustat Data item *LDTQ*) to total assets (Compustat data item *ATQ*) in last quarter of the year relative to the IPO. *LnMV* is the natural log of market value of equity, where market value of equity is calculated as in market-to-book (Compustat data item *CSHOQ* multiplied by *PRCCQ*) in the last quarter of the relevant year relative to the IPO.

B.2 Measuring *abnormal* operating performance:

We measure abnormal performance relative to industry benchmarks. We assign each firm to an industry according to the firm's 4-digit SIC code. The sample of 1907 IPO firms come from 227 4-digit SIC code industries.[40] We then create benchmarks using all firms in these industries in Compustat data. However, if there are less than 10 firms in Compustat data for a variable, we use the 3-digit SIC code to create the benchmark for that industry. In rare cases we even go down to 2-digit SIC code. Like the variables, the benchmarks are calculated by creating

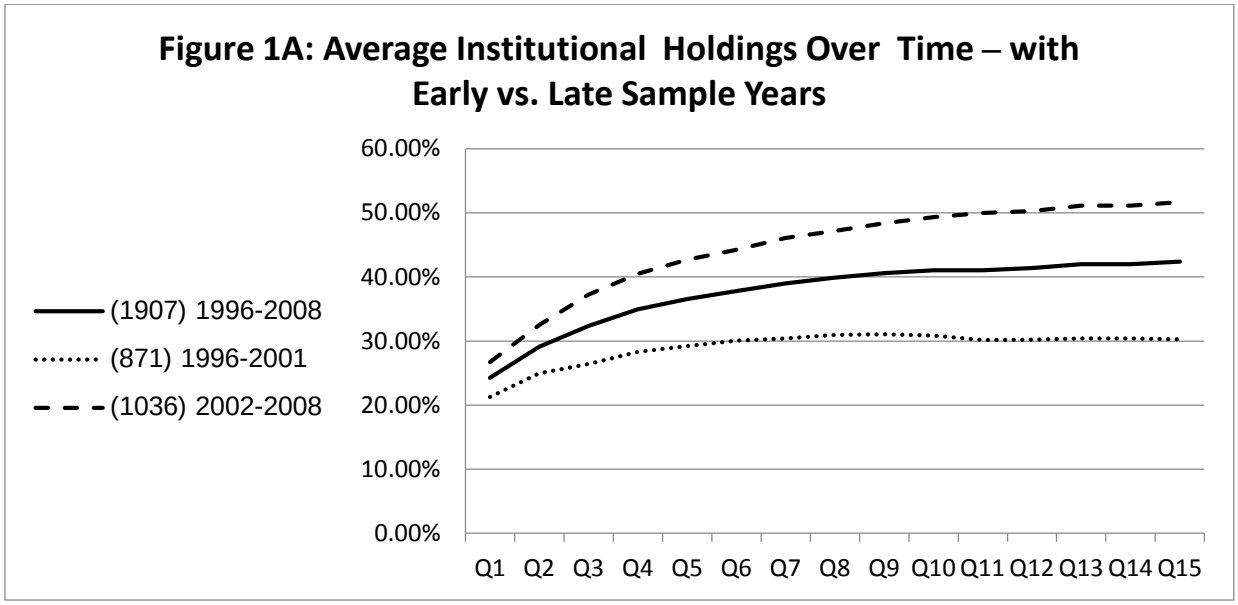
[40] Some studies (e.g. Gu and Hackbarth (2013)) use the 48 Fama-French industries instead of SIC code-based industries. For our purpose, SIC code-based industries are more appropriate, because they allow for more specific industries. Indeed, as mentioned above, our IPO sample comes from 227 4-digit SIC groups. We can thus balance between industry and number of firms available for benchmarking and go to SIC code with a smaller number of digits only when we do not have enough firms to create the benchmark.

yearly data by aggregating quarterly data. Thus, the benchmark for a firm depends on the year and quarter in which it was issued. For example, Sagebrush was issued in the first quarter of 1996 and hence the benchmark for abnormal performance of *ROA* one year following the IPO is calculated by aggregating operating performance of four quarters, namely *Q2* of 1996 through *Q1* of 1997, for each firm in the 4-digit SIC (5812) and dividing it by its assets *ATQ* at the end of *Q1* of 1997. Then, the value-weighted averages, and the median 1-year performance are each calculated based on the firms available for this period that are included in SIC 5812. To control for outliers, every variable is 1% winsorized (0.5% of high values and 0.5% of low values) for the complete sample, that is, before allocating to SIC groups.[41]

[41] For robustness, we also calculated benchmarks when the IPO sample firms are excluded from the benchmark calculation. The results in this analysis are qualitatively the same.

Figure 1: Institutional Investor Holdings over Time

This figure describes the evolution of institutional shareholders' holdings as a fraction of shares outstanding over the first 15 quarters after the initial public offering for our IPO sample. **Figure 1A** plots the average holdings for the complete sample of 1907 IPOs (solid line) and for two sub-samples: the early years (1996–2001, dotted line, 871 IPOs) and the late years (2002–2008, dashed line, 1036 IPOs). The graphs plot 15 quarters after the IPO, the solid line is constructed using institutional holdings over the years 1996–2012, the dotted line is constructed using institutional holdings over the years 1996–2005, and the dashed line is constructed using institutional holdings over the years 2002–2012. **Figure 1B** plots the average holdings for the complete sample (solid line) and for two sub-samples: cold market years (2001–2003, 2008, dotted line, 152 IPOs) and hot market years (1996–2000, 2004–2007, dashed line, 1755 IPOs).



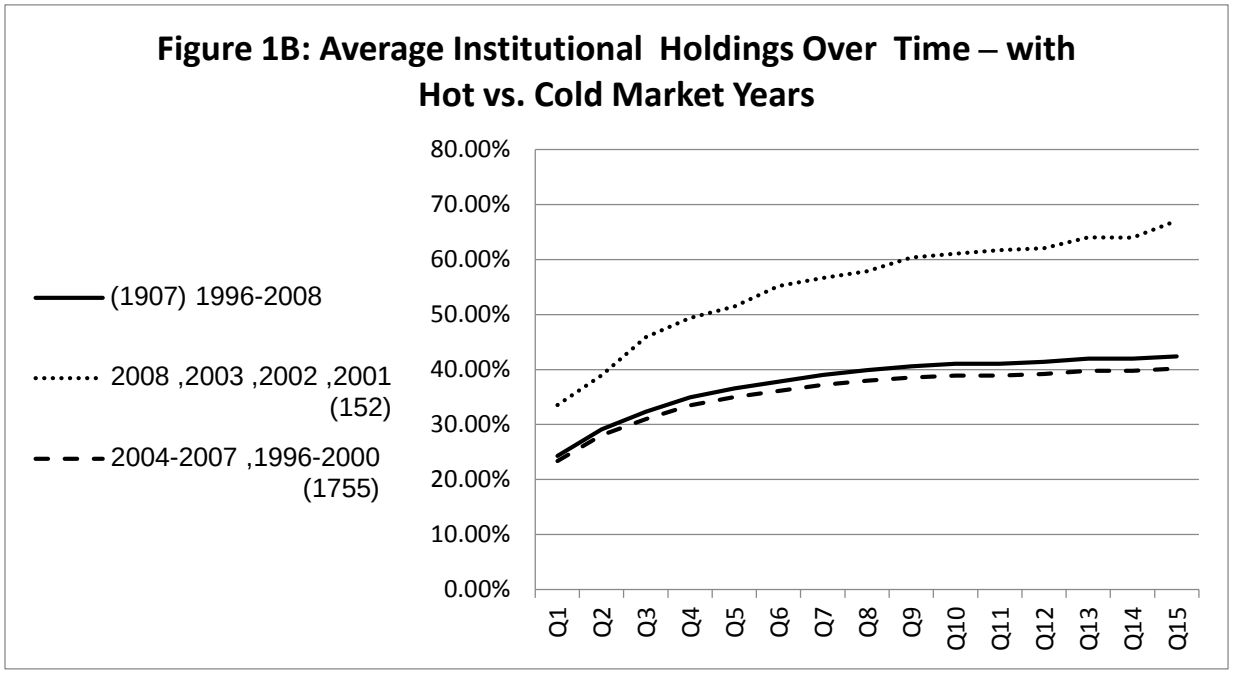


Table 1: Summary statistics

This table describes summary statistics. **Panel A** reports summary statistics for the IPO sample by year and for the complete sample (bottom row). Column (1) reports the number of IPOs per year over the sample period 1996–2008 and Column (2) reports this number as a fraction of the total sample. Columns (3) and (4) report the average of primary and secondary shares sold as a fraction of the post-IPO outstanding shares, respectively. Column (5) reports the averages of the *PF* variable (public float), which is the ratio of total shares sold to total post-issue outstanding shares. This column is the sum of Columns (3) and (4). Column (6) reports averages of *PRIM*, which is the ratio of primary shares issued to total shares sold. *PRIM* is also the complement to unity of the fraction of secondary shares sold out of total shares sold. This column is also the ratio of Columns (3) and (5). **Panel B** reports summary statistics of institutional holdings (top of left side of panel); performance variables components in millions of dollars (rest of left side of panel); and performance and control variables (right side of panel) over time. For institutional holdings, the statistics are reported for *Q1* after the IPO, which is the first quarter they are available, and also for the end of *Y1*, *Y2*, and *Y3* after the IPO. For the performance variables and their components and for control variables the statistics are reported for *Y0, Y1*, *Y2*, and *Y3* after the IPO, except for market value (*MV*) and variables that depend on it that are reported for *Q1* instead of *Y0*. In the left column, *OIBD* is operating income before depreciation calculated by aggregating Compustat quarterly data items *OIBDPQ* over four fiscal quarters. *ATQ* is Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO. *CHEQ* is cash at the end of the relevant quarter. *REV* is revenue calculated by aggregating Compustat quarterly data items *REVQ* over four fiscal quarters. *MV* is market value of equity calculated as number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. On the right side of the panel, *ROA* is operating return on assets calculated as operating income before depreciation divided by end-of-year total assets (*OIBD* divided by *ATQ*). *RO_ALC* is operating return on assets-less-cash, calculated as *OIBDPQ* divided by *ATQ*-less-*CHEQ*; *ROS* is operating performance to revenue ratio, calculated as *OIDB* divided by *ATQ*. *MtoB* is market-to-book, calculated as the ratio of market value (*MV*) to book value of the firm's equity. For book value of equity we use Compustat data item *SEQQ*. *lnMV* is firm size, calculated as the natural log of the firm's market value of equity (*MV*). *LEVER* is leverage calculated as the ratio of long term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects and year relative to IPO fixed effects.

Panel A: Summary statistics of IPO sample

	(1)	(2)	(3)	(4)	(5)	(6)
Year	Number of IPOs	Percentage (of Total)	Primary Shares Issued / Post-IPO Shares Outstanding	Secondary Shares Sold / Post-IPO Shares Outstanding	*PF* = Public Float = Total Shares Sold / Post-IPO Shares Outstanding	*PRIM* = Primary Shares Issued / Total Shares Sold
1996	404	21%	0.2998	0.0205	0.3203	0.9450
1997	295	15%	0.2964	0.0337	0.3301	0.9218
1998	111	6%	0.2761	0.0243	0.3005	0.9138
1999	277	15%	0.2359	0.0187	0.2546	0.9504
2000	181	9%	0.2159	0.0098	0.2257	0.9676
2001	39	2%	0.2581	0.0296	0.2877	0.9313
2002	49	3%	0.2469	0.0524	0.2993	0.8896
2003	48	3%	0.2874	0.0866	0.3740	0.8272
2004	133	7%	0.2520	0.0561	0.3081	0.8643
2005	115	6%	0.3144	0.0526	0.3670	0.8695
2006	115	6%	0.2768	0.0530	0.3298	0.8663
2007	124	7%	0.2495	0.0523	0.3019	0.8483
2008	16	1%	0.2781	0.0591	0.3373	0.7974
TOTAL	1,907	100%	0.2683	0.0422	0.3105	0.8917

Panel B: Summary statistics of II holding, operating performance variables and variables used to construct them, and control variables

		Average	Med	Stdev	N			Average	Med	Stdev	N
II holdings	Q1	24.27%	20.50%	18.85%	1907	*ROA*	Y0	-0.1239	0.0925	0.5804	1387
	Y1	34.91%	30.13%	24.30%	1876		Y1	-0.0336	0.0756	0.3246	1580
	Y2	39.85%	34.01%	28.71%	1727		Y2	-0.0869	0.0587	0.4187	1480
	Y3	41.36%	37.34%	30.61%	1510		Y3	-0.0693	0.0659	0.3814	1289
OIBD	Y0	28.514	3.124	106.27	1401	*RO_ALC*	Y0	-0.6124	0.1012	1.9694	1387
	Y1	32.779	5.982	122.97	1581		Y1	-0.5461	0.0983	2.1130	1580
	Y2	35.448	5.6895	122.38	1480		Y2	-0.6593	0.0771	2.5074	1480
	Y3	47.897	7.418	153.53	1292		Y3	-0.5358	0.0801	2.1659	1289
ATQ	Y0	239.67	35.672	786.31	1860	*ROS*	Y0	-2.4300	0.0711	11.374	1339
	Y1	361.39	105.74	947.12	1861		Y1	-2.8735	0.0806	18.568	1536
	Y2	441.13	125.17	1137.4	1689		Y2	-2.6255	0.0612	17.047	1453
	Y3	546.48	137.08	1489.9	1461		Y3	-1.8002	0.0639	10.646	1265
CHEQ	Y0	19.442	5.291	53.361	1858	*MtoB*	Q1	6.5691	3.9799	10.670	1804
	Y1	60.391	28.947	113.29	1859		Y1	4.6035	3.0799	5.7057	1815
	Y2	64.721	25.074	133.84	1688		Y2	3.8326	2.2983	5.7678	1621
	Y3	72.844	24.538	181.36	1461		Y3	3.7435	2.0134	5.8761	1383
REV	Y0	248.47	39.794	852.56	1809	*LnMV*	Q1	5.5779	5.5343	1.2117	1854
	Y1	306.96	68.464	933.09	1838		Y1	5.3954	5.4500	1.3908	1847
	Y2	368.69	92.946	1050.4	1671		Y2	5.1060	5.1601	1.6745	1681
	Y3	471.04	110.20	1401.0	1443		Y3	5.0231	5.0958	1.8199	1454
MV	Q1	579.65	253.22	1159.1	1854	*LEVER*	Y0	0.2472	0.0954	0.3363	1849
	Y1	600.97	232.76	1437.8	1847		Y1	0.1253	0.0126	0.2004	1842
	Y2	626.03	174.18	1804.2	1681		Y2	0.1514	0.0211	0.2277	1674
	Y3	724.55	163.33	2228.0	1454		Y3	0.1612	0.0248	0.2468	1449

Table 2: Initial institutional holdings immediately following the IPO as a function of IPO characteristics and pre-IPO operating performance

This table reports results of regressions in which the dependent variable is institutional holdings (as a fraction of shares outstanding) at the end of the first quarter following the IPO (*Q1*). The independent variables are IPO characteristics and pre-IPO operating performance, where "pre-IPO" is defined as the year ending in the last reported quarter just prior to the IPO (*Y0*). *PF* is the public float, measured as the ratio of shares sold in the IPO to shares outstanding after the IPO. *PRIM* is the ratio of primary shares issued to total shares floated to the public in the IPO. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets, where *OIBD* is calculated by aggregating Compustat quarterly data items *OIBDPQ* over four fiscal quarters and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO. *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIBDPQ, ATQ* and *CHEQ*; *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIBDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value to book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. *lnMV* is firm size, calculated as the natural log of the firm's market value of equity. *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	0.1859***	-0.2412***	0.0469*	0.0408	0.0393	-0.2732***	-0.2752***	-0.2727***	0.0121	-0.2429***
	(6.989)	(-6.517)	(1.795)	(1.564)	(1.479)	(-6.041)	(-6.078)	(-5.899)	(0.571)	(-6.399)
PF	0.3953***	0.5964***				0.6547***	0.6574***	0.6572***		0.5792***
	(13.412)	(18.969)				(17.176)	(17.223)	(16.954)		(17.795)
PRIM	-0.1107***	-0.0302				-0.0113	-0.0153	-0.0152		-0.0295
	(-4.958)	(-1.378)				(-0.419)	(-0.567)	(-0.561)		(-1.298)
ROA $_{Y0}$			0.03166***			0.0087				
			(3.4555)			(1.031)				
RO_ALC $_{Y0}$				0.0070***			0.0004			
				(2.670)			0.165			
ROS $_{Y0}$					0.0010**			0.0005		
					(2.335)			(1.136)		
MtoB $_{Q1}$									-0.0016***	-0.0009***
									(-4.033)	(-2.591)
lnMV $_{Q1}$		0.0568***	0.0305***	0.0318***	0.0322***	0.0569***	0.0577***	0.0573***	0.0379***	0.0590***
		(15.273)	(6.558)	(6.910)	(6.843)	(12.606)	(12.880)	(12.580)	(9.655)	(15.391)
LEVER $_{Q-1}$		0.0273**	0.0611***	0.0620***	0.0622***	0.0224*	0.0235*	0.0245*	0.0813***	0.0398
		(2.383)	(4.194)	(4.239)	(4.128)	(1.694)	(1.774)	(1.806)	(6.150)	(3.258)
Adj R^2	0.1904	0.3024	0.1342	0.1311	0.1276	0.3060	0.3055	0.3059	0.1520	0.2992
N	1907	1814	1359	1359	1298	1359	1359	1298	1767	1767

Table 3: Initial institutional holdings immediately following the IPO as a function of IPO characteristics and pre-IPO *abnormal* operating performance

This table reports regression results on the relation between institutional holdings (as a fraction of shares outstanding) at the end of the first quarter after the IPO (*Q1*), IPO characteristics, and pre-IPO abnormal operating performance, where "pre-IPO" is defined as the year ending in the last reported quarter just before the IPO (*Y0*). *PF* is the public float measured as the ratio of shares issued to shares outstanding after the IPO. *PRIM* is the ratio of primary shares to total shares floated to the public in the IPO. Abnormal operating performance is measured relative to two different benchmarks. In Columns (1)–(3) the benchmark is the value-weighted industry average (VW), and in Columns (4)–(6) the benchmark is the median in the industry (Med). For industry benchmarks formation see Section III.C. The prefix *Abn* in the variable names indicates abnormal values. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIBDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*; *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value to book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. *lnMV* is firm's size, calculated as the natural log of the firm's market value of equity. *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	Benchmark: Industry VW Average			**Benchmark: Industry Median**		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.2710***	-0.2748***	-0.2716***	-0.2723***	-0.2750***	-0.2717***
	(-5.980)	(-6.065)	(-5.897)	(-6.020)	(-6.074)	(-5.898)
PF	0.6540***	0.6571***	0.6571***	0.6550***	0.6573***	0.6572***
	(17.151)	(17.280)	(16.952)	(17.211)	(17.235)	(16.956)
PRIM	-0.0007	-0.0150	-0.00152	-0.0110	-0.0152	-0.0053
	(-0.397)	(-0.558)	(-0.559)	(-0.409)	(-0.563)	(-0.563)
Abn ROA $_{Y0}$	0.0101			0.0109		
	(1.206)			(1.235)		
Abn RO_ALC $_{Y0}$		0.0006			0.0006	
		(0.240)			(0.224)	
Abn ROS $_{Y0}$			0.0005			0.0005
			(1.153)			(1.146)
lnMV $_{Q1}$	0.0567***	0.0577***	0.0573***	0.0568***	0.0577***	0.0573***
	(12.572)	(12.866)	(12.580)	(12.634)	(12.899)	(12.585)
LEVER $_{Q-1}$	0.0222*	0.0234*	0.0246*	0.0224*	0.0235*	0.0246*
	(1.673)	(1.765)	(1.806)	(1.697)	(1.769)	(1.808)
Adj R^2	0.3068	0.3060	0.3064	0.3068	0.3060	0.3064
N	1359	1359	1298	1359	1359	1298

Table 4: Institutional holdings as a function of contemporaneous operating performance over time

This table reports regression results on institutional holdings as a function of contemporaneous operating performance in year *t* (*Yt*) after the IPO, *t* = 1, 2, 3. *Y1* is the end of the fourth quarter following the IPO, and so on. *ROA* is operating return on assets calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*); *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value to book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. Firm size, *lnMV* is calculated as the natural log of the firm's market value of equity. *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	II t = 1				*II t* = 2				*II t* = 3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Intercept	-0.0603*** (-2.550)	-0.08535*** (-3.718)	-0.0908*** (-3.942)	-0.1074*** (-5.227)	-0.0786*** (-3.422)	-0.1098*** (-4.996)	-0.1205*** (-5.584)	-0.1132*** (-5.688)	-0.0848*** (-3.553)	-0.1170*** (-5.115)	-0.1225*** (-5.351)	-0.1250*** (-5.775)
ROA_t	0.1010*** (5.719)				0.0800*** (5.263)				0.0890*** (4.982)			
RO_ALC_t		0.0100*** (4.052)				0.0066*** (2.907)				0.0069** (2.3988)		
ROS_t			0.0008*** (2.944)				0.0008*** (2.693)				0.0007 (1.282)	
$MtoB_t$				-0.0033*** (-3.821)				-0.0035*** (-3.647)				-0.0047*** (-4.535)
$lnMV_t$	0.0690*** (16.2179)	0.0750*** (18.5419)	0.0758*** (18.610)	0.0810*** (21.010)	0.0836*** (21.264)	0.0900*** (24.513)	0.0921*** (25.628)	0.0924*** (26.077)	0.0895*** (22.556)	0.0957*** (25.598)	0.0952*** (25.329)	0.0965*** (25.917)
$LEVER_t$	0.0594** (2.3543)	0.0625** (2.4637)	0.0674*** (2.627)	0.0771*** (3.002)	0.0418* (1.715)	0.0414* (1.685)	0.4491* (1.819)	0.047* (1.767)	0.0136 (0.533)	0.0180 (0.700)	0.0221 (0.8478)	0.0403 (1.340)
Adj R2	0.1990	0.3505	0.3463	0.3438	0.4860	0.4792	0.4824	0.4756	0.5306	0.5180	0.5174	0.5046
N	1549	1549	1503	1787	1449	1449	1422	1593	1252	1252	1227	1347

Table 5: Institutional holdings as a function of lagged operating performance over time

This table reports regression results on institutional holdings in year *t* (*Yt*) as a function of operating performance variables in year *t-1* (*Yt-1*) for *t* = 1, 2, 3, where *Y0* is the year that ends in the last reported quarter prior to the IPO, *Y1* is the end of the fourth quarter after the IPO, and so on. *ROA* is operating return on assets calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO. *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*); *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value to book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. Firm size, *lnMV*, is calculated as the natural log of the firm's market value of equity. *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	II t = 1				*II t* = 2				*II t* = 3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Intercept	-0.4555 (-1.513)	-0.0577* (-1.919)	-0.0579* (-1.905)	-0.0776*** (-3.031)	-0.1028*** (-3.8291)	-0.1375*** (-5.234)	-0.1390*** (-5.2651)	-0.1437*** (-6.057)	-0.1210*** (-4.702)	-0.1609*** (-6.474)	-0.1640*** (-6.7143)	-0.1636*** (-7.219)
ROA t-1	0.0547*** (5.217)				0.1306*** (6.345)				0.0914*** (5.300)			
RO_ALC t-1		0.0116*** (3.878)				0.0104*** (3.622)				0.0049* (1.871)		
ROS t-1			0.0022*** (4.3706)				0.0008*** (2.707)				0.0006* (1.887)	
MtoB t-1				-0.0005 (-1.064)				-0.0010 (-0.974)				-0.025** (-2.240)
LN of MV t-1	0.0650*** (12.125)	0.0676*** (12.694)	0.0677*** (12.567)	0.0717*** (15.147)	0.0856*** (17.685)	0.0935*** (20.130)	0.0670*** (19.944)	0.0952*** (21.375)	0.0931*** (21.148)	0.1009*** (24.197)	0.1017*** (24.8355)	0.1007*** (24.832)
LEVER t-1	0.0326* (1.950)	0.0343** (2.042)	0.0297* (1.734)	0.0478*** (3.012)	0.0520* (1.784)	0.0593** (2.016)	0.0670** (2.254)	0.0572* (1.916)	-0.0197 (-0.734)	-0.0172 (-0.633)	-0.0165 (0.605)	-0.0054 (-0.183)
Adj R2	0.2757	0.2691	0.2746	0.2656	0.4384	0.4278	0.4264	0.4137	0.5047	0.4952	0.4998	0.4876
N	1344	1344	1283	1741	1441	1441	1398	1657	1297	1297	1272	1424

Table 6: Operating performance as a function of lagged institutional holdings over time

This table reports regression results on operating performance in year *t* (*Yt*) as a function of institutional holdings in year *t-1* (*Yt-1*) for *t* = 1, 2, 3. Here *Y0* is the year that ends in the last reported quarter prior to the IPO, *Y1* is the end of the fourth quarter after the IPO, and so on. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value to book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. Firm size, *lnMV* is calculated as the natural log of the firm's market value of equity. *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	t=1				*t=2*				*t* = 3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	ROA	*RO_ALC*	*ROS*	*MtoB*	*ROA*	*RO_ALC*	*ROS*	*MtoB*	*ROA*	*RO_ALC*	*ROS*	*MtoB*
Intercept	-0.4014***	-2.2588***	-10.8447***	-0.7770	-0.4950***	-2.3153***	-6.1594***	0.1081	-0.0980***	-0.1234***	-0.132***	-0.1112***
	(-10.391)	(-8.4896)	(-4.328)	(-0.1330)	(-11.400)	(-8.193)	(-3.047)	(0.1712)	(-3.712)	(-5.076)	(-5.443)	(-4.9006)
II $_{t-1}$	0.1651***	0.6010**	5.9057**	-3.0347***	0.2676***	1.0652***	5.8522***	-2.7915***	0.0859***	0.0063**	0.0006	-0.0041***
	(3.954)	(2.089)	(2.195)	(-4.017)	(5.515)	(3.373)	(2.591)	(-3.876)	(5.060)	(2.231)	(1.188)	(-4.118)
lnMV $_{t-1}$	0.0728***	0.3340***	1.4988***	1.1151***	0.0720***	0.2961***	0.4362	0.9805***	0.0860***	0.0915***	0.0927***	0.0921***
	(10.208)	(6.799)	(3.249)	(9.019)	(8.469)	(5.351)	(1.105)	(7.861)	(20.358)	(22.428)	(22.762)	(23.622)
LEVER $_{t-1}$	0.0886***	0.583***	2.337	0.9398**	0.2337***	1.3153***	0.990	0.0952	0.0514*	0.0580**	0.0640**	0.0541*
	(3.880)	(3.710)	(1.579)	(2.225)	(4.684)	(4.050)	(0.427)	(0.1202)	(1.921)	(2.148)	(2.361)	(1.856)
Adj R2	0.1588	0.0659	0.0170	0.0696	0.1830	0.0784	0.017	0.0522	0.4805	0.4720	0.4722	0.4682
N	1520	1520	1475	1744	1450	1450	1423	1589	1258	1258	1235	1353

Table 7: Institutional holdings as a function of contemporaneous *abnormal* operating performance over time

This table reports regression results on institutional holdings as a function of same year level of abnormal operating variables in year *t* (*Yt*), *t* = 1, 2, 3, i.e. in the first, second and third years after the IPO. Abnormal operating performance is measured relative to two different benchmarks. In Panel A, the benchmark is the value-weighted industry average (VW) and in Panel B the benchmark is the median in the industry (Med). For industry formation, see Section III.C. The prefix *Abn* for the variable names indicates abnormal values. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return to assets-less-cash, calculated using Compustat data items *OIDPQ, ATQ* and *CHEQ*); *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. Firm size, *lnMV*, is the natural log of the firm's equity, where the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage, calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

Panel A: The benchmark for operating performance is the industry value-weighted average (VW)

	II t=1			*II t=2*			*II t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.04562*	-0.0834***	-0.0907***	-0.0689***	-0.1088***	-0.1204***	-0.0791***	-0.1193***	-0.1224***
	(-1.858)	(-3.623)	(-3.935)	(-2.888)	(-4.925)	(-5.576)	(-3.172)	(-5.177)	(-5.343)
Abn ROA $_t$	0.1033***			0.0781***			0.0825***		
	(5.828)			(5.162)			(4.691)		
Abn RO_ALC $_t$		0.0101***			0.0065***			0.0067**	
		(4.087)			(2.895)			(2.347)	
Abn ROS $_t$			0.0008***			0.0009***			0.0007
			(2.9630)			(2.707)			(1.290)
lnMV $_t$	0.0692***	0.0750***	0.0758***	0.0840***	0.0901***	0.0921***	0.0894***	0.0951***	0.0952***
	(16.341)	(18.560)	(18.610)	(21.481)	(24.539)	(25.630)	(22.466)	(25.356)	(25.330)
LEVER $_t$	0.0575**	0.0618**	0.0674***	0.0410*	0.0411*	0.0449*	0.0159	0.0202	0.0221
	(2.2787)	(2.433)	(2.628)	(1.682)	(1.673)	(1.820)	(0.623)	(0.782)	(0.848)
Adj R2	0.3578	0.3507	0.3463	0.4857	0.4791	0.4824	0.5253	0.5190	0.5174
N	1549	1549	1503	1449	1449	1422	1252	1252	1227

Panel B: The benchmark for operating performance is the industry median (Med)

	II t=1			*II t=2*			*II t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.0701***	-0.0880***	-0.0911***	-0.0816***	-0.1116***	-0.120***	-0.0928***	-0.1233***	-0.1239***
	(-2.920)	(-3.829)	(-3.952)	(-3.491)	(-5.073)	(-5.591)	(-3.808)	(-5.381)	(-5.412)
AbnROA $_t$	0.0791***			0.0742***			0.0823***		
	(4.077)			(4.501)			(4.097)		
AbnRO_ALC $_t$		0.0026***			0.0060***			0.0060**	
		(3.507)			(2.587)			(2.0239)	
AbnROS $_t$			0.0008***			0.0008***			0.0007
			(2.879)			(2.648)			(1.238)
lnMV $_t$	0.0717***	0.0754***	0.0758***	0.0847***	0.0903***	0.0921***	0.0901***	0.0956***	0.0955***
	(16.809)	(18.641)	(18.619)	(21.397)	(24.588)	(25.635)	(22.293)	(25.472)	(25.396)
LEVER $_t$	0.0708***	0.0651**	0.0677***	0.0500**	0.0429*	0.0451*	0.0244	0.0216	0.0955***
	(2.805)	(2.566)	(2.638)	(2.046)	(1.745)	(1.829)	(0.954)	(0.840)	(25.396)
Adj R2	0.3506	0.3551	0.3461	0.4888	0.4785	0.4823	0.5242	0.5193	0.5182
N	1549	1549	1503	1449	1449	1422	1251	1251	1226

Table 8: Institutional holdings as a function of lagged *abnormal* operating performance over time

This table reports regression results on institutional holdings in year *t* (*Yt*) after the IPO as a function of abnormal operating performance in year *t-1* (*Yt-1*) for *t* = 1, 2, 3. Abnormal operating performance is measured relative to two different benchmarks. In Panel A, the benchmark is the value-weighted industry average (VW) and in Panel B the benchmark is the median in the industry (Med). For industry formation, see Section III.C. The prefix *Abn* for the variable names indicates abnormal values. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO. *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. Firm size, *lnMV* is the natural log of the firm's equity, where the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

Panel A: The benchmark for operating performance is industry the value-weighted average (VW)

	II t=1			*II t=2*			*II t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.0372 (-1.220)	-0.0556* (-1.842)	-0.0575* (-1.893)	-0.0844*** (-3.165)	-0.1360*** (-5.157)	-0.1389*** (-5.259)	-0.1104*** (-4.129)	-0.1601*** (-6.413)	-0.1639*** (-6.708)
AbnROA $_{t-1}$	0.0546*** (5.217)			0.1251*** (6.049)			0.0879*** (5.123)		
AbnRO_ALC $_{t-1}$		0.0116*** (3.873)			0.0102*** (3.576)			0.0048* (1.825)	
AbnROS $_{t-1}$			0.0022*** (4.390)			0.0009*** (2.717)			0.0006* (1.896)
lnMV $_{t-1}$	0.0650*** (12.135)	0.0677*** (12.698)	0.0677*** (12.570)	0.0864*** (17.908)	0.093*** (20.156)	0.0935*** (19.945)	0.0937*** (21.341)	0.101*** (24.215)	0.1018*** (24.837)
LEVER $_{t-1}$	0.0321* (1.925)	0.0341** (2.026)	0.0300* (1.735)	0.0511* (1.751)	0.058** (1.998)	0.0670** (2.255)	-0.0204 (-0.760)	-0.0174 (-0.639)	-0.0164 (-0.604)
Adj R2	0.2757	0.2645	0.274	0.4370	0.4277	0.4264	0.5040	0.4952	0.4999
N	1344	1344	1283	1441	1441	1398	1297	1297	1272

Panel B: The benchmark for operating performance is the industry median (Med)

	II t=1			*II t=2*			*II t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.4890 (-1.616)	-0.0615** (-2.045)	-0.0583* (-1.920)	-0.1097*** (-4.022)	-0.1399*** (-5.319)	-0.1393*** (-5.274)	-0.1224*** (-4.669)	-0.1624*** (-6.530)	-0.1614*** (-6.718)
AbnROA $_{t-1}$	0.050*** (4.553)			0.1138*** (5.029)			0.0876*** (4.627)		
AbnRO_ALC $_{t-1}$		0.0106*** (3.352)			0.0096*** (3.177)			0.0043 (1.622)	
AbnROS $_{t-1}$			0.0022*** (4.290)			0.0008*** (2.652)			0.0006* (1.874)
lnMV $_{t-1}$	0.0661*** (12.338)	0.0683*** (12.824)	0.068*** (12.583)	0.0880*** (18.148)	0.0939*** (20.209)	0.0935*** (19.953)	0.0941*** (21.189)	0.1012*** (24.257)	0.1018*** (24.840)
LEVER $_{t-1}$	0.0353** (2.112)	0.0356** (2.119)	0.0299* (1.746)	0.0666** (2.285)	0.0620** (2.107)	0.0673** (2.264)	-0.0105 (-0.393)	-0.0160 (-0.589)	-0.0163 (-0.599)
Adj R2	0.2722	0.267	0.2742	0.4326	0.4266	0.4263	0.5022	0.5007	0.4998
N	1344	1344	1283	1441	1441	1398	1297	1297	1272

Table 9: *Abnormal* operating performance as a function of lagged institutional holdings over time

This table reports regression results on abnormal operating performance in year *t* (*Yt*) as a function of the one-year lag of institutional holdings, i.e. at the end of year *t-1* (*Yt-1*) for *t* = 1, 2, 3. Abnormal operating performance is measured relative to two different benchmarks. In Panel A, the benchmark is the value-weighted industry average (VW) and in Panel B the benchmark is the median in the industry (Med). For industry formation, see Section III.C. The prefix *Abn* for the variable names indicates abnormal values. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. Firm size, *lnMV* is the natural log of the firm's equity, where the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

Panel A: The benchmark for operating performance is the industry value-weighted average (VW)

	t=1			*t=2*			*t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$AbnROA_t$	$AbnRO\_ALC_t$	$AbnROS_t$	$AbnROA_t$	$AbnRO\_ALC_t$	$AbnROS_t$	$AbnROA_t$	$AbnRO\_ALC_t$	$AbnROS_t$
Intercept	-0.5426***	-2.4412***	-10.9690***	-0.6388***	-2.4922***	-6.2951***	-0.6107***	-1.9526***	-5.1372***
	(-14.146)	(-9.161)	(-4.378)	(-14.710)	(-8.821)	(-3.114)	(8.620)	(-8.121)	(-4.245)
II_{t-1}	0.1735***	0.6311**	5.9447**	0.2706***	1.0727***	5.8906***	0.2274***	0.6204**	1.7114
	(4.185)	(2.191)	(2.210)	(5.575)	(3.397)	(2.607)	(4.817)	(2.191)	(1.203)
$lnMV_{t-1}$	0.0709***	0.3315***	1.4900***	0.0705***	0.2929***	0.4288	0.0654***	0.2267***	0.6123**
	(10.015)	(6.737)	(3.230)	(8.301)	(5.295)	(1.086)	(8.188)	(4.729)	(2.542)
$LEVER_{t-1}$	0.0920***	0.6063***	2.3165	0.2437***	1.3677***	0.9215	0.1294***	0.8339***	1.6959
	(4.060)	(3.849)	(1.565)	(4.884)	(4.212)	(0.397)	(2.880)	(3.093)	(1.256)
Adj R2	0.1425	0.0662	0.0178	0.1687	0.0784	0.0070	0.1670	0.0649	0.0174
N	1520	1520	1475	1450	1450	1423	1258	1258	1235

Panel B: The benchmark for operating performance is the industry median (Med)

	t=1			*t=2*			*t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$AbnROA_t$	$AbnRO\_ALC_t$	$AbnROS_t$	$AbnROA_t$	$AbnRO\_ALC_t$	$AbnROS_t$	$AbnROA_t$	$AbnRO\_ALC_t$	$AbnROS_t$
Intercept	-0.3826***	-2.1033***	-10.665***	-0.516***	-2.2749***	-6.0967***	-0.4676***	-1.7176***	-4.8991***
	(-10.742)	(-8.287)	(-4.264)	(-12.699)	(-8.260)	(-3.019)	(-13.126)	(-7.423)	(-4.133)
$II_{t}-1$	0.1073***	0.479*	5.8008**	0.1978***	0.9108***	5.7276**	0.1699***	0.4720*	1.5485
	(2.787)	(1.747)	(2.160)	(4.480)	(2.959)	(2.538)	(4.053)	(1.733)	(1.112)
$lnMV_{t-1}$	0.0617***	0.3059***	1.4655***	0.0722***	0.2958***	0.4302	0.0656***	0.2296***	0.6170***
	(9.386)	(6.528)	(3.182)	(9.096)	(5.485)	(1.091)	(9.225)	(4.970)	(2.612)
$LEVER_{t-1}$	0.0434**	0.507***	2.2266	0.1143**	1.1136***	0.6966	0.0182	0.6070**	1.4440
	(2.063)	(3.383)	(1.506)	(2.451)	(5.485)	(0.300)	(0.4575)	(2.342)	(1.093)
Adj R2	0.1129	0.055	0.0169	0.1518	0.0684	0.0061	0.1679	0.0688	0.0158
N	1520	1520	1475	1450	1450	1423	1257	1257	1234

Table 10: Change in institutional holdings as a function of contemporaneous change in operating performance over time

This table reports regression results on the change in institutional holdings in year *t* (*Yt*) as a function of the contemporaneous change in operating performance variables and the level of *MtoB* for *t* = 1, 2, 3. Columns (1)–(4), (5)–(8), (9)–(12) report the findings for *t*=1, *t*=2, and *t*=3, respectively. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where OIBD is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and ATQ is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value to book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. Firm size, *lnMV* is the natural log of the firm's equity, where the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	ΔII t = 1				*ΔII t* = 2				*ΔII t* = 3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Intercept	-0.116***	-0.110***	-0.110***	-0.091***	-0.0278	-0.0359*	-0.0381*	-0.0269	-0.0361**	-0.0349**	-0.0300*	-0.055***
	(-4.647)	(-4.425)	(-4.251)	(-4.400)	(-1.429)	(-1.843)	(-1.905)	(-1.540)	(-2.223)	(-2.139)	(-1.831)	(-3.607)
ROA Growth $_t$	0.0125				0.0779***				0.0628***			
	(1.056)				(4.891)				(4.180)			
RO_ALC Growth $_t$		0.0082**				0.0094***				0.0063**		
		(2.486)				(3.049)				(2.120)		
ROS Growth $_t$			-0.0001				0.0005				0.0003	
			(-0.143)				(1.038)				(0.835)	
MtoB $_t$				0.0011***				0.0027***				0.0013*
				(2.712)				(3.612)				(1.704)
lnMV $_t$	0.0387***	0.0374***	0.0380***	0.0347***	0.0156***	0.0164***	0.0167***	0.0116***	0.0109***	0.0101***	0.0093***	0.0090***
	(8.651)	(8.341)	(8.178)	(9.022)	(4.533)	(4.754)	(4.724)	(3.538)	(4.001)	(3.671)	(3.381)	(3.324)
LEVER $_t$	-0.0282**	-0.0279**	-0.0364**	-0.035***	-0.0206	-0.0134	-0.0082	-0.0291	-0.083***	-0.079***	-0.082***	-0.065***
	(-2.006)	(-1.996)	(-2.480)	(-2.702)	(-0.947)	(-0.612)	(-0.365)	(-1.329)	(-4.618)	(-4.345)	(-4.581)	(-3.271)
Adj R^2	0.1235	0.1271	0.1265	0.1233	0.1006	0.0906	0.0850	0.0952	0.0578	0.0474	0.0447	0.0343
N	1253	1253	1189	1740	1320	1320	1275	1652	1183	1183	1155	1421

Table 11: Change in initial institutional holdings as a function of lagged change in operating performance over time

This table reports regression results on the change in institutional holdings in year *t* (*Yt*) as a function of the change in operating performance variables and the level of *MtoB* in year *t-1* (*Yt-1*), for *t* = 2, 3. Columns (1)–(4) and (5)–(8) report the findings for *t*=2 and *t*=3, respectively. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where OIBD is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value to book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. Firm size, *lnMV* is calculated as the natural log of the firm's market value of equity. *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	ΔII t = 2				*ΔII t = 3*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	-0.0140	-0.0126	-0.0116	0.0081	0.0014	-0.0044	-0.0013	-0.0144
	(-0.556)	(-0.504)	(-0.446)	(0.387)	(0.072)	(-0.230)	(-0.068)	(-0.813)
ROA Growth $_{t-1}$	0.0047				0.0468***			
	(0.393)				(2.857)			
RO_ALC Growth $_{t-1}$		0.0011				-0.0014		
		(0.323)				(-0.452)		
ROS Growth $_{t-1}$			0.0002				-0.0003	
			(0.450)				(-0.567)	
MtoB $_{t-1}$				0.0006				-0.0001
				(1.476)				(-0.146)
LnMV $_{t-1}$	0.0111**	0.0109**	0.0114**	0.0063	-0.0008	-0.0001	-0.0005	0.0008
	(2.453)	(2.395)	(2.425)	(1.625)	(-0.235)	(-0.029)	(-0.136)	(0.246)
LEVER $_{t-1}$	-0.0026	-0.0029	0.0020	-0.0069	-0.0426**	-0.0388*	-0.0424**	-0.0447**
	(-0.184)	(-0.209)	(0.136)	(-0.535)	(-2.040)	(-1.856)	(-2.007)	(-2.052)
Adj R^2	0.0693	0.0692	0.0661	0.0767	0.0370	0.0305	0.0316	0.0217
N	1163	1163	1103	1596	1181	1181	1139	1445

Table 12: Change in operating performance as a function of lagged change in institutional holdings over time

This table reports regression results on the change in operating performance and the level of *MtoB* in year *t* (*Yt*) as a function of institutional holdings in year *t-1* (*Yt-1*), for *t* = 2, 3. Columns (1)–(4) and (5)–(8) report the findings for *t*=2 and *t*=3, respectively. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where OIBD is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. *MtoB* is market-to-book, calculated as the ratio of market value and book value of the firm's equity. Market value of the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). For book value of equity we use Compustat data item *SEQQ*. Firm size, *lnMV* is calculated as the natural log of the firm's market value of equity. *LEVER* is leverage, calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	t = 2				*t = 3*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ROA Growth $_t$	RO_ALC Growth $_t$	ROS Growth $_t$	MtoB $_t$	ROA Growth $_t$	RO_ALC Growth $_t$	ROS Growth $_t$	MtoB $_t$
Intercept	-0.1070***	-0.2825	4.2329***	1.2039	0.0793**	0.4975***	1.4781	2.0674***
	(-2.682)	(-1.369)	(3.172)	(1.593)	(2.208)	(2.758)	(0.908)	(2.899)
II Growth $_{t-1}$	0.0337	-0.0483	-1.3671	-0.3543	-0.0421	0.1575	0.0715	4.0540***
	(0.749)	(-0.207)	(-0.917)	(-0.408)	(-0.817)	(0.608)	(0.031)	(3.916)
lnMV $_{t-1}$	0.0120	0.0438	-0.5800**	0.6065***	-0.0234***	-0.0882***	-0.0852	0.3838***
	(1.628)	(1.153)	(-2.368)	(4.332)	(-3.692)	(-2.772)	(-0.296)	(3.006)
LEVER $_{t-1}$	0.0125	0.1213	-2.2942***	-0.2692	0.0632	-0.0750	0.7172	0.7048
	(0.539)	(1.014)	(-2.988)	(-0.578)	(1.595)	(-0.377)	(0.400)	(0.803)
Adj R^2	0.0207	-0.0003	0.0157	0.0263	0.0272	0.0108	-0.0046	0.0315
N	1306	1306	1261	1551	1185	1185	1158	1339

Table 13: Change in II holdings as a function of contemporaneous *abnormal* operating performance over time

This table reports regression results on the change in institutional holdings over the year as a function of the end-of-year level of abnormal operating variables. Here the change in institutional holdings over year *t* (*Yt*) is regressed over the level of abnormal operating performance at the end of the same year *t* (*Yt*) for *t* = 1, 2, 3, i.e. in the first, second and third years after the IPO. Abnormal operating performance is measured relative to the value-weighted industry average (VW). For industry formation, see Section III.C. The prefix *Abn* for the variable names indicates abnormal values. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO. *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ, ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. Firm size, *lnMV*, is the natural log of the firm's equity, where the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage, calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	ΔII t=1			*ΔII t=2*			*ΔII t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.0543**	-0.0836***	-0.0920***	-0.0011	-0.0295	-0.0347*	-0.0157	-0.0341**	-0.0341**
	(-2.293)	(-3.622)	(-3.945)	(-0.053)	(-1.541)	(-1.841)	(-0.897)	(-2.083)	(-2.129)
Abn ROA $_t$	0.0897***			0.0532***			0.0336***		
	(6.016)			(4.729)			(2.969)		
Abn RO_ALC$_t$		0.0078***			0.0027			0.0015	
		(3.591)			(1.544)			(0.807)	
Abn ROS $_t$			0.0004			0.0002			0.0001
			(1.523)			(0.861)			(0.242)
lnMV $_t$	0.0307***	0.0348***	0.0358***	0.0112***	0.0150***	0.0160***	0.0066**	0.0090***	0.0090***
	(7.316)	(8.400)	(8.488)	(3.272)	(4.475)	(4.823)	(2.314)	(3.295)	(3.351)
LEVER $_t$	-0.0314**	-0.0269**	-0.0234*	-0.0206	-0.0097	-0.0062	-0.0828***	-0.0785***	-0.0805***
	(-2.396)	(-2.041)	(-1.728)	(-0.960)	(-0.449)	(-0.285)	(-4.599)	(-4.348)	(-4.510)
Adj R^2	0.1399	0.1266	0.1202	0.0977	0.0850	0.0842	0.0499	0.0436	0.0448
N	1513	1513	1468	1434	1434	1408	1244	1244	1221

Table 14: Change in institutional holdings as a function of lagged *abnormal* operating performance over time

This table reports regression results on the change in institutional holdings over year *t* (*Yt*) as a function of one-year lag of abnormal operating performance, i.e. in year *t-1* (*Yt-1*) for *t* = 1, 2, 3. Abnormal operating performance is measured relative to the value-weighted industry average (VW). For industry formation, see Section III.C. The prefix *Abn* for the variable names indicates abnormal values. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*). *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. Firm size, *lnMV*, is the natural log of the firm's equity, where the firm's equity is calculated as the number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	ΔII t=1			*ΔII t=2*			*ΔII t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.0895***	-0.0973***	-0.0959***	-0.0006	-0.0158	-0.0121	0.0079	-0.0076	-0.0055
	(-3.609)	(-3.975)	(-3.882)	(-0.023)	(-0.688)	(-0.523)	(0.402)	(-0.405)	(-0.299)
Abn ROA $_{t-1}$	0.0217***			0.0275*			0.0241**		
	(2.551)			(1.807)			(2.125)		
Abn RO_ALC$_{t-1}$		0.0044*			-0.0004			0.0000	
		(1.822)			(-0.170)			(-0.020)	
Abn ROS $_{t-1}$			0.0012***			0.0001			-0.0001
			(2.874)			(0.317)			(-0.653)
lnMV $_{t-1}$	0.0350***	0.0361***	0.0358***	0.0095**	0.0116***	0.0112***	-0.0008	0.0012	0.0010
	(8.028)	(8.356)	(8.164)	(2.258)	(2.814)	(2.663)	(-0.250)	(0.368)	(0.303)
LEVER $_{t-1}$	-0.0300**	-0.0291**	-0.0339**	-0.0105	-0.0073	-0.0079	-0.0574***	-0.0513**	-0.0553***
	(-2.207)	(-2.136)	(-2.431)	(-0.798)	(-0.557)	(-0.592)	(-2.763)	(-2.475)	(-2.691)
Adj R^2	0.1185	0.1164	0.1240	0.0769	0.0748	0.0749	0.0277	0.0243	0.0248
N	1343	1343	1282	1403	1403	1361	1284	1284	1260

Table 15: *Abnormal* operating performance as a function of lagged change in institutional holdings over time

This table reports regression results on abnormal operating performance in year *t* (*Yt*) as a function of the one-year lag of change in institutional holdings , i.e. the change in year *t-1* (*Yt-1*) for *t* = 2, 3. Columns (1)–(3) and (4)–(6) report the findings for *t*=2 and *t*=3, respectively. Abnormal operating performance is measured relative to the value-weighted industry average (VW). For industry formation, see Section III.C. The prefix *Abn* for the variable names indicates abnormal values. *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where *OIBD* is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. Firm size, *lnMV*, is the natural log of the firm's equity, where the firm's equity is calculated as number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage, calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	t=2			*t=3*		
	(1)	(2)	(3)	(4)	(5)	(6)
	$AbnROA_t$	$AbnRO\_ALC_t$	$AbnROS_t$	$AbnROA_t$	$AbnRO\_ALC_t$	$Abn\ ROS_t$
Intercept	-0.5936***	-2.7111***	-5.5330**	-0.5632***	-1.9710***	-5.9496***
	(-11.260)	(-8.091)	(-2.332)	(-12.200)	(-7.215)	(-4.542)
II Growth $_{t-1}$	0.2695***	1.1962***	4.9553*	0.2449***	0.5582	0.2250
	(4.495)	(3.140)	(1.839)	(3.672)	(1.415)	(0.120)
lnMV $_{t-1}$	0.0710***	0.3605***	0.6546	0.0642***	0.2609***	0.8707***
	(7.346)	(5.865)	(1.505)	(7.827)	(5.379)	(3.744)
LEVER $_{t-1}$	0.1372***	0.9025***	-0.5834	0.3157***	1.2307***	2.6502*
	(4.467)	(4.622)	-(0.418)	(6.172)	(4.067)	(1.835)
Adj R^2	0.1092	0.0651	0.0025	0.1219	0.0546	0.0156
N	1419	1419	1392	1245	1245	1223

Table 16: *Abnormal* long-run stock returns and institutional holdings

This table reports regression results on the relation between abnormal stock return and institutional holdings. In **Panel A** the dependent variable in all regressions is buy-and-hold abnormal stock return for different time periods. Abnormal returns are measured using a model that is based on the three Fama-French factors and the Carhart (1997) momentum factor (4-factor alpha). In Columns (1)–(3) the independent variable is II holdings at the end-of *Q1* after the IPO while the dependent variable is buy-and-hold abnormal return over 1, 2, and 3 years after the IPO, respectively. In Columns (4)–(6) the year-*t* buy-and-hold abnormal return is regressed over end-of-year-*t* II holdings for years *t* = 1, 2, and 3 after the IPO, respectively. In Regressions 7–9 we repeat the analysis performed in Regressions 4–6, replacing II holdings at the end of year *t* with *change* in II holdings over year *t*. In **Panel B** we consider the relation in lags. In Regressions 1–2 of the panel the dependent variable is buy-and-hold abnormal stock return over years 1 and 2, respectively, and the independent variables are the 1-year lagged institutional holdings. In Regressions 3–4 of Panel B the dependent variable is institutional holdings in years 2 and 3, respectively, and the dependent variable is the 1-year lagged buy-and-hold abnormal return. In Columns (5)–(8) of Panel B we repeat the analysis performed in Columns (1)–(4) of this panel, with institutional holdings growth replacing institutional holdings. In both Panels A and B, in all regressions, we control for firm size and leverage as follows: Firm size, *lnMV*, is the natural log of the firm's equity, where the firm's equity is calculated as number of shares outstanding (Compustat data item *CSHOQ*) times share price (Compustat data item *PRCCQ*). *LEVER* is leverage, calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

Panel A: *Abnormal* long-run stock returns and contemporaneous institutional holdings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	B&H 1-year	*B&H 2-year*	*B&H 3-year*	*B&H t=1*	*B&H t=2*	*B&H t=3*	*B&H t=1*	*B&H t=2*	*B&H t=3*
Intercept	-0.1522*	-0.2030	-0.2016	-0.0792	0.1583	0.5860***	-0.0107	0.1303	0.5584***
	(-1.643)	(-1.385)	(-1.037)	(-0.875)	(1.628)	(5.060)	(-0.120)	(1.376)	(5.116)
II_{Q1}	-0.1292	-0.0867	-0.2120						
	(-1.248)	(-0.530)	(-0.976)						
II_t				0.7447***	0.7407***	0.6249***			
				(8.745)	(7.362)	(4.686)			
II Growth $_t$							1.2573***	1.5563***	2.0498***
							(12.262)	(11.606)	(10.914)
$lnMV_{t-1}$	0.0525***	0.0751***	0.1040***	-0.0088	-0.0586***	-0.1150***	-0.0033	-0.0170	-0.0673***
	(3.0773)	(2.7853)	(2.9063)	(-0.5052)	(-2.9980)	(-4.9583)	(-0.1998)	(-1.0045)	(-3.6586)
$LEVER_{t-1}$	-0.0740	-0.0874	-0.1176	-0.1160**	-0.1058	-0.1682	-0.0513	-0.0338	-0.0265
	(-1.3322)	(-0.9948)	(-1.0086)	(-2.1655)	(-0.9336)	(-1.2708)	(-0.9787)	(-0.3055)	(-0.2088)
Adj R2	0.0719	0.0735	0.0367	0.1078	0.0789	0.0514	0.1421	0.1208	0.1087
N	1813	1813	1813	1787	1682	1468	1787	1678	1466

Panel B: *Abnormal* long-run stock returns and institutional holdings in lags

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	B&H t=2	*B&H t=3*	*II t= 2*	*II t=3*	*B&H t=2*	*B&H t=3*	*II Growth t=2*	*II Growth t=3*
Intercept	0.0286	0.3143***	-0.0676***	-0.1413***	0.0073	0.3635***	0.0002	-0.0168
	(0.262)	(2.774)	-(2.372)	-(5.324)	(0.067)	(3.207)	(0.010)	-(0.988)
II t-1	-0.0776	-0.3504***						
	-(0.756)	-(2.988)						
B&H t-1			0.0906***	0.0749***			0.0337***	0.0363***
			(12.298)	(11.416)			(6.448)	(8.662)
II Growth t-1					-0.2752**	0.0255		
					-(2.187)	(0.159)		
LnMV t-1	0.0199	0.0011	0.0765***	0.0906***	0.0247	-0.0319	0.0080**	0.0004
	(0.9523)	(0.0491)	(14.8487)	(19.2641)	(1.2265)	-(1.5744)	(2.1832)	(0.1383)
LEVERQ t-1	0.0258	-0.0936	0.0533***	0.0319	0.0155	-0.1200	0.0012	-0.0467***
	(0.3998)	-(0.7083)	(3.1689)	(1.0460)	(0.2409)	-(0.9068)	(0.0990)	-(2.4040)
Adj R2	0.0449	0.0344	0.3825	0.4437	0.0471	0.0291	0.0988	0.0727
N	1787	1682	1640	1468	1787	1678	1638	1466

Table 17: Industry Analysis

This table reports the results of our industry analysis. **Panel A** reports summary statistics for the IPO sample by industry for the 10 Fama-French industries at the end of *Q1* after the IPO. By construction Fama-French industry 9 (utilities) is excluded from the sample. Column (1) reports the number of IPOs per industry. Columns (2)–(4) report the average, median, and standard deviation, respectively, of II holdings at the end of *Q1* in each of the Fama French industries. **Panel B** reports regression results for the dependence of II holdings on performance, controlling for FF industries. The dependent variable is II holdings at the end of *Y1* after the IPO. The table includes one column for each of the FF industries, excluding industry 9 (utilities). In all regressions the independent variable is $AbnROA_{Y1}$, the return on assets relative to the value-weighted SIC industry average, at the end of the first year following the IPO. *lnMV* is firm size, calculated as the natural log of the firm's market value of equity. *LEVER* is leverage, calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. Each regression contains a dummy variable for a different FF industry, *INDSi*. For example, Regression 1 includes a dummy variable that takes on the value of 1 for firms in the nondurable industry, and 0 otherwise. *INDSi*AbnROA* is the interaction between the industry dummy variable *INDS* and the abnormal operating performance variable, *AbnROA*. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

Panel A: IPO sample distribution by industry

		(1)	(2)	(3)	(4)
FF Industry Category	Industry Name	N	Avg II Q1	Med II Q1	StDev II Q1
1	NoDur	63	24.71%	22.28%	19.34%
2	Durbl	29	22.23%	19.97%	16.37%
3	Manuf	117	32.30%	24.76%	26.55%
4	Energy	53	31.62%	26.98%	22.11%
5	HiTec	719	20.17%	16.45%	15.72%
6	Telcm	100	27.19%	20.50%	20.62%
7	Shops	201	24.48%	19.76%	19.08%
8	Hlth	324	23.41%	21.86%	14.63%
9	Utils	0	NA	NA	NA
10	Other	301	29.55%	25.50%	22.05%
	TOTAL	1907	24.27%	20.50%	18.85%

Panel B: II holdings as a function of operating performance by FF industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)
FF INDS Category:	NoDur	Durbl	Manuf	Energy	HiTec	Telcm	Shops	Hlth	Other
Intercept	0.0164	0.0173	0.0130	0.0131	0.0202	0.0090	0.0094	0.0154	0.0055
	(0.578)	(0.608)	(0.457)	(0.460)	(0.705)	(0.314)	(0.323)	(0.537)	(0.191)
$AbnROA_{Y1}$	0.1644***	0.1563***	0.1497***	0.1581***	0.1462***	0.1491***	0.1601***	0.1702***	0.1482***
	(9.053)	(8.703)	(8.212)	(8.789)	(6.823)	(8.218)	(8.481)	(7.738)	(7.854)
$LnMV_{Q1}$	0.0585***	0.0579***	0.0583***	0.0587***	0.0591***	0.0594***	0.0590***	0.0582***	0.0584***
	(11.464)	(11.299)	(11.402)	(11.452)	(11.535)	(11.521)	(11.450)	(11.365)	(11.432)
$LEVER_{Q-1}$	0.0651**	0.0630**	0.0554**	0.0596**	0.0424	0.0734***	0.0605**	0.0616**	0.0484*
	(2.442)	(2.362)	(2.077)	(2.240)	(1.509)	(2.658)	(2.275)	(2.311)	(1.806)
INDSi	-0.0692**	-0.0539	0.0479**	-0.0296	-0.0239*	-0.0040	0.0162	-0.0093	0.0474***
	(-2.313)	(-1.209)	(2.098)	(-0.961)	(-1.705)	(-0.140)	(0.905)	(-0.479)	(3.104)
*INDSi*AbnROA*	-0.2046**	0.2984	0.0928	-0.3743	0.0296	0.2043*	-0.0722	-0.0459	0.0160
	(-2.017)	(0.887)	(0.959)	(-1.437)	(0.816)	(1.927)	(-1.288)	(-1.120)	(0.305)
Adj R^2	0.3098	0.3068	0.3077	0.3067	0.3086	0.3083	0.3070	0.3061	0.3101
N	1529	1529	1529	1529	1529	1529	1529	1529	1529

Table 18: Identification

This table reports the results of regression discontinuity design (RDD) analysis. Column (1) reports the results of the first step of the analysis. The dependent variable is II holdings. *D* is a dummy variable that takes on the value of 1 when the firm is in the Russell 2000 and the value of 0 otherwise. *lnMV* is firm size, calculated as the natural log of the firm's market value of equity. *LEVER* is leverage, calculated as the ratio of long-term debt (Compustat data item *DLTTQ*) to total assets (Compustat data item *ATQ*) in the last quarter of the relevant year. Columns (2)–(4) report the results of the second stage of the RDD analysis. Here, *Est_II* is the estimate of II holdings using the first stage of the analysis (from Column (1)). *ROA* is operating return on assets, calculated as operating income before depreciation divided by end-of-year total assets (where OIBD is calculated by aggregating Compustat quarterly data items *OIDPQ* over four fiscal quarters, and *ATQ* is the Compustat quarterly total asset variable from the last quarter of the relevant year relative to the IPO). *RO_ALC* is operating return on assets-less-cash, calculated using Compustat data items *OIDPQ*, *ATQ* and *CHEQ*. *ROS* is the operating performance to revenue ratio, calculated using Compustat data items *OIDPQ* and *REVQ*. All regressions include year fixed effects. *t*-statistics are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	II	*ROA*	*RO_ALC*	*ROS*
Intercept	-0.05202***	-0.4833***	-1.9433***	-5.8377***
	(-5.19967)	(-24.094)	(-14.660)	(-5.941)
Est_II	-	0.5439***	2.0810***	7.5014***
		7.647	4.427	2.149
D	0.1753***	-	-	-
	27.000			
LnMV	0.0653***	0.0545***	0.1548***	0.2801
	34.820	8.196	3.521	0.862
LEVER	0.0454***	0.0680***	0.7579***	1.7851
	4.307	2.981	5.028	1.605
Adj R^2	0.2974	0.2272	0.0787	0.0126
N	6687	4296	4296	4195

Table A-1: Example of raw institutional holding data – Source Data Corporation Q1 2002

Original Order	File Date	Manager Name	Manager Number	Type Code	Report Date	Prior Report Date	Cusip	Shares Held at End of Qtr	Net Change in Shares Since Prior Report	Stock Name	Ticker Symbol	Stock Class Description	Share Price, as of FDATE	Shares Outstanding in Millions, as of FDATE	Shares Outstanding in 1000s, as of FDATE
545735	31MAR2002	AIM MANAGEMENT GROUP,INC.	140	5	31MAR2002	31DEC2001	83616710	117700	46500	SOURCECORP	SRCP	COM	29.49	17	17377
545736	31MAR2002	AELTUS INVESTMENT MGMT, INC.	500	5	31MAR2002	31DEC2001	83616710	3200	1300	SOURCECORP	SRCP	COM	29.49	17	17377
545737	31MAR2002	AID ASSOCIATION FOR LUTHERANS	650	5	31MAR2002	31DEC2001	83616710	14900	14900	SOURCECORP	SRCP	COM	29.49	17	17377
545738	31MAR2002	AMALGAMATED BANK OF NEW YORK	1380	1	31MAR2002	31DEC2001	83616710	13919	519	SOURCECORP	SRCP	COM	29.49	17	17377
545739	31MAR2002	AMERICAN INTL GROUP INC	2470	2	31MAR2002	31DEC2001	83616710	4409	-3726	SOURCECORP	SRCP	COM	29.49	17	17377
545740	31MAR2002	APEX CAPITAL, LLC	4422	5	31MAR2002	31DEC2001	83616710	35500	35500	SOURCECORP	SRCP	COM	29.49	17	17377
545741	31MAR2002	AWAD ASSET MANAGEMENT, INC.	5350	5	31MAR2002	31DEC2001	83616710	694035	531550	SOURCECORP	SRCP	COM	29.49	17	17377
545742	31MAR2002	BNP PARIBAS ARBITRAGE SNC	5810	4	31MAR2002	30SEP2001	83616710	11480	11480	SOURCECORP	SRCP	COM	29.49	17	17377
545743	31MAR2002	BANK ONE CORPORATION	5955	1	31MAR2002	31DEC2001	83616710	4939	1260	SOURCECORP	SRCP	COM	29.49	17	17377
545744	31MAR2002	FORT POINT CAP MGMT, L.L.C.	6161	5	31MAR2002	31DEC2001	83616710	134400	134400	SOURCECORP	SRCP	COM	29.49	17	17377
545745	31MAR2002	BNY ASSET MANAGEMENT	6890	1	31MAR2002	31DEC2001	83616710	12300	500	SOURCECORP	SRCP	COM	29.49	17	17377
545746	31MAR2002	PROFUND ADVR LLC	7633	5	31MAR2002		83616710	12411		SOURCECORP	SRCP	COM	29.49	17	17377
545747	31MAR2002	DEUTSCHE BK AKTIENGESELLSCHAFT	7800	1	31MAR2002	31DEC2001	83616710	63253	9397	SOURCECORP	SRCP	COM	29.49	17	17377
545748	31MAR2002	BARCLAYS BANK PLC	7900	4	31MAR2002	31DEC2001	83616710	503094	80206	SOURCECORP	SRCP	COM	29.49	17	17377
545749	31MAR2002	BEAR, STEARNS & CO. INC.	8238	5	31MAR2002	31DEC2001	83616710	63	-1937	SOURCECORP	SRCP	COM	29.49	17	17377
545750	31MAR2002	CIBC WORLD MARKETS CORP.	11190	5	31MAR2002	31DEC2001	83616710	46653	1630	SOURCECORP	SRCP	COM	29.49	17	17377
545751	31MAR2002	CREDIT SUISSE FIRST BOSTON COR	11800	5	31MAR2002	31DEC2001	83616710	21344	-4465	SOURCECORP	SRCP	COM	29.49	17	17377
545752	31MAR2002	CALIFORNIA STATE TEACH RETIRE	12120	5	31MAR2002	31DEC2001	83616710	20900	-15693	SOURCECORP	SRCP	COM	29.49	17	17377
545753	31MAR2002	CCM PTNR	12970	5	31MAR2002	31DEC2001	83616710	570		SOURCECORP	SRCP	COM	29.49	17	17377
545754	31MAR2002	CENTURY CAPITAL MGMT, INC.	15090	5	31MAR2002	31DEC2001	83616710	12000	6000	SOURCECORP	SRCP	COM	29.49	17	17377
545755	31MAR2002	TIMESSQUARE CAPITAL MGMT, INC	16180	5	31MAR2002	31DEC2001	83616710	348100	25600	SOURCECORP	SRCP	COM	29.49	17	17377
545756	31MAR2002	COLLEGE RETIRE EQUITIES	18265	3	31MAR2002	31DEC2001	83616710	93416	1300	SOURCECORP	SRCP	COM	29.49	17	17377
545757	31MAR2002	PUBLIC EMP' RETIREMENT ASSN CO	18740	5	31MAR2002	31DEC2001	83616710	47700	-14900	SOURCECORP	SRCP	COM	29.49	17	17377
545829	30JUN2002	PUBLIC EMP' RETIREMENT ASSN CO	18740	5	31MAR2002	31DEC2001	83616710	47700	-14900	SOURCECORP	SRCP	COM	26.5	17	17424
545758	31MAR2002	COOKE & BIELER, INC.	21350	5	31MAR2002	31DEC2001	83616710	247800	247800	SOURCECORP	SRCP	COM	29.49	17	17377
545759	31MAR2002	SG COWEN SECURITIES CORP	21560	5	31MAR2002	31DEC2001	83616710	11975	500	SOURCECORP	SRCP	COM	29.49	17	17377
545760	31MAR2002	DEERE & COMPANY	22300	5	31MAR2002	31DEC2001	83616710	24600	6900	SOURCECORP	SRCP	COM	29.49	17	17377
545761	31MAR2002	DENVER INVESTMENT ADVR LLC	22860	5	31MAR2002	31DEC2001	83616710	145700	145700	SOURCECORP	SRCP	COM	29.49	17	17377
545762	31MAR2002	ARTEMIS INVESTMENT MGMT, LLC	22940	5	31MAR2002	31DEC2001	83616710	175750	40800	SOURCECORP	SRCP	COM	29.49	17	17377
545763	31MAR2002	DIMENSIONAL FD ADVISORS, INC.	23000	5	31MAR2002	31DEC2001	83616710	236000	105300	SOURCECORP	SRCP	COM	29.49	17	17377
545764	31MAR2002	AXA FINANCIAL, INC.	25610	2	31MAR2002	31DEC2001	83616710	81795	59095	SOURCECORP	SRCP	COM	29.49	17	17377

Source: F13 filings to the SEC, obtained from Thompson Reuters through WRDS