# Do pre-IPO investments generate information advantage?

# Evidence from mutual funds

Julie Ngo

Albert Wang

Auburn University

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**ABSTRACT**

We examine whether mutual funds' pre-IPO investments in private firms generate any trading profits via early access to information not available to the public. We find supporting evidence that access to private firms before their IPOs generates an information advantage that allows mutual funds to earn superior returns in other public-listed firms in the same industry where the private investment is made. Moreover, information advantage from private investments spills over to other funds within the same family and funds managed by the same manager(s). While prior literature suggests that mutual funds' private investments provide high returns through exit via IPO, our results point to another benefit that is related to trading in the secondary market.

*Keywords*: mutual funds, pre-IPO investments, IPO, private firms, information advantage

## 1. Introduction

As mutual funds with open-end nature must maintain liquidity carefully to meet daily redemption requests from their customers (Chen, Goldstein, and Jang, 2010; Chernenko and Sunderam, 2017), they traditionally focus their investments on the public market. Moreover, unlike venture capitalists, mutual funds do not specialize in nurturing startups (Huang et al., 2021). However, there has been a dramatic increase in mutual fund investment in private companies, especially in "unicorns," defined as private firms with a valuation surpassing one billion dollars. According to Morningstar, as of December 2017, 5.5% of large-cap equity funds have some level of investment in private firms. Moreover, the number of mutual funds with private investments is continuously rising.[1]

Several recent studies have provided some explanations for the increasing trend of mutual fund participation in the private market. First, increased mutual fund investment in private firms may reflect that fewer companies have gone to the public market in recent years. The average number of firms going public since 2000 is about a third of that during the 1990s, while the number of firms listed on the U.S. exchanges has fallen by more than 50% over the last 20 years (Lowry, Michaely, and Volkova, 2017). Mutual funds provide an additional source of capital that allows the firms to stay private longer so as to achieve a larger scaler before going public. The relationship between private firms and mutual funds is a two-way street. While public market investors' involvement gives startups the "oversight would help them become a better public company" and some sort of a seal of approval, it also gives mutual funds understandings about "potentially disruptive developments that might impact their publicly traded portfolio." [2] Anecdotal evidence suggests that investment in private firms can differentiate actively managed mutual funds from index funds that follow passive investing strategies and deliver a huge profit.[3] Additional advantages of private holdings include providing returns that are uncorrelated with market

[1] According to Kwon, Lowry, and Qian (2020), Among the 14 biggest fund families, the number of funds holding private securities has increased from less than 15 during 1995-2000 period to more than 90 in the 2014 -2015 period, with the aggregate valuation of investment increasing from $16 million in 1995 to $8 billion in 2015.

[2] See "Getting Into The Unicorn Boom: 10 Mutual Funds With Stakes In Pre-IPO Tech Stars", *Forbes*, October 13, 2015.

[3] For example, in its 2016 annual report, T. Rowe Price New Horizon Fund for the first time revealed that their $1.2 billion investment in 63 private companies had returned 34.8% annually. See https://www.sec.gov/Archives/edgar/data/80248/000120677417000549/arnhf_ncsr.htm

downturns and higher IPO allocation when the firms decide to go public (Kwon, Lowry, and Qian, 2020).

In this paper, we investigate another potential source of benefit to mutual funds from investing in private firms. Specifically, we examine whether the pre-IPO investment in private firms generates information advantage for mutual funds via early access to information not available to the public. There are several ways mutual funds can gain information advantage from investment in private companies. First, mutual funds might get private information through regular reports between private companies and investors that are not publicly available. Second, mutual fund managers can obtain information through frequent interaction with these private firms' executive and management teams. Another possible channel through which mutual funds can gain private information is via direct involvement in private firms' activities.[4]

To examine whether pre-IPO investments provide mutual funds with information advantage, we focus on mutual fund post-IPO trading in the secondary market. First, information acquired during the private investment period could help mutual funds make better trading decisions once these private companies become public. Prior studies have indicated that early access to information before IPOs generates a trading advantage after IPOs for institutional investors. For example, Ozmel, Trombley, and Yavuz (2019) examine the information channel through venture capital funds and find that limited partners (LPs) of lead venture capital funds obtain higher returns when they invest in newly public stocks backed by their VC funds. Even though mutual funds usually participate in late-stage funding rounds as syndicate members, some make investments many years before the startups decide to go public.[5] Remarkably, mutual funds sometimes even act as a lead investor in some financing rounds.[6] This high level of involvement in private firms would provide mutual funds with valuable information about the firms not available to the public. Private firms going public allows pre-IPO investors to trade stocks easily on the secondary markets – an opportunity they do not have when the companies stay private.

[4] For example, Fidelity requires quarterly reports and conference calls with private firms they invested in. See "Betting on Private Companies", Barron's, March 13, 2015

[5] For example, Dropbox Ser A shares were acquired by Fidelity Contrafund on 5/29/2012 and first appeared in the fund's portfolio on Jun 20,2012. See

https://www.sec.gov/Archives/edgar/data/24238/000087846712000074/main.htm

[6] For example, Fidelity led Uber's series D funding round and Lyft's series I funding round.

Starting with 1,071 firms going public during 2010-2019, we find that in 2010, only 2 firms received pre-IPO investment from mutual funds with a total value of $36.8 million. In 2019, 22 IPOs received pre-IPO mutual fund financing with a total investment of $2.6 billion. The trend is consistent with that described in Kwon, Lowry, and Qian (2020). In total, 152 out of 1,071 firms going public during 2010-2019 received some level of investment from mutual funds before IPOs. We first examine the holding behavior of mutual funds on stocks in which they have a pre-IPO investment (pre-IPO stocks). We find that mutual funds hold a large position of pre-IPO stocks relative to other newly listed stocks, and this holding bias is not driven by higher IPO allocations. Using survival analysis and counting after their IPO dates, we find that mutual funds tend to hold these firms in their portfolio significantly longer than other newly listed stocks.

Next, we examine whether mutual fund trades in pre-IPO stocks have predictability power on their future performance. We infer trades from quarterly changes of mutual fund holdings. A mutual fund trade in each stock is classified as Buy (Sell) if a fund increases (decreases) the number of shares relative to the previous quarter holding. If mutual funds are better informed about their pre-IPO stocks, we expect mutual fund buys to be positively associated with future abnormal returns. However, contrary to our expectations, trades made by mutual funds in pre-IPO stocks, both buying and selling, do not predict subsequent stock returns. One possible explanation is that the timing of information benefits (while firms are still private) and trading returns (after firms are publicly traded) are distant in time (i.e., the average holding period of private investment is around two years). Any information advantage fund managers accumulate while the stock is private is no longer materially relevant when it becomes public. Furthermore, any private information before IPOs should be disclosed to the public once the firms become public (i.e., SEC rules). Another possibility is that funds with private investments are associated with better stock picking ability. Using calendar time portfolio approach, we find that pre-IPO stocks have similar risk-adjusted performance as other newly listed stocks. In addition, mutual funds with private investments do not outperform those without any private investments, suggesting that pre-IPO funds do not have superior investment ability.

It is possible that pre-IPO investments provide fund managers with additional information that helps them make better investment decisions of other public-listed firms in the same industry (we label these as connected industries). Nowadays, startups have been delaying going public and getting bigger. The average age of companies going public in 2014 (the peak of the IPO market

during our sample) is 11 years old, while it was 4 years old in 1999 (Abelson and Narasin, 2015). As a result, many innovations and disruptions happen in the private markets. Chattopadhyay et al. (2002) find that institutional investors with access to private firms through venture capitalists can use industry-level information and earn positive excess returns. Their results suggest that relevant information in the public markets is produced in private markets. Participating in private firms combined with public market expertise could give fund managers an understanding of potentially disruptive developments such as innovation or new technology that might impact their traded portfolios. Unlike public counterparts, private firms are not subject to strict reporting rules. Hence, early access to private firms might give mutual funds information that they may not easily obtain elsewhere, giving mutual funds an edge when evaluating other investment opportunities in the same industry.

We then examine whether investing in private firms leads to information advantage in the connected industries. Several interesting findings emerge: (1) mutual funds tend to invest in private firms in industries they already overweight prior to the private investments, (2) after investing in private firms, mutual funds put more weight on other public-listed firms in the same industries, and (3) the return difference between investments in connected and unconnected industries is positive and statistically significant only after the private investments are made. The magnitude of the information advantage is also economically large. After the private investment is made, investments in connected industries outperform those in unconnected industries by 2% per year. These results confirm our hypothesis that investments in private firms help mutual funds better evaluate other public-listed firms in the same industry. Overall, our results provide supporting evidence that mutual funds gain information advantage from investing in private firms. While information accumulated from private investments does not translate into informed trades on these stocks after they become public, it helps make better investments in other public-listed firms belonging to the same industry.

Another way of investigating whether our results are driven by information is to check whether the holding bias and return on connected industries are related to the expected information advantage. We expect that mutual funds gain more information advantage when they have a larger private investment or hold the private firm for a longer period. We also expect that mutual funds have a higher information advantage if they have better access to the information, as proxied by being the lead advisor in any financing round. We find that the holding bias and return performance

in connected industries are positively correlated with the dollar amount and duration of mutual fund private investments. We also find that mutual funds obtain higher returns in connected industries if the connection implies better access to the information as being the lead investor.

In the last part of the paper, we examine two instances where the information accumulated from pre-IPO investments is spread across other funds in the same family or funds managed by the same manager(s). Information spillover between members in a fund family is expected given cross-fund cooperation and learning are common within the family (Nanda, Wang, and Zheng, 2004; Brown and Wu, 2016; Sialm and Tham, 2016; and Choi, Kahraman, and Mukherjee, 2016). We find that mutual funds overweight and earn superior returns of 2.4% per year on investments in industries where other funds in the same family have private investments (we label these as family-connected industries), suggesting that information advantage from private investments spills over to other funds within a fund family. In addition, managers that manage multiple funds simultaneously may create synergy by applying investment knowledge from one fund to the other. This is exactly what we find. Mutual funds overweight industries in which other funds managed by the same manager(s) have private investments (we label these as manager-connected industries).[7] They also earn higher returns in investments from manager-connected industries after other same-manager funds make their private investments (1.2% per year relative to other industries), indicating that fund managers can apply superior knowledge from private investments in managing other funds.

Our study is directly related to an emerging stream of literature on investment by public market investors in private firms. Recent research highlights the dramatically increased investment in the private market made by mutual funds (Kwon, Lowry, and Qian, 2020) and hedge funds (Aragon, Li, and Lindsey, 2018). Agarwal et al. (2021) and Cederburg and Stoughton (2018) study the valuation of private securities by mutual fund families. Chernenko, Lerner, and Zeng (2021) focus on the corporate governance features and examine the contractual provisions of startup funding rounds with mutual fund involvement. They find that mutual funds tend to invest in later rounds with more emphasis on redemption and IPO-related rights and less on governance rights, which is consistent with the liquidity constraints that they face. Huang et al. (2021) also use the IPO context but focus on the impact of pre-IPO investments made by public market institutional

[7] We require that mutual funds do not have any private investment in manager-connected industries .

investors on the going-public process of venture-back startups. We contribute to literature as the first to examine the relations between pre-IPO investment and post-IPO trading of mutual funds. Our approach is different from Ozmel et al. (2019), who examine the post-IPO trading of the limited partners of the lead VC fund in the financing rounds of IPO firms. While mutual funds might act as the LP of the lead VC fund, we focus on mutual funds' direct investments in private firms. Our results also uncover an important source of benefit to mutual funds via information advantage in connected industries.

Our research is most closely related to Kwon, Lowry and Qian (2020). They find that mutual funds earned an average of 4.8% monthly return for private investments that exit via IPO. These returns come from the difference between the price mutual funds paid to acquire private shares and the closing price at the end of the lockup period. While also discussing the benefit of private investment to mutual funds, we focus on a different angle, which is mutual fund performance after the private investments go public. Furthermore, we provide evidence that the information advantage acquired from private investments can be shared among other funds within the same family or funds managed by the same manager(s). Our results indeed complement the benefits found in Kwon, Lowry, and Qian (2020) and help shed some light on the recent increasing trend of private investments among mutual funds.

We also contribute to the general literature discussing institutional investors' gains from information advantage via non-public channels. Other research provides evidence of non-public channels such as shared educational networks with board members (Cohen et al., 2008), affiliation with banks' lending to firms (Massa and Rehma, 2008), pension business ties (Pederson, 2020; Duan et al., 2018), early access to private firms via VC relationship (Ozmel et al., 2019), prime broker banks (Kumar et al., 2020), and taxi trips (Cicero et al., 2021). We are able to show that private investment is another unique and distinct channel from which mutual funds acquire significant information advantage that allows them to make profitable trades in connected industries on the secondary market.

## 2. Data

We consider active domestic equity mutual funds and domestic operating companies. The data on mutual fund holdings and mutual fund characteristics are from CRSP Mutual fund database. There are 3,944 domestic equity mutual funds in our sample. Data on stock returns, firm

characteristics, and mutual fund manager history are from CRSP, Compustat, and Morningstar, respectively.

### 2.1. Mutual fund pre-IPO holdings

We identify mutual funds that have pre-IPO investments in companies that went public from 2010 to 2019. We start from 2010 because mutual fund investments in private firms were rare before 2010 (Agarwal et al., 2019). Since there is no standard database for mutual fund investment in private firms, we take several steps to create our unique dataset. First, we obtain a list of IPOs 2010-2019 from IPOScoop.com. Additional information on IPO firms is from Professor Jay Ritter's website[8] and IPO prospectus from EDGAR. After excluding ADRs, partnerships, REITs, units and blank-check companies, the sample contains 1071 domestic companies that went public via an IPO in 2010 – 2019.

Second, we use CRSP mutual fund holdings database to initially scan private investments.[9] This dataset includes holdings at the portfolio level with information on the name of security, CUSIP, ticker, number of security shares held in the portfolio, market value of position as of the report date, etc. We first drop all holdings with Ticker and CUSIP as private holdings do not have this information. In the next step, for each firm in our 2010 – 2019 IPO list, we pick a keyword in the name and automatically search this keyword in the mutual fund holdings dataset. We keep all the mutual fund holdings with the securities names containing this keyword. For example, we choose the keyword 'UBER' for Uber Technologies[10]. Pre-IPO holdings of Uber are usually under names such as 'UBER TECH INC P/P,' 'UBER TECHNOLOGIES SER A,' 'UBER TECH SER G-1'. Our search keeps all the holdings with the string 'UBER' in their holding names. After this step, we have an initial list of pre-IPO investments made by domestic active equity funds in firms that conducted an IPO during 2010-2019. We then manually verify to make sure those holdings are indeed pre-IPO investments using SEC filings (Form N-Q, N-CSR, N-CSRS). In SEC filings, mutual fund investments in private companies are usually reported as restricted securities. We

[8] Professor Jay Ritter's website is at https://site.warrington.ufl.edu/ritter/ipo-data/

[9] Mutual fund research using fund portfolio holdings usually use Thomson Reuters Mutual Fund Holding Database (s12). However, the s12 dataset contains equity holdings of listed companies only. The CRSP mutual fund holding database, on the other hand, reports positions on restricted equity securities, including shares of private firms (Fischer et al., 2021).

[10] As mentioned in Chernenko ,Lerner and Zeng (2021), one challenge is that firms may have different names before IPO. For example, Iroonwood was originally called Microbia, or Axcella is also known as Pronutria Biosciences. Hence, we also collect alternative names and use these alternative names to identify private holdings.

further collect information on the acquisition date and acquisition cost of those pre-IPO holdings from SEC filings.

The above procedure identifies 1,236 pre-IPO investments made by 252 domestic equity funds in 152 private firms that conducted IPO during 2010-2019. We then refer to these mutual funds as *pre-IPO mutual funds*. These pre-IPO mutual funds belong to 46 mutual fund families and are concentrated in several fund families such as Fidelity, T Rowe Price, Morgan Stanley (Appendix Tabel A1). By the same token, *pre-IPO stocks* refer to mutual funds' private investment that went public during 2010-2019. Private firms that receive mutual fund pre-IPO financing are also highly concentrated in several industries, such as pharmaceutical products and business services (Appendix Table A2).

Figure 1 shows the number of total IPOs along with the number of mutual fund financing IPOs each year in our sample from 2010 to 2019. The proportion of total IPOs receiving mutual fund pre-IPO investment increased significantly over time. Only 2 out of 78 companies conducting IPOs in 2010 received financing from mutual funds prior to the IPO, representing less than 3%. However, this number grew significantly before entering a slower pace in 2015. In 2019, 21.26% of total IPOs are companies with mutual fund private financing. While Kwon, Lowry and Qian (2020) also document a similar increasing trend, we only focus on private investments made by mutual funds that exit via IPO.[11]

[Insert Figure 1 about here]

Using information collected from N-Q and N-CSR forms, we further calculate private investment duration and total investment amount for each fund-firm pair. A mutual fund sometimes makes multiple rounds of investment in a private firm. We define *Private investment duration* as the number of months from when a mutual fund first acquires shares of a private firm to the firm's IPO. *Pre-IPO investment* is defined as the sum of acquisition costs that mutual funds pay to acquire pre-IPO shares. Appendix Figure A1 gives an example of a private investment made by Fidelity Contrafund in Pinterest Inc. Fidelity first invested in Pinterest on October 23, 2013, which is 66 months before the firm's IPO on April 18, 2019. The fund paid $159.376 million to acquire 54,841,080 series E shares. Subsequently, the fund acquired $11.739 million and $30.879

[11] Another important exit for private investment is through merger and acquisition. According to Kwon, Lowry and Qian (2020), from 1990 to 2016, out of 132 private investments, 83 exit via IPO and 49 exit through M&A.

million worth of Pinterest series F and series G shares on May 15, 2014, and February 27, 2015, respectively. By our definition, Fidelity Contrafund's investment in Pinterest is considered as *one* pre-IPO investment (even though the fund made multiple rounds of investment). The length of this private investment duration is 66 months, and the pre-IPO investment amount is $201.994 million ($159.376 million + $11.739 million + $30.879 million).

**2.2 Summary statistics**

Table 1 presents the summary statistics of the sample. Panel A compares characteristics of mutual funds that invest in at least one private firm prior to its IPO in our sample period with other funds. Mutual funds with private investments appear to differ from other funds significantly. They have an average total net assets value of $4.7 billion, compared to $1.16 billion of their peers. These funds also are older, charge lower fees, deliver higher monthly returns, and are riskier. All differences are statistically significant at the 1% level.

[Insert Table 1 about here]

Panel B of Table 1 compares IPO firms that receive pre-IPO investments from at least one mutual fund and other IPOs during the period 2010 - 2019. On average, IPOs financed by mutual funds are bigger and have a lower book-to-market ratio. Specifically, the average market value of pre-IPO stocks is $2.069 billion, which is much larger than that of other newly listed stocks, $993 million. The average book-to-market ratio of pre-IPO stocks and other IPO stocks is 0.33 and 0.43, respectively. In terms of IPO-related characteristics, the two samples differ substantially. Specifically, compared to other IPOs, IPOs financed by mutual funds have much larger proceeds ($420 million versus 209 million), shorter history of operation at the time of IPO (9.73 years versus 18.69 years), and higher first-day returns (28.82% versus 15.96%). 94% of IPOs with mutual fund investments are also backed by venture capitalists, while that proportion of other IPOs is only 60%. All the differences are strongly statistically significant at the 1% level, suggesting that IPO firms financed by mutual funds are fundamentally different from other newly listed firms during the same period.

Panel C of Table 1 presents the summary statistics of pre-IPO investments. On average, a private firm receives pre-IPO investments from 8.13 different mutual funds. The mean and median number of private investments in a pre-IPO fund is 4.9 and 3, respectively. On average, a pre-IPO

fund invests approximately $7.4 million in each private firm for a duration of 25 months or two years prior to its IPO.

## 3. Mutual fund holdings of pre-IPO stocks

### 3.1. Do mutual funds place a bigger bet on pre-IPO stocks?

We are interested in the holding behavior of mutual funds on their pre-IPO stocks compared to other newly listed firms. We begin by analyzing the portfolio choices of individual funds concerning the stocks with pre-IPO investment once these firms go public. We do so by estimating the following regression equation

$$w_{f,i,q} = constant + \beta \times Pre - IPO_{fi} + Controls_{f,i,q} + e_{f,i,q} \qquad (1)$$

Where $w_{f,i,q}$ is the weight in fund *f*'s portfolio put in stock *i* during quarter $q$, measured as the dollar holdings in the stock scaled by the fund's total assets. Since we are interested in understanding the holding behavior of mutual funds on their stock with pre-IPO investments compared to other newly listed stocks, we restrict the sample to all mutual fund holdings in firms that conducted an IPO within two years. $Pre - IPO_{fi}$, a dummy that equals 1 if fund $f$ invests in firm $i$ before its IPO, is the main independent variable of interest. A positive value of $\beta$ would indicate that mutual funds place a larger weight in stocks with pre-IPO investment than other newly listed firms.

We include a set of control variables to control for stock characteristics: market value of equity (*Market Value*), book-to-market ratio (*BM*), past quarter return (*Past return*). Prior studies in the IPO literature have found that IPO characteristics can signal good quality and post-IPO performance (Ritter, 1991; Brav and Gompers, 1997; Brav, Geczy and Gompers, 2000). As we are examining the portfolio choices of mutual funds regarding newly listed stocks, we add many standard IPO-related variables, including IPO proceeds (*Proceeds*), firm's age at the time of IPO (*IPO Age*), a dummy variable indicating whether the IPO has venture capital backing (*VC*), and first-day stock return as a measurement of IPO underpricing (*Underpricing*). We also include several variables controlling for the differences in fund characteristics, such as fund size (*TNA*), fund age, and fund return volatility (*Fund Ret Vol*).

[Insert Table 2 here]

Panel A of Table 2 reports the coefficient estimates from the OLS estimation of various forms of equation (1). The unit of observations is at the fund-quarter-stock level. The results strongly indicate that mutual funds have a larger position on stocks with pre-IPO investments compared to other newly listed stocks. Column 1 reports the unconditional difference in portfolio weight a mutual fund places in pre-IPO stocks versus other newly listed stocks. Compared to the average weight of 40.2 basis points on other newly listed stocks, mutual funds place an additional 7.8 basis points on firms that they have pre-IPO investment. Columns 2-4 report the results of different specifications, including various types of fixed effects and control variables. In all these specifications, the coefficient on dummy *Pre-IPO* is positive and statistically significant, confirming mutual funds overweight pre-IPO stocks in their portfolios. All control variables are also statistically significant at the 1% level. Mutual funds tend to put more weight on large firms, firms with lower book-to-value ratios, and firms with better previous returns. Consistent with the IPO literature, mutual funds appear to put more weight on older IPO firms with larger proceeds. When more variables and fixed effects are included in the regression, the goodness-of-fit statistics (adjusted R-squared) increase, suggesting our models are correctly specified, and the variables included can explain the variation in mutual funds' decision to hold newly listed stocks.

We focus on Column 4 when all related variables and both time and fund fixed effects are included. The substantial increase in adjusted R-squared when fund fixed effects are added indicates that fund-specific effects explain a large part of the variation in mutual funds' portfolio choices. The results suggest that after controlling for related stock and fund characteristics, mutual funds overweight pre-IPO stocks by 13.3 basis points. This represents a 33% increase compared to the average weight of 40 basis points among newly listed stocks. The results are also consistent with Kwon, Lowry and Qian (2020) where they find fund families that invested in the firm prior to its IPO hold significantly more shares after the IPO.

One possibility is that the large holdings of pre-IPO stocks are likely driven by the fact that mutual funds obtain higher IPO allocations from their private investments. Chemmanur, Hu, and Huang (2010) find that, on average, institutional investors sell more than 70% of their IPO allocations in the first year after the IPO. In Panel B of Table 2, we report the results of the regression (1) using a sample of mutual fund holdings of the same set of stocks as in panel A but restrict to holdings after two years since the IPO. Using the sample excluding the mutual fund holdings within two years since the IPO helps us address the concerns that large holdings of stocks

with pre-IPO investment are driven by higher IPO allocations. Consistent with the results found in Panel A, the coefficient on dummy *Pre-IPO* is positive and statistically significant at the 1% level, telling a consistent story that mutual funds tend to place a larger bet on firms that they have pre-IPO investment. The holding bias toward pre-IPO stocks is likely driven by the active decision of mutual funds rather than solely due to large IPO allocations.

### 3.2. Holding duration after IPOs

We have shown that mutual funds tend to put a higher weight on their private investment after IPOs. A natural question to ask is whether mutual funds hold these firms in their portfolios longer than other newly listed firms. We rely on survival analysis models to examine the impact of the pre-IPO investment on the holding duration of portfolio stocks. Specifically, we focus on the length of the holding period between a firm's IPO date and the time when mutual funds fully exit their positions on that firm. In our design, the "failure" event is defined as when a mutual fund liquidates a firm. Duration analysis is more appropriate compared to simple regression as it can handle right-censored data, i.e., at the time of analysis, the exit events may not yet have occurred.

We identify investment in IPO firms if we observe a positive holding in a mutual fund portfolio at the end of its IPO quarter. For each subsequent quarter, if the security were retained in the mutual fund's portfolio from the previous quarter, we classified the observation as "survive." An observation is considered "exit" if we observe a firm in the mutual fund portfolio in the previous but not the current quarter. The investment duration is measured as the number of consecutive quarters in which a firm appears in the mutual fund holding portfolios after its IPO. Panel A of Table 3 reports the summary statistics of investment duration made by mutual funds in newly listed companies during the period of our sample (2010-2019). Mutual funds appear to hold pre-IPO stocks for a longer period. Conditional on exiting during the sample period, the average (median) investment duration a mutual fund holds its pre-IPO stocks is 6.69 quarters (4 quarters), compared to 4.43 quarters (2 quarters) for other newly listed stocks.

[Insert Table 3 about here]

To formally examine the impact of pre-IPO connection on holding duration by mutual funds, we perform survival analysis using data on mutual fund holding duration in newly listed stocks. We briefly outline the intuition behind the economic approach. Let $T$ be a random variable measuring the duration of a mutual fund's investment in firms. The survival analysis relies on

hazard function *h(t)*, that is $h(t) = \lim_{\Delta t \to 0} \frac{\Pr(t \leq T < t+\Delta t \mid T \geq t)}{\Delta t}$. The hazard function measures the instantaneous rate at which a mutual fund exits a portfolio firm conditional on not having done so before time *t*. We use a panel data parametric proportional hazard model to estimate the hazard rate $h(t) = h_0(t)\exp(X\beta)$, in which the baseline hazard $h_0(t)$ has an exponential functional form. The parameters in survival analysis are estimated using MLE. A negative coefficient $\beta_i$ would indicate an inverse relationship between the explanatory variable $X_i$ and hazard rate, i.e., instantaneous exit rate, or in other words, longer holding duration.

We report the results in panel B of Table 3. The unit of analysis is a fund-firm-quarter investment. The independent variables are similar as in Table 2. We also include an additional explanatory variable, portfolio weight a mutual fund put on a stock (*Weight*), as a mutual fund may take it longer to liquidate its position on a firm with a sizeable initial holding from IPO allocation. The main coefficient of interest, dummy *Pre-IPO*, is negative and statistically significant across alternative specifications. This finding confirms that mutual funds tend to hold pre-IPO stocks for a more extended period before fully liquidating their positions. The hazard rate for private investments is 21% lower than other newly listed stocks.[12] Among the control variables, size, book-to-market, portfolio weight, and IPO age are negatively related to hazard rate, i.e., increasing mutual fund holding duration. Interestingly, past returns have no impact on the mutual fund holding duration of IPO stocks as the coefficient is negative but not statistically significant (column 3). Fund characteristics appear to be important determinants of funds' holding duration of IPO stocks as all the coefficients on fund-related variables are statistically significant at the 1% level.

**4. Do mutual funds possess an information advantage on pre-IPO stocks?**

Our results thus far show that mutual funds have a strong bias in holding pre-IPO stocks in their portfolios. First, mutual funds tend to hold a larger position in stocks that they have pre-IPO investment. Second, mutual funds hold these stocks in their portfolio for a longer period compared to other newly listed stocks. This section examines the performance of pre-IPO stocks. We hypothesize that pre-IPO investment in a private firm allows mutual funds to gain an informational advantage that would enable them to make profitable trades on those stocks after these firms

[12] Calculated as $[(\exp(\beta) - 1] \times 100\%$

become public. If mutual funds are better informed about their private investments, their post-IPO trading should reflect such information advantage. Since mutual funds already have a large position in pre-IPO stocks from the private investment period, one might expect them to buy more only if they believe the stocks will deliver higher returns. If mutual funds are better informed about pre-IPO stocks, we expect to see buying predicts future positive abnormal returns. Selling, on the other hand, might be driven by factors other than valuation. For example, Chemmanur et al. (2010) find that institutional investors sell 70.2% of their IPO allocations in the first year and do not dissipate any profits in post-IPO trading. As we do not have high frequency trading data to disentangle the allocation sale from active selling of IPO stocks in the secondary market, we do not expect IPO sales using quarterly holding change to be associated with future stock performance.

### 4.1. Returns on pre-IPO stocks trades

We rely on mutual fund quarterly holdings data to infer their trading. We define mutual fund trades as the changes in the number of shares a fund holds in a firm between quarters. As purchases and sales might have different predictability power on a firm future performance, we separate the sample of trades made by mutual funds into Buy and Sell subsamples. A mutual fund trade is classified as Buy (Sell) for each quarter if the fund has increased (decreased) the number of shares relative to the previous quarter holding.

Most IPO features share lockup periods, which typically last for 180 days, prohibiting insiders and pre-IPO shareholders from selling their shares immediately after the IPO. As pre-IPO investors, mutual funds are constrained by such lockup agreements. Hence, we focus on trades after the lockup period expiration (6 months after the IPO date) to capture mutual funds' active trading decisions without any constraints. We perform the following regression:

$$Return_{i,q+1} = \beta_1 \times \Delta ownnership_{fiq} \times Pre - IPO_{fi} + \beta_2 \times \Delta ownnership_{fiq} + \beta_3 \times Pre - IPO_{fi} + controls + e_{f,i,q} \quad (2)$$

where $Return_{i,q+1}$ is the stock performance in the subsequent quarter. We use raw returns and various methods of adjusting for risk, including subtracting the return of the matched portfolio by size and book-to-market quintiles (*FF 25 return*), and stock return subtracting the return of matched portfolios by size, book-to-market, and past 6-month return quintiles (*DGTW return*). *Δownership,* calculated by the product of the number of shares changed and the share price, scaled

by the mutual fund's total assets, is a measurement of the magnitude of the trade by mutual fund $f$ in stock $i$. Note that $\Delta ownership$ is positive for purchases and negative for sales by construction. $Pre - IPO_{fi}$ is a dummy variable taking a value of one if mutual fund $f$ has any pre-IPO investment in firm $i$ and zero otherwise. Control variables include firm and IPO-related characteristics. The unit of observation is fund-firm-quarter level. The coefficient on the interaction term captures the marginal effect for a trade of mutual funds in pre-IPO stocks. If mutual funds are better informed about pre-IPO stocks, we expect that magnitude of buy predicts future abnormal returns, that is, the coefficient on the interaction term being positive. In all regressions, we include both time (year-quarter) and fund fixed effects to control for unobserved shocks in the time series and omitted fund characteristics in the cross-section. The standard errors are clustered at the stock level.

[Insert Table 4 about here]

We report the results of regression (2) in Table 4. In panel A, we use the sample of all portfolio changes made by mutual funds in IPO stock after the lockup expiration. Columns 1, 2, and 3 report the results for the Buy subsample, and columns 4,5, and 6 report the results for the Sell subsample. In all specifications, we include year-quarter fixed effects and standard errors are clustered at the stock level. We focus on the coefficient of the interaction term. A positive and significant coefficient would indicate that trades by mutual funds predict future stock performance. However, contrary to our expectations, the coefficients on the interaction terms are not statistically significant in all specifications. Trades by mutual funds in IPO stocks with pre-IPO investment appear to be no better or worse than trades in other IPO stocks.

One might argue that the information advantage, if exist, should be short-lived as the information gradually becomes available to the public. Appendix Table A3 summarizes the pattern of trades in IPO stocks for the first four quarters after the lockup expiration. Trades are classified as *Sell*, *Hold*, and *Buy* if the number of shares a mutual fund hold in a stock increases, stays the same, or increases, respectively. Compared to other newly listed stocks, mutual funds tend to sell (buy) their pre-IPO stocks more (less) frequently. For example, in the first quarter post-lockup, mutual funds sell (buy) shares of pre-IPO stocks 48% (30.94%) of the time while selling (buying) other IPO stocks 30.12% (50.11%) of the time. This is somehow consistent with the view that mutual funds, as well as VC funds, sell a significant portion of their pre-IPO shares right after the lockup expires.

To see if the trading of pre-IPO stocks has any information advantage in the short return, we run regression (2) using the sample of trades within one year after the lockup quarter and report the results in panel B of Table 4. Similar to panel A, no pattern of predictability of mutual fund trades on pre-IPO stocks is found. We also try several different cutoffs other than one year, and the results are very similar (not tabulated). This suggests that mutual funds trading on pre-IPO stocks after they become public do not predict future stock returns.

**4.2. Discussions**

One possible explanation for no predictability of mutual fund trades of pre-IPO stocks is that the information mutual funds accumulate during the private investment period may not remain relevant to stock prices after IPO. Any private information before IPOs should be disclosed to the SEC and the public when the firms conduct an IPO. Moreover, the timing of information benefits and trading returns are distant in time. Hence, the information mutual funds acquire from private investments may be already incorporated in stock prices when the firms are traded on secondary markets. Moreover, mutual funds may have access to information through other channels (Cohen, Frazzini, and Malloy, 2008) or simply have better investment ability.

One possibility is that pre-IPO stocks are better stocks because additional fundings from mutual funds allow them to stay private longer and grow bigger before going public (Kwon, Lowry, and Qian, 2020). To test that, at the beginning of each year, we put IPO stock that went public in the last year into two portfolios: firms with pre-IPO investment by at least one mutual fund (*MF Financing IPOs*), and other firms (*Other IPOs*). Calendar time portfolio monthly returns are computed by averaging across stocks in each group, weighting each IPO stock by its IPO proceeds. We also construct a zero-investment portfolio consisting of a long position in *MF financing IPOs* portfolio and a short position in *Other IPOs* portfolio. The portfolios are rebalanced each year so that only stocks that went public in the previous year are included in the portfolios at each point in time. The value-weighted portfolio returns are then regressed on the Fama-French-Carhart four factors (Fama and French 1993; Carhart 1997), where four factors include MKTRF, the market risk premium, SMB, the difference in returns between the small-firms stocks and the big-firms stocks, HML, the difference in returns between high book-to-market stocks and low book-to-market stocks, UMD, the difference in returns between high-momentum stocks and low-momentum stocks.

[Insert Table 5 about here]

Table 5, Panel A presents the results of calender-time portfolio regressions. Looking at the factor loadings, we see that relative to IPO stocks not invested by mutual funds, MF Financing IPOs have larger loadings on the market, size, and momentum factors, and lower loadings on the value factor, which suggests that MF Financing IPOs are more growth-oriented. The intercepts (alphas) reflect whether IPOs stocks have abnormal returns. Consistent with prior literature on IPO underperformance, both groups have significantly negative alphas. However, the alpha for the zero-investment portfolio is not significantly different from zero, indicating that IPO stocks with mutual fund pre-IPO investments do not outperform those not invested by mutual funds before IPOs.

Do pre-IPO funds have superior investment skills? To investigate that, we examine the performance of pre-IPO mutual funds and their peers using the same calendar portfolio approach as for IPO stocks. In particular, mutual funds in our sample are grouped into two portfolios: *Pre-IPO funds* and *Other funds*. Calendar time portfolio monthly returns are computed by averaging across funds, weighting each fund by its TNA in the previous month. The zero-investment portfolio consists of a long position in *Pre-IPO funds* portfolio and a short position in *Other funds* portfolio. The results are presented in Table 5, Panel B. Pre-IPO funds have similar factor loadings to other funds, except for the value factor. Pre-IPO funds have significantly lower loading on value factor, indicating that they invest heavily in growth stocks, which may include pre-IPO stocks. The alpha (abnormal return) of pre-IPO funds is not statistically different from zero, whereas other funds in our sample have a significantly negative alpha. The difference in alpha between pre-IPO funds and other funds, however, is not statistically different from zero, suggesting that pre-IPO funds do not outperform other funds that do not invest in private firms.[13]

The question still remains as why mutual funds over-invest in pre-IPO stocks if they do not possess information advantage on those stocks. We now turn our focus to industry-level analyses.

## 5. Mutual funds and connected industries

Our previous section shows that trades by mutual funds do not have predictive power on future returns of pre-IPO stocks. In this section, we investigate another source of benefit to mutual

[13] Since we only consider private investments that exit through IPO, other funds may invest in private firms that exsit through merger and acquisition.

funds with private investments. Private investments could provide fund managers with additional information that helps select other public-listed firms in the same industry. Chattopadhyay et al. (2022) find that institutional investors use industry-level information that they obtain from their private equity investments to earn positive excess returns in public-traded stocks from connected industries. Some information relevant to the pricing of public firms, such as innovation and new technology, may be developed among private firms. We hypothesize that mutual funds can gain insights from the industry by investing in private firms and generate better returns when trading other public-listed stocks in the same industry. As knowledge in an industry might not translate into superior knowledge in any particular stock but the industry as a whole, we aggregate the holdings within each of Fama-French 48 industries and examine the performance of mutual funds' investment at the industry level.

### 5.1. Mutual fund holdings of connected industries

Stocks in mutual fund portfolios are classified into industries using Fama & French 48 industry classification. A mutual fund is "connected" to an industry if the fund invested in at least one private firm that belongs to the industry prior to its IPO. We examine the mutual fund holding decision in public stocks of connected industries using the following regression:

$$weight_{fjq} = c + \beta_1 Connected_{fj} + \beta_2 Connected_{fj} * Post_{fjq} + controls + e_{f,j,q} \quad (3)$$

Where $weight_{fjq} = \sum_{i \in J} w_{fiq}$ is the sum of portfolio weight mutual fund *f* put in stocks of industry *j* at the end of quarter *q*. Since we want to capture investment in other firms of the same sector, we exclude the pre-IPO stocks from the industry weight calculation. $Connected_{fj}$ receives the value of one if mutual fund *f* is "connected" to industry *j* as defined above. $Post_{fjq}$ equals one if mutual fund *f* invests in the pre-IPO stock from industry *j* before quarter *q*. We control for industry characteristics, including total industry size (*Industry Size*), the weighted average of industry past-quarter performance (*Past Industry Return*), and the average book-to-market ratio (*Industry BM*).

[Insert Table 6 about here]

Table 6 reports the pooled OLS estimation of various forms of equation (3). The unit of observation is at the fund-industry-quarter level. In column 1, only dummy variable *Connected* and a constant are included in the regression. The intercept of 3.24 percent is the average weight a

mutual fund puts on nonconnected industries. The coefficient on the dummy variable is statistically significant at the 1% level. On average, mutual funds put an additional 7.88 percent portfolio weight on connected industries relative to nonconnected industries. This result can have two interpretations. First, mutual funds tend to invest in private firms belonging to the industry they overinvest in the first place. As mutual funds put more weight in one sector, they would probably spend more time analyzing and thus better grasp industry trends and opportunities, leading to investment in private firms in the same sector. Second, investments in private firms allow mutual funds to gain insights and better understandings of the innovation and disruption in a particular industry, leading to overinvestment in the industry afterward. These two explanations are not mutually exclusive and might complement each other. To address this issue, we include the interaction *Connected*Post* into the regression. Coefficient $\beta_1$ on *Connected* captures the holding bias in connected industries before mutual funds invest in private firms, and coefficient $\beta_2$ on the interaction term captures additional bias mutual funds put in connected industries after the private investments are made.

In Column 2, we add the interaction term into the regression and include time (year-quarter) fixed effects. The coefficient $\beta_1$ is statistically significant, confirming our first prediction. Mutual funds tend to invest in private firms of the industries they initially overinvest. The sum of $\beta_1$ and $\beta_2$ is the average bias on connected industries after mutual funds make private investments. Compared to other industries, mutual funds overweight connected industries by 4.865 percent before making private investments. The coefficient $\beta_2$ is statistically significant, suggesting that after making private investments, mutual funds put an additional 4.302 percent of total assets in the same industries.

In Columns 3, 4, and 5, we add control variables that account for different industry and fund characteristics. These variables are all statistically significant at the 1% level. Mutual funds tend to place a larger weight in industries that are larger in size, have a lower average book-to-market ratio and have better past returns. In column 5, we add fund fixed effects to account for heterogeneity in skills and capture the within-fund variation in portfolio choice. The significance level of coefficients remains the same while the magnitude of the main coefficients declines slightly. After controlling for relevant industries and fund characteristics, mutual funds overweight

connected industries by 4.022 percent before making private investments and put an additional 3.536 percent of total assets in the same industries after private investment.

**5.2. Returns on connected industries.**

The previous section shows that mutual funds investing in pre-IPO stocks appear to put a higher portfolio weight on the connected industries. Next, we examine whether mutual funds earn a higher return on these positions. Table 8 presents the pooled OLS regressions results where the dependent variable is the quarterly value-weighted return on a mutual fund positions in each of 48 Fama-French industries. For each mutual fund, we calculate the monthly value-weighted return of each industry as the weighted average of returns of publicly listed stocks held by the fund within the same industry. The weight for each stock is its proportion in the fund's portfolio at the end of the previous quarter. We control for relevant industry and fund characteristics and different combinations of fixed effects. The unit of observation is at the fund-industry-quarter level.

$$industry\_return_{fiq} = \mathrm{c} + \beta_1 Connected_{fj} + \beta_2 Connected_{fj} * Post_{fjq} + Controls + e_{f,j,q} \quad (4)$$

[Insert Table 7 about here]

Table 7 reports the results of regression (4). Column 1 indicates that mutual funds earn an excess return of 100 basis points per quarter on connected industries relative to nonconnected industries. Since we include only the dummy and a constant in the regression, the intercept is the average quarterly return to mutual funds on nonconnected industries. Compared to the 280 basis points average return on nonconnected industries, the outperformance of 100 basis points is economically significant. We are interested in examining whether these abnormal returns are attributable to the informational advantages gained from private investments. In column 2, we include the interaction term *Connected∗Post* and control for time fixed effect. Coefficient $\beta_1$ on *Connected* captures the superior return on connected industries before mutual funds invest in private firms, and coefficient $\beta_2$ on the interaction term captures additional superior return after making private investments. The sum of $\beta_1$ and $\beta_2$ is the overperformance of the connected industry relative to nonconnected after private investments are made. Now, only the coefficient on the interaction term is statistically significant, suggesting that mutual funds earn better returns on connected industries only after making private investments.

When adding industries characteristics in Column 3, the magnitude of outperformance drops slightly while still being significant at the 1% level. Mutual funds earn higher returns in industries that are larger, have lower book-to-market ratios, and have better past returns. This suggests that part of the mutual funds' outperformance in connected industries is attributed to the ability to choose investments based on publicly available information.

We focus on the results in Column 5 when both industry and fund characteristics are included. Moreover, we add fund fixed effect to account for heterogeneity in fund investment skills. All the fund characteristics are also statistically significant, indicating fund's performance is also driven by time-varying fund characteristics. Interestingly, the coefficient on dummy *Connected* is now negative and statistically significant at the 1% level, while the coefficient on the interaction term remains positive and also statistically significant. After controlling for relevant control variables, connected industries underperform nonconnected industries by 50 basis points per quarter before making any private investment. This suggests that, while mutual funds overinvestment the connected industries before making private investments, they do not earn higher returns or have superior knowledge in these industries. However, mutual funds appear to earn an additional 100 basis points per quarter on connected industries after private investments are made. Taken together, mutual fund investments in connected industries outperform nonconnected industries by 50 basis points per quarter or 2% annually (the sum of coefficients on the dummy variable and the interaction term) after making private investments. This outperformance represents 18% higher than the average return on nonconnected industries. These results are consistent with the hypothesis that investment in private firms helps mutual funds make better investment decisions in other public firms in the same industry.

**5.3. Strength of fund-industry connections.**

We have shown that mutual funds overweight and earn better returns on connected industries. If mutual funds' holding bias and superior returns in connected industries are driven by information advantage, we should see the impact is more pronounced for stronger connections with better access to information. In this section, we create several variables to proxy for the strength of the fund-industry pre-IPO relationships.

We start with the investment amount and investment duration of private investments for each fund-industry connection. We expect a larger pre-IPO investment amount would represent a

stronger connection between a mutual fund and a private firm. First, given private firms are costlier to value due to the illiquidity nature and lack of disclosure, funds with a large holding in private firms would spend more effort to monitor the investment and acquire information to better value the private securities. Second, private firms usually disclose periodic financial and operational updates to investors with investments above some threshold percentage (Argawal et al., 2021). To calculate the investment amount for each fund-industry connection, we sum up the dollar amount of each private investment scaled by the fund's TNA at the IPO date for each fund-industry pair.[14] We also postulate that a longer investment period would allow a mutual fund to accumulate more information about the startup and build a better relationship with the startup's management team, strengthening the fund-industry connection. The private investment duration for each fund-industry connection is measured as the number of months between the acquisition date of the first private investment and the IPO date of the last private investment for each fund-industry pair.

We create a new variable, *Connection_Strength*, that denotes the quartile rank of fund-industry pre-IPO connection measured by either the private investment amount or private investment duration. *Connection_Strength* receives a value from 1 to 4 with 4 (1) for being in the top (bottom) quartile. For nonconnected industries, *Connection_Strength* is set to equal zero. By construction, a higher value of *Connection_Strength* represents a stronger connection between a mutual fund and an industry. We repeat the similar analysis as in Tables 6 and 7, replacing the dummy *Connected* by *Connection_Strength,* and report the results in Table 8.

[Insert Table 8 about here]

Panel A examines the impact of fund-industry connection strength on holding bias. Columns 1 and 2 report the results when connection strength is measured using the private investment amount. The coefficient on *Connection_Strength* is significantly positive in Column 1, suggesting that a stronger connection appears to be positively related to mutual funds' holding bias. In Column 2, we interact *Connection_Strength* with a time dummy *Post* that represents the time period after the first private investment in a connected industry. The interaction term is positive and statistically significant at the 1% level, confirming that the holding bias is larger for stronger fund-industry connections after a fund invested in a private firm in the connected industry.

[14] If a fund invests in a private firm through several funding rounds, we add up all the investment dollars over the entire period.

The results are similar if we measure connection strength by private investment duration in Columns 3 and 4. Panel B examines the effect of the connection strength on mutual fund returns in connected industries. The coefficients on the interaction term *Connection_Strength*Post* is positive and statistically significant, indicating that stronger connections are associated with better returns after the private investment is made.

When investing in private firms, mutual funds usually join a syndicate under a lead venture capital firm. However, mutual funds sometimes can act as a lead investor in some financing rounds. A lead investor in an investment round typically contributes the most capital in the round and directly negotiates the terms of funding with the private firm. Several studies in the venture capital financing literature have found that lead venture capitalists have better access and could obtain a higher quantity and quality of information about private firms than nonlead syndicate members (Gorman and Sahlman, 1989; Admati and Pfleiderer, 1994). Mutual funds participating as lead investors are more likely to receive privileged information as a part of their investor rights agreement (Agarwal et al., 2021). We obtain the data on the lead investor of funding rounds from Crunchbase.[15] We decompose the dummy variable $Connected_{fj}$ into $Lead\_Connected_{fj}$ and $Nonlead\_Connected_{fj}$ dummies, where $Lead\_Connected_{fj}$ is a dummy variable that equals 1 if mutual fund *f*'s family is the lead investor in at least one funding round of any private investment in industry *j*. $Nonlead\_Connected_{fj}$ is the dummy variable that equals 1 if mutual fund *f* is connected to industry *j* but mutual fund *f*'s family is not the lead investor in any funding rounds of any private investment in industry *j*. We then perform a similar regression as in Tables 6 and 7. The dependent variable is either mutual fund portfolio weight or mutual fund's return in an industry, and other independent variables are defined the same as in equation (3).

$$y_{fjq} = c + \beta_1 Nonlead\_Connected_{fj} + \beta_2 Lead\_Connected_{fj} + \beta_3 Nonlead\_Connected_{fj} * Post_{fjq} + \beta_6 Lead\_Connected_{fj} * Post_{fjq} + controls + e_{f,j,q} \quad (5)$$

The sum of $\beta_1$+$\beta_3$ ($\beta_2$+$\beta_4$) captures the performance difference between nonlead-connected (lead-connected) industries and nonconnected industries after the private investment is made. The regression results are presented in Columns 5 and 6 in Table 8. In comparison to nonlead connections, mutual funds place a larger bet and earn better returns in industries with lead

[15] https://www.crunchbase.com/

connections. Compared to nonconnected industries, lead-connected (nonlead-connected) industries outperform by 106 basis points (36 basis points) per quarter or 4.24% (1.44%) per year. We perform the Wald-test to test for the difference between the outperformance of lead-connected and nonlead-connected industries; that is, we test whether $\beta_2+\beta_4$ is statistically greater than $\beta_1+\beta_3$. We confirm that after making private investments, lead-connected industries significantly outperform nonlead-connected industries by 70 basis points per quarter or 2.8% per year (t-statistic=2.9).

Taken together, the analysis in Table 8 shows that a stronger connection between a mutual fund and an industry is associated with a larger holding bias and superior returns, augmenting the hypothesis that private investment provides mutual funds with an information edge in related industries.

## 6. Information spillover

Having shown that mutual funds can take advantage of industry-level information obtained from private investments to make better investment decisions in public firms, we next investigate whether (1) information advantage due to private investments spills over to other funds within a fund family, and (2) fund managers can transfer their superior knowledge into better performance of other funds they manage simultaneously.

### 6.1. Information sharing within mutual fund families

Existing literature has shown that information flows within fund families (Cici, Jaspersen, and Kempf, 2017; Brown and Wu, 2015). Fund managers in the same family may share information and opinions with each other through frequent interactions. Cross-fund learning can also result from access to common sources of information, for example, the same pool of financial analysts, trading desks, and research team. Hence, a manager's knowledge in one sector or industry may spill over to other funds within the same family. To examine the extent to which information advantages in a particular industry due to private investment are shared among mutual fund managers within a fund family, we include two additional dummy variables $Family\_connected_{fj}$ and $Post\_family$ into regressions (3) and (4). $Family\_connected_{fj}$ is a dummy variable receiving the value of 1 if mutual fund $f$ does not invest in private firms of industry $j$ but other funds in the same family do. A mutual fund is "family-connected" to an industry if other funds in the same family invest in at least one private firm that belongs to the industry prior to its IPO.

$Post\_family_{fjq}$ equals one if other funds in the same family that fund j belongs to invest in the pre-IPO stock from industry $j$ before quarter $q$.

[Insert Table 9 about here]

In panel A of Table 9, we report the results examining whether mutual funds overweight family-connected industries. The coefficients on two additional dummy variables are statistically significant in all specifications, suggesting that mutual funds also overweight family-connected industries. The unconditional difference in portfolio weight between family-connected and nonconnected industries is 2.646 percent. We focus on column 5 when relevant control variables and fixed effects are included. Compared to other nonconnected industries, mutual funds overweight family-connected industries by approximately 1 percent before other funds in the same family make any private investments. After private investments are made, mutual funds put an additional 0.64 percent in that industry. The magnitude of overweighting in family-connected industries is smaller than that in the industries "connected" to mutual funds themselves.

The previous section shows that private investments provide information advantage in a particular industry and help mutual funds generate abnormal returns when investing in public stocks of that industry. We then examine whether mutual funds earn superior returns on family-connected industries and report the results in panel B of Table 9. Consistent with the information-sharing hypothesis, mutual funds appear to earn a higher return when investing in family-connected industries. However, this higher return is only significant after the other fund in the family makes a private investment in the industry. In columns 2-5, the coefficient on the dummy *Family_connected* is negative and statistically significant, indicating that mutual funds underperform in family-connected industries before the other funds in the family make private investments. The results in column 5 indicate that after controlling for relevant industry and fund characteristics, mutual funds earn an additional 100 basis points per quarter in a family-connected industry after the private investments are made. The sum of coefficients on *Family_Connected* and the interaction term is 0.006 and statistically significant at the 1% level. Mutual fund investments in family-connected industries outperform nonconnected industries by 60 basis points per quarter or 2.4% annually after the private investments are made. The results are consistent with the hypothesis that information advantage in a particular industry due to private investments spills over to other funds within a fund family.

### 6.2. Multi-fund managers

It is a common practice in the mutual fund industry that a manager or team of managers manage multiple funds simultaneously. Multi-fund managers may achieve information synergy by applying investment ideas acquired from one fund to another. While a fund manager might avoid holding the same set of stocks in multiple funds, industry knowledge from private investments is likely to lead to new investment opportunities in different funds managed by the same manager. To examine whether mutual funds managers can apply their superior knowledge about connected industries in managing other funds, we include two additional dummy variables *Manager_connected* and *Post_manager,* into regressions (3) and (4). $Manager\_connected_{fjq}$ receives the value of 1 if a mutual fund *f* does not invest in pre-IPO stocks of industry *j* but other mutual funds managed by at least one of the same managers at the same time do. $Post\_manager_{fjq}$ equals 1 if other mutual fund managed by the same manager invests in pre-IPO stock in industry *j* before quarter $q$. A mutual fund is "manager-connected" to an industry if other mutual funds managed by the same manager invest in at least one private firm that belongs to the industry prior to its IPO.

[Insert Table 10 about here]

The results from panel A of Table 10 confirm that mutual funds overweight manager-connected industries in their portfolios. Specifically, mutual funds put an additional 4.175 percent portfolio weight on manager-connected industries relative to nonconnected industries. The results in column 5 of Table 10 suggest that after controlling for relevant variables, mutual funds overweight manager-connected industries by 1.313 percent relative to nonconnected industries initially. After other funds managed by the same manager making private investments, mutual funds put an additional 1.953 percent of total assets in the same industries as the other same-manager fund's private investments.

In terms of performance, on average, mutual fund investments in manager-connected industries outperform other nonconnected industries by 80 basis points per quarter. However, similar to results from the previous sections, the superior return is only significant after the private investments are made. In columns 3-5 of panel B of Table 10, the coefficient on the dummy variable *Manager_connected* is statistically insignificant when the interaction term *Manager_connected*Post_manager* is included. The results in column 5 indicate that after

controlling for relevant industry characteristics and fixed effects, mutual funds can earn an additional 60 basis points per quarter on manager-connected industries after making private investments. Compared to the nonconnected industries, the outperformance is 30 basis points (1.2% annually) and is statistically significant at the 1% level. The results confirm our prediction that fund managers can transfer their superior knowledge into better performance of other funds they manage.

## 7. Conclusion

Mutual fund pre-IPO investment in private firms has been increasing in recent years. While mutual funds traditionally invest in public markets due to liquidity constraints, the reason why they invest in illiquid private investment is not completely clear. In this study, we examine another source of benefits to mutual funds from private investment. We hypothesize that investment in private firms gives mutual funds information advantage via early access to information not available to the public.

We collect a unique dataset and identify 1,236 private investments made by 252 domestic equity mutual funds in 152 firms that went public during the 2010-2019 period. Stocks with pre-IPO investment by mutual funds account for 14.17% of our IPO sample. Mutual funds appear to place a larger bet on firms in which they have pre-IPO investments and hold these pre-IPO stocks in their portfolios longer than other newly listed stocks.

We find evidence that mutual funds gain information advantage from investing in private firms. Contradicting with our initial predictions, information gained from private investments does not translate into informed trades in these stocks after the firms become public. However, we find strong evidence that investments in private firms provide mutual funds with information advantage that leads to a better selection of other public-listed firms belonging to the same industry. Mutual funds tend to overinvest in industries of the private firms they connect, and the overweighting is more significant after the private investments are made. Interestingly, mutual funds investments in connected industries underperform nonconnected industries before making private investments. After investing in private firms, mutual funds earn a superior return of 2% per year on the positions of public stocks in the same industry. Other funds managed by the same manager(s) also overweight these industries and earn an additional return of 1.2% per year. Furthermore, mutual funds earn superior returns in the industries in which other funds in the same family have private

investments, suggesting that information advantage in a particular industry due to private investment spillover to other funds within fund families or funds managed by the same manager(s). Our results uncover another potential source of benefits to mutual funds' private investments, which helps explain the increasing trend of mutual funds investing in private firms recently.

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**Figure 1: Distribution of IPOs 2010-2019**

The sample consists of domestic companies that conducted an IPO between 2010 and 2019. ADRs, partnerships, REITs and units, and blank-check companies excluded. There are 1,071 IPOs, of which 152 received pre-IPO investment by at least one mutual fund. The line represents the percent of IPOs that received mutual fund pre-IPO investment each year.

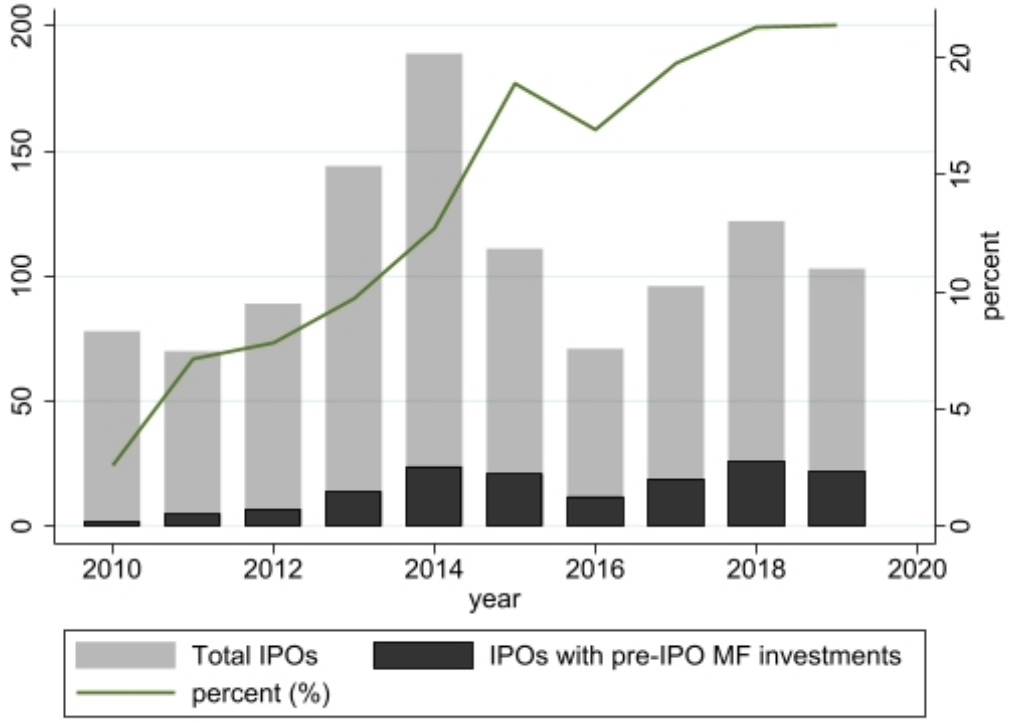

**Table 1: Summary statistics**

This table provides summary statistics for *pre-IPO mutual funds* – mutual funds that made pre-IPO investment in at least one private firm that subsequently went public, *MF financing IPOs* – IPO firms that received pre-IPO investment from at least one mutual fund, and mutual fund pre-IPO investments from 2010 to 2019. Panel A compares pre-IPO mutual funds with other domestic equity mutual funds. *Fund TNA* is the total net assets of mutual fund in millions of dollars, *Monthly returns* is the average monthly return weighted by TNA of each share class, *Fund Age* is the number of years since the mutual fund began trading until the end of the sample period, *Volatility* is the standard deviation of daily return each quarter, and *Expense ratio* is the ratio of the total investment that shareholders pay for fund's operating expenses. Panel B compares MF financing IPOs and non-MF financing IPOs that went public during 2010-2019. *Market value* is calculated as the stock price multiplied by shares outstanding and reported in millions of dollars, *BM* is the ratio of book value to market value of equity, *Proceeds* is the IPO offer proceeds, *IPO Age* is firm age at the time of IPO, *VC dummy* equals one if the IPO has venture capital backing and zero otherwise, and *First day return* is the IPO return from the offer price to first-day closing price. Panel C summarizes the pre-IPO investments in IPO firms made by mutual funds. *# pre-IPO investments* is the number of firms that mutual funds invested in prior to IPO, *# Industries* is the number of industries in which mutual funs have pre-IPO investment, *# MF investments* is the number of mutual funds that invested in private firms prior to IPO, *Private investment duration* is the number of months from when the mutual fund first invested in a private firm till its IPO, and *Pre-IPO investment amount* is the total acquisition cost a mutual fund paid for pre-IPO shares of a private firm. *, **, and *** indicate significant level at 10%, 5%, and 1% respectively.

**Panel A: Pre-IPO funds vs. Other funds.**

| | **Pre-IPO MFs** | | **Other MFs** | | **Difference** |
|---|---|---|---|---|---|
| | ***N*** | ***Mean*** | ***N*** | ***Mean*** | |
| Fund TNA (million) | 25,889 | 4,679.12 | 283,803 | 1,161.07 | 3518.05*** |
| Fund Age | 252 | 24.83 | 3,384 | 17.13 | 7.7*** |
| Volatility | 8,649 | 0.99% | 94,760 | 0.95% | 0.04*** |
| Expense ratio | 1,423 | 0.92% | 16,959 | 1.09% | 0.17%*** |
| Monthly return | 25,851 | 1.2209% | 283,301 | 0.9973% | 0.22%*** |

**Panel B: MF-financing IPOs vs. Other IPOs**

| | MF Financing IPOs | | Other IPOs | | Difference |
|---|---|---|---|---|---|
| | ***N*** | ***Mean*** | ***N*** | ***Mean*** | |
| Market value (million) | 152 | 2,069.14 | 919 | 993.35 | 1,102.79*** |
| BM | 152 | 0.33 | 919 | 0.43 | -0.10*** |
| Proceeds (million) | 151 | 420.21 | 918 | 208.80 | 211.41*** |
| IPO Age | 152 | 9.73 | 919 | 18.69 | -8.96*** |
| VC dummy | 152 | 0.94 | 919 | 0.60 | 0.38*** |
| First day return | 152 | 28.83% | 919 | 15.96% | 12.87%*** |

**Panel C: Pre-IPO investments by mutual funds**

| | | | | ***Percentile*** | | | |
|---|---|---|---|---|---|---|---|
| | ***N*** | ***Average*** | ***Min*** | ***25th*** | ***50th*** | ***75th*** | ***Max*** |
| # Pre-IPO investments each fund | 252 | 4.9 | 1 | 1 | 3 | 6 | 51 |
| # Industries each fund | 252 | 1.98 | 1 | 1 | 1 | 2 | 8 |
| # MF investments each firm | 152 | 8.13 | 1 | 2 | 4 | 9 | 70 |
| Private investment duration (months) | 1,236 | 25 | 1 | 10 | 17 | 39 | 174 |
| Pre-IPO investment ($ million) | 1,236 | 7.404 | 0.0034 | 0.58 | 2.47 | 7.27 | 225 |

**Table 2: Portfolio weights in pre-IPO stocks**

The unit of observation is at the fund-firm-quarter level. The dependent variable is the portfolio weight of a stock in a mutual fund's portfolio at the end of each quarter. *Pre-IPO* is a dummy variable taking a value of one if a mutual fund has any pre-IPO investment in a firm and zero otherwise. Control variables include market value of equity (*Market Value)*, Book-to-market ratio (*BM*), past quarter return (*Past Return*), portfolio weight of mutual funds put on portfolio firms (*Weight*), proceeds from IPO (*Proceeds*), firm age at the time of IPO (*IPO Age*), a dummy indicating IPO has venture capital backing (*VC*), IPO first-day return (*Underpricing*), mutual fund size (*TNA*), mutual fund age (*Fund Age*), and mutual fund's daily return volatility (*Fund Ret Vol*). *, **, and *** indicate significant level at 10%, 5%, and 1% respectively. Panel A (Panel B) reports the results using the sample of all mutual fund holdings in stocks within (after) two years since the IPO.

**Panel A: Mutual fund holdings of IPO stocks within two years since the IPO**

| | Dependent variable: portfolio weight | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Pre-IPO | 0.078*** | 0.047*** | 0.147*** | 0.133*** |
| | (0.008) | (0.008) | (0.008) | (0.006) |
| Ln(Market Value) | | 0.125*** | 0.125*** | 0.090*** |
| | | (0.002) | (0.002) | (0.001) |
| Ln(BM) | | -0.021*** | -0.015*** | -0.007*** |
| | | (0.001) | (0.001) | (0.001) |
| Past Return | | 0.056*** | 0.052*** | 0.061*** |
| | | (0.004) | (0.003) | (0.002) |
| Ln(Proceeds) | | 0.009*** | 0.026*** | 0.013*** |
| | | (0.002) | (0.002) | (0.001) |
| Ln(IPO Age +1) | | 0.018*** | 0.017*** | 0.011*** |
| | | (0.001) | (0.001) | (0.001) |
| VC | | -0.014*** | -0.022*** | -0.020*** |
| | | (0.003) | (0.003) | (0.002) |
| Underpricing | | -0.016*** | -0.011*** | -0.051*** |
| | | (0.004) | (0.004) | (0.002) |
| Ln(TNA) | | | -0.096*** | -0.040*** |
| | | | (0.001) | (0.001) |
| Ln(Fund Age + 1) | | | 0.088*** | 0.032*** |
| | | | (0.001) | (0.004) |
| Fund Ret Vol | | | 0.330*** | 0.086*** |
| | | | (0.004) | (0.005) |
| Constant | 0.402*** | -0.719*** | -1.026*** | -0.435*** |
| | (0.001) | (0.027) | (0.027) | (0.023) |
| Observations | 360073 | 298691 | 291091 | 290969 |
| Adjusted R2 | 0.000 | 0.097 | 0.193 | 0.660 |
| Year-Quarter FE | No | Yes | Yes | Yes |
| Fund FE | No | No | No | Yes |

**Panel B: Mutual fund holdings of IPO stocks after two years since the IPO.**

| Dependent variable: portfolio weight | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Pre-IPO | 0.843*** | 0.529*** | 0.554*** | 0.589*** |
| | (0.012) | (0.012) | (0.011) | (0.008) |
| Ln(Market Value) | | 0.190*** | 0.193*** | 0.122*** |
| | | (0.001) | (0.001) | (0.001) |
| Ln(BM) | | -0.025*** | -0.013*** | -0.006*** |
| | | (0.001) | (0.001) | (0.001) |
| Past Return | | 0.056*** | 0.047*** | 0.089*** |
| | | (0.004) | (0.004) | (0.002) |
| Ln(Proceeds) | | 0.044*** | 0.064*** | 0.078*** |
| | | (0.001) | (0.001) | (0.001) |
| Ln(IPO Age +1) | | -0.010*** | -0.006*** | -0.006*** |
| | | (0.001) | (0.001) | (0.001) |
| VC | | 0.089*** | 0.067*** | 0.067*** |
| | | (0.002) | (0.002) | (0.001) |
| Underpricing | | -0.118*** | -0.106*** | -0.142*** |
| | | (0.003) | (0.003) | (0.002) |
| Ln(TNA) | | | -0.099*** | -0.032*** |
| | | | (0.000) | (0.001) |
| Ln(Fund Age + 1) | | | 0.087*** | 0.019*** |
| | | | (0.001) | (0.004) |
| Fund Ret Vol | | | 0.730*** | 0.048*** |
| | | | (0.005) | (0.004) |
| Constant | 0.538*** | -1.810*** | -2.500*** | -1.792*** |
| | (0.001) | (0.018) | (0.019) | (0.018) |
| Observations | 767055 | 698508 | 681687 | 681635 |
| Adjusted R2 | 0.006 | 0.192 | 0.277 | 0.690 |
| Year-Quarter FE | No | Yes | Yes | Yes |
| Fund FE | No | No | No | Yes |

**Table 3: Duration analysis**

For each investment by a mutual fund in a newly listed firm, if the security were retained in the mutual fund's portfolio from the previous quarter, we classify the observation as "survive." An observation is considered as "exit" if we observe that firm in the mutual fund portfolio in the previous but not current quarter. Panel A reports summary statistics of mutual funds' investment duration in newly listed firms from 2010 to 2019. The holding duration is measured as the number of consecutive quarters in which a firm appeared in a mutual fund holding portfolio. *Exit* is the sample of investments where mutual funds fully exit their positions in a portfolio firm during our sample period. *Censored* is the sample of investments that the exit event has not yet occurred at the time of analysis. Panel B reports the results from the duration analysis of mutual fund investment in newly listed firms during the sample period. The unit of analysis is a fund-firm-quarter. We use a panel data parametric proportional hazard model to estimate the hazard rate $h(t) = h_0(t)\exp(X\beta)$, in which the baseline hazard $h_0(t)$ has an exponential functional form. *Pre-IPO* is a dummy variable taking a value of one if mutual fund has a pre-IPO investment in a firm and zero otherwise. Control variables include market value of equity (*Market Value)*, Book-to-market ratio (*BM*), past quarter return (*Past Return*), portfolio weight of mutual funds put on portfolio firms (*Weight*), proceeds from IPO (*Proceeds*), firm age at the time of IPO (*IPO Age*), a dummy indicating IPO has venture capital backing (*VC*), IPO first-day return (*Underpricing*), mutual fund size (*TNA*), mutual fund age (*Fund Age*), and mutual fund's daily return volatility (*Fund Ret Vol*). *, **, and *** indicate significant level at 10%, 5%, and 1% respectively.

**Panel A: Mutual fund holding duration on newly listed stocks**

| | **Holding duration** | **N** | **Mean** | **10th percentile** | **50th percentile** | **90 percentile** |
|---|---|---|---|---|---|---|
| Exit | Pre-IPO stocks | 736 | 6.69 | 2 | 4 | 15 |
| | Other newly listed stocks | 28,711 | 4.43 | 1 | 2 | 11 |
| Censored | Pre-IPO stocks | 381 | 9.13 | 2 | 4 | 26 |
| | Other newly listed stocks | 7,422 | 8.42 | 2 | 6 | 22 |

**Panel B: Survival analysis**

| | Coefficient | Hazard Ratio | Coefficient | Hazard Ratio |
|---|---|---|---|---|
| Pre-IPO | -0.411*** | 0.663*** | -0.236*** | 0.790*** |
| | (0.051) | | (0.052) | |
| Ln(Market Value) | -0.417*** | 0.659*** | -0.404*** | 0.668*** |
| | (0.011) | | (0.011) | |
| Ln(BM) | -0.148*** | 0.863*** | -0.144*** | 0.866*** |
| | (0.010) | | (0.011) | |
| Past return | -0.071** | 0.932** | -0.041 | 0.960 |
| | (0.034) | | (0.034) | |
| Weight | -0.368*** | 0.692*** | -0.445*** | 0.641*** |
| | (0.017) | | (0.018) | |
| Ln(Proceed) | 0.482*** | 1.619*** | 0.486*** | 1.626*** |
| | (0.014) | | (0.014) | |
| Ln(IPO Age +1) | -0.058*** | 0.943*** | -0.059*** | 0.942*** |
| | (0.012) | | (0.012) | |
| VC | 0.186*** | 1.205*** | 0.187*** | 1.206*** |
| | (0.024) | | (0.025) | |
| Underpricing | 0.041 | 1.042 | 0.057* | 1.058* |
| | (0.030) | | (0.030) | |
| Ln(TNA) | | | -0.139*** | 0.870*** |
| | | | (0.006) | |
| Ln(Fund Age + 1) | | | 0.150*** | 1.162*** |
| | | | (0.017) | |
| Fund Ret Vol | | | 0.073*** | 1.075*** |
| | | | (0.008) | |
| Constant | -10.585*** | | -10.324*** | |
| | (0.213) | | (0.220) | |
| Pseudo R2 | 0.123 | | 0.142 | |
| Observations | 110043 | | 108119 | |

**Table 4: Mutual fund returns from trades of pre-IPO stocks**

This table reports the result of the regression examining the performance of stock trades made by mutual funds. In each quarter, we infer trades from quarterly changes of mutual fund holdings. A mutual fund trade in each stock is classified as Buy (Sell) if the fund had increased (decreased) the number of shares relative to the previous quarter holding The dependent variable is the measures of the stock return over the next 3 months, including raw stock return (*Raw return)*, stock return subtracting the return of matched portfolio by size and book-to-market quintiles (*FF 25 return*), and stock return subtracting the return of matched portfolios by size, book-to-market, and past 6-month return quintiles (*DGTW return*). *Pre-IPO* is a dummy variable taking a value of one if a mutual fund has any pre-IPO investment in a firm and zero otherwise. *ΔOwnership,* calculated as the product of the number of shares changed and the share price, scaled by the mutual fund's total assets, is a measurement of the magnitude of the trade. Control variables include market value of equity (*Market Value)*, Book-to-market ratio (*BM*), past quarter return (*Past Return*), proceeds from IPO (*Proceeds*), firm age at the time of IPO (*IPO Age*), a dummy indicating IPO has venture capital backing (*VC*), IPO first day return (*Underpricing*). Standard errors are clustered at the stock level and reported in parenthesis. *, **, and *** indicate significant level at 10%, 5%, and 1% respectively.

**Panel A: All trades after lockup quarter**

| | **BUY** | | | **SELL** | | |
|---|---|---|---|---|---|---|
| | Raw return | FF 25 return | DGTW return | Raw return | FF 25 return | DGTW return |
| Pre-IPO | 0.001 | -0.006 | -0.007 | 0.010 | 0.009 | 0.008 |
| | (0.012) | (0.013) | (0.013) | (0.017) | (0.016) | (0.015) |
| ΔOwnership | -0.005* | -0.005 | -0.003 | 0.000 | 0.002 | 0.002 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| ΔOwnership*Pre-IPO | -0.030 | -0.018 | -0.018 | -0.018 | -0.018 | -0.013 |
| | (0.026) | (0.022) | (0.019) | (0.021) | (0.020) | (0.019) |
| Ln(BM) | -0.054*** | | | -0.053*** | | |
| | (0.004) | | | (0.005) | | |
| Ln(Market Value) | -0.020*** | | | -0.022*** | | |
| | (0.004) | | | (0.004) | | |
| Past return | -0.011 | 0.010 | | -0.029** | -0.008 | |
| | (0.018) | (0.017) | | (0.012) | (0.012) | |
| Ln(Proceeds) | 0.023*** | 0.001 | 0.000 | 0.024*** | 0.001 | 0.001 |
| | (0.005) | (0.003) | (0.003) | (0.005) | (0.003) | (0.002) |
| Ln(IPO Age +1) | -0.002 | 0.000 | -0.000 | -0.000 | 0.001 | 0.001 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| VC | -0.003 | 0.017*** | 0.015** | 0.008 | 0.024*** | 0.023*** |
| | (0.007) | (0.006) | (0.006) | (0.007) | (0.006) | (0.006) |
| Underpricing | -0.007 | 0.006 | 0.004 | -0.004 | 0.009 | 0.006 |
| | (0.011) | (0.009) | (0.009) | (0.011) | (0.009) | (0.009) |
| Constant | -0.337*** | -0.027 | -0.018 | -0.354*** | -0.035 | -0.033 |
| | (0.074) | (0.054) | (0.050) | (0.075) | (0.050) | (0.046) |
| Observations | 396583 | 409504 | 409504 | 342616 | 356920 | 356920 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Adjusted R2 | 0.227 | 0.019 | 0.014 | 0.226 | 0.017 | 0.012 |
| Year-Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Fund FE | Yes | Yes | Yes | Yes | Yes | Yes |

**Panel B: Trades within one year after lockup quarter**

| | **BUY** | | | **SELL** | | |
|---|---|---|---|---|---|---|
| | Raw return | FF 25 return | DGTW return | Raw return | FF 25 return | DGTW return |
| Pre-IPO | 0.034 | 0.021 | 0.019 | 0.024 | 0.000 | -0.001 |
| | (0.034) | (0.037) | (0.037) | (0.036) | (0.037) | (0.034) |
| ΔOwnership | -0.017** | -0.015* | -0.009 | 0.018* | 0.014 | 0.015 |
| | (0.008) | (0.009) | (0.008) | (0.010) | (0.009) | (0.010) |
| ΔOwnership*Pre-IPO | -0.071 | -0.041 | -0.009 | -0.033 | -0.068 | -0.063 |
| | (0.050) | (0.051) | (0.048) | (0.058) | (0.058) | (0.054) |
| Ln(BM) | -0.076*** | | | -0.075*** | | |
| | (0.012) | | | (0.015) | | |
| Ln(Market Value) | -0.028*** | | | -0.030*** | | |
| | (0.010) | | | (0.009) | | |
| Past return | 0.008 | 0.022 | | -0.023 | -0.007 | |
| | (0.042) | (0.040) | | (0.032) | (0.027) | |
| Ln(Proceeds) | 0.028** | -0.002 | -0.003 | 0.031*** | -0.001 | -0.002 |
| | (0.011) | (0.008) | (0.008) | (0.011) | (0.009) | (0.009) |
| Ln(IPO Age +1) | -0.006 | -0.006 | -0.006 | -0.010 | -0.013 | -0.012 |
| | (0.011) | (0.011) | (0.011) | (0.013) | (0.015) | (0.014) |
| VC | -0.016 | 0.009 | 0.007 | -0.010 | 0.011 | 0.010 |
| | (0.023) | (0.022) | (0.022) | (0.029) | (0.028) | (0.027) |
| Underpricing | -0.026 | -0.003 | -0.003 | -0.023 | -0.008 | -0.005 |
| | (0.024) | (0.025) | (0.024) | (0.023) | (0.024) | (0.022) |
| Constant | -0.385** | 0.051 | 0.069 | -0.412** | 0.051 | 0.066 |
| | (0.164) | (0.164) | (0.167) | (0.170) | (0.181) | (0.178) |
| Observations | 86077 | 87306 | 87306 | 55715 | 56783 | 56783 |
| Adjusted R2 | 0.210 | 0.036 | 0.029 | 0.200 | 0.031 | 0.025 |
| Year-Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Fund FE | Yes | Yes | Yes | Yes | Yes | Yes |

**Table 5: Risk-adjusted performance**

This table compares the risk-adjusted performance of pre-IPO funds vs. other funds (Panel A) and MF financing IPOs vs. other IPOs (Panel B) using a calendar time portfolio approach. Mutual funds in our sample are grouped into two portfolios: *Pre-IPO funds* and *Other funds*. Calendar time portfolio monthly returns are computed by averaging across funds, weighting each fund by its TNA. The zero-investment portfolio consists of a long position in *pre-IPO funds* portfolio and a short position in *Other funds* portfolio. Each year, IPO stocks that went public during the previous year are grouped into two portfolios *MF financing IPOs* and *Other IPOs.* Stock portfolios are rebalanced every year. Stock portfolio monthly returns are computed by averaging across stocks, weighting each IPO stock by its IPO proceeds. The zero-investment portfolio consists of a long position in *MF financing IPOs* portfolio and a short position in *Other IPOs* portfolio. Abnormal returns of calendar time portfolios (alpha) are the intercept in the regression of monthly excess returns on the Fama-French-Carhart four factors. *, **, and *** indicate significant level at 10%, 5%, and 1% respectively.

**Panel A: Risk-adjusted performance of MF financing IPOs vs. Other IPOs**

| | **Alpha** | **MKTRF** | **SMB** | **HML** | **UMD** | **Adj. R2** |
|---|---|---|---|---|---|---|
| MF Financing IPOs | -1.921* | 1.471*** | 1.366*** | -0.608 | 0.025 | 0.351 |
| | (0.993) | (0.259) | (0.433) | (0.406) | (0.328) | |
| Other IPOs | -0.626* | 1.206*** | 0.762*** | -0.397*** | -0.222** | 0.761 |
| | (0.332) | (0.087) | (0.145) | (0.136) | (0.110) | |
| MF Financing - Other | -1.295 | 0.265 | 0.604 | -0.212 | 0.247 | 0.006 |
| | (0.983) | (0.257) | (0.428) | (0.402) | (0.325) | |

**Panel B: Risk-adjusted performance of Pre-IPO funds vs. Other funds**

| | **Alpha** | **MKTRF** | **SMB** | **HML** | **UMD** | **Adj. R2** |
|---|---|---|---|---|---|---|
| Pre-IPO funds | -0.054 | 1.017*** | 0.094*** | -0.233*** | 0.012 | 0.970 |
| | (0.066) | (0.019) | (0.030) | (0.030) | (0.023) | |
| Other funds | -0.084*** | 0.977*** | 0.075*** | 0.007 | -0.009 | 0.996 |
| | (0.024) | (0.007) | (0.011) | (0.011) | (0.008) | |
| Pre-IPO - Other | 0.031 | 0.040** | 0.019 | -0.240*** | 0.021 | 0.483 |
| | (0.059) | (0.017) | (0.027) | (0.027) | (0.020) | |

**Table 6: Portfolio weights in connected industries**

This table reports the results examining mutual funds and portfolio weights in connected industries. The dependent variable is $industry\_weight_{fiq}$, the sum of portfolio weights that a mutual fund *f* put in stocks in industry *j* at the end of quarter $q$. $Connected_{fj}$ receives the value of 1 if a mutual fund *f* invests in a pre-IPO stock in industry *j* and $Post_{fjq}$ equals 1 if a mutual fund *f* invests in pre-IPO stock in industry *j* before quarter $q$. Control variables include total industry size (*Industry Size*), the weighted average of industry past-quarter performance (*Past Industry Return*), and the average book-to-market ratio (*Industry BM*), mutual fund size (*TNA*), mutual fund age (*Fund Age*), and mutual fund's daily return volatility (*Fund Ret Vol*). Stocks are classified into industries using Fama & French 48 industry classification.

| **Dependent variable: Industry weight** | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Connected | 7.880*** | 4.865*** | 3.437*** | 3.388*** | 4.022*** |
| | (0.032) | (0.058) | (0.051) | (0.055) | (0.054) |
| Connected*Post | | 4.302*** | 3.598*** | 3.872*** | 3.536*** |
| | | (0.070) | (0.061) | (0.065) | (0.062) |
| Ln(Industry Size) | | | 1.506*** | 1.506*** | 1.407*** |
| | | | (0.002) | (0.002) | (0.002) |
| Industry past return | | | 0.993*** | 1.262*** | 1.191*** |
| | | | (0.037) | (0.040) | (0.038) |
| Industry BM | | | -0.136*** | -0.232*** | -0.182*** |
| | | | (0.008) | (0.009) | (0.009) |
| Ln(Fund TNA) | | | | -0.141*** | -0.045*** |
| | | | | (0.001) | (0.005) |
| Ln(Fund Age) | | | | 0.096*** | 0.032*** |
| | | | | (0.003) | (0.011) |
| Fund Ret Vol | | | | 0.224*** | 0.063*** |
| | | | | (0.007) | (0.008) |
| Constant | 3.240*** | 3.240*** | -15.765*** | -15.670*** | -14.536*** |
| | (0.003) | (0.003) | (0.023) | (0.030) | (0.058) |
| Observations | 2541073 | 2541073 | 2541073 | 2109617 | 2109617 |
| Adjusted R2 | 0.023 | 0.027 | 0.251 | 0.258 | 0.328 |
| Year-Quarter FE | No | Yes | Yes | Yes | Yes |
| Fund FE | No | No | No | No | Yes |

**Table 7: Mutual fund returns on connected industries**

This table reports the results examining whether mutual funds earn superior returns on connected industries. The dependent variable, *industry_return,* is the quarterly value-weighted return on a mutual fund position in each of 48 FF industries. For each mutual fund, we calculate the quarterly value-weighted return of each industry as the weighted average of returns of stocks held by the fund within the same industry. The weight for each stock is its proportion in the fund's portfolio at the end of the previous quarter. $Connected_{fj}$ receives the value of 1 if mutual fund *f* invests in a pre-IPO stock in industry *j* and $Post_{fjq}$ equals 1 if a mutual fund *f* invests in a pre-IPO stock in industry *j* before quarter *q*. Control variables include total industry size (*Industry Size*), the weighted average of industry past-quarter performance (*Past Industry Return*), and the average book-to-market ratio (*Industry BM*), mutual fund size (*TNA*), mutual fund age (*Fund Age*), and mutual fund's daily return volatility (*Fund Ret Vol*). Stocks are classified into industries using Fama & French 48 industry classification.

| **Dependent variable: Industry quarter return** | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Connected | 0.010*** | 0.002 | 0.001 | -0.003* | -0.005*** |
| | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) |
| Connected*Post | | 0.012*** | 0.009*** | 0.012*** | 0.010*** |
| | | (0.002) | (0.002) | (0.002) | (0.002) |
| Ln(Industry Size) | | | 0.002*** | 0.002*** | 0.002*** |
| | | | (0.000) | (0.000) | (0.000) |
| Industry past return | | | 0.066*** | 0.067*** | 0.066*** |
| | | | (0.001) | (0.001) | (0.001) |
| Industry BM | | | -0.015*** | -0.014*** | -0.014*** |
| | | | (0.000) | (0.000) | (0.000) |
| Ln(Fund TNA) | | | | 0.000*** | -0.002*** |
| | | | | (0.000) | (0.000) |
| Ln(Fund Age) | | | | -0.000 | -0.001*** |
| | | | | (0.000) | (0.000) |
| Fund Ret Vol | | | | 0.002*** | 0.003*** |
| | | | | (0.000) | (0.000) |
| Constant | 0.028*** | 0.028*** | 0.013*** | 0.008*** | 0.028*** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.002) |
| Observations | 2531823 | 2531823 | 2531823 | 2102085 | 2102085 |
| Adjusted R2 | 0.000 | 0.388 | 0.390 | 0.384 | 0.385 |
| Year-Quarter FE | No | Yes | Yes | Yes | Yes |
| Fund FE | No | No | No | No | Yes |

**Table 8: Strength of fund-industry connection**

This table reports the results examining the relationship between the strength of the fund-industry pre-IPO connection and mutual fund's portfolio weight on connected industries (Panel A) and mutual fund returns on connected industries (Panel B). *Connection_Strength* denotes the quartile rank of fund-industry pre-IPO connection measured using either the pre-IPO investment amount or investment duration. *Pre-IPO investment amount (%)* for each fund-industry connection is the sum of pre-IPO investment scaled by the fund's TNA across firms within the industry and the *Private Investment Duration* for each fund-industry connection is measured as the duration between the first acquisition date to the IPO date of firms within the industry. $Lead\_Connected_{fj}$ is a dummy variable that equals 1 if mutual fund *f*'s family is the lead investor in at least one private funding round of firms in industry *j*. $Nonlead\_Connected_{fj}$ is the dummy variable that equals 1 if mutual fund *f* is connected to industry *j* but mutual fund *f*'s family is not the lead investor in any private funding round of firms in industry *j*. Control variables include total industry size (*Industry Size*), the weighted average of industry past-quarter performance (*Past Industry Return*), and the average book-to-market ratio (*Industry BM*), mutual fund size (*TNA*), mutual fund age (*Fund Age*), and mutual fund's daily return volatility (*Fund Ret Vol*). Stocks are classified into industries using Fama & French 48 industry classification.

**Panel A: Fund-industry connection strength and portfolio weight**

| | **Dependent variable: Industry weight** | | | | | |
|---|---|---|---|---|---|---|
| | *Private Investment Amount (%)* | | *Private Investment Duration* | | *Lead vs. Nonlead Investor* | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Connection_Strength | 2.735*** | 1.619*** | 2.692*** | 1.713*** | | |
| | (0.011) | (0.021) | (0.010) | (0.022) | | |
| Connection_Strength *Post | | 1.488*** | | 1.238*** | | |
| | | (0.024) | | (0.025) | | |
| Nonlead_Connected | | | | | 5.517*** | 3.789*** |
| | | | | | (0.035) | (0.065) |
| Lead_Connected | | | | | 9.213*** | 4.621*** |
| | | | | | (0.054) | (0.096) |
| Nonlead_Connected *Post | | | | | | 2.365*** |
| | | | | | | (0.075) |
| Lead_Connected *Post | | | | | | 6.540*** |
| | | | | | | (0.112) |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2109617 | 2109617 | 2541073 | 2109617 | 2109617 | 2109617 |
| Adjusted R2 | 0.332 | 0.333 | 0.327 | 0.333 | 0.328 | 0.330 |
| Year-Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Fund FE | Yes | Yes | Yes | Yes | Yes | Yes |

**Panel B: Fund-industry connection strength and industry return**

| Dependent variable: Industry quarter return | | | | | | |
|---|---|---|---|---|---|---|
| | *Private Investment Amount (%)* | | *Private Investment Duration* | | *Lead vs. Nonlead Investor* | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Connection_Strength | 0.001* | -0.002*** | 0.001*** | -0.002** | | |
| | (0.000) | (0.001) | (0.000) | (0.001) | | |
| Connection_Strength *Post | | 0.003*** | | 0.003*** | | |
| | | (0.001) | | (0.001) | | |
| Nonlead_Connected | | | | | 0.001 | -0.007*** |
| | | | | | (0.001) | (0.002) |
| Lead_Connected | | | | | 0.007*** | -0.000 |
| | | | | | (0.002) | (0.003) |
| Nonlead_Connected *Post | | | | | | 0.010*** |
| | | | | | | (0.002) |
| Lead_Connected *Post | | | | | | 0.011*** |
| | | | | | | (0.004) |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2102085 | 2102085 | 2531823 | 2102085 | 2102085 | 2102085 |
| Adjusted R2 | 0.385 | 0.385 | 0.390 | 0.385 | 0.385 | 0.385 |
| Year-Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Fund FE | Yes | Yes | Yes | Yes | Yes | Yes |

**Table 9: Mutual funds and family-connected industries**

This table reports the results examining whether mutual funds overweight family-connected industries (Panel A) and earn superior returns from these industries (Panel B). $Connected_{fj}$ receives the value of 1 if mutual fund f invests in a pre-IPO stock in industry j and $Post_{fjq}$ equals 1 if a mutual fund f invests in a pre-IPO stock in industry j before quarter q. $Family\_connected_{fj}$ receives value of 1 if a mutual fund f does not invest in pre-IPO stocks of industry j but other mutual fund in the same family does. $Post\_family_{fjq}$ equals 1 if other mutual fund in the same fund family invests in pre-IPO stock in industry j before quarter q. Control variables include total industry size (Industry Size), the weighted average of industry past-quarter performance (Past Industry Return), and the average book-to-market ratio (Industry BM), mutual fund size (TNA), mutual fund age (Fund Age), and mutual fund's daily return volatility (Fund Ret Vol). Stocks are classified into industries using Fama & French 48 industry classification.

**Panel A: Portfolio weights on family-connected industries**

| **Dependent variable: Industry weight** | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Connected | 7.985*** | 4.957*** | 3.501*** | 3.484*** | 4.225*** |
| | (0.032) | (0.058) | (0.051) | (0.055) | (0.054) |
| Family_connected | 2.646*** | 1.706*** | 0.681*** | 0.706*** | 0.998*** |
| | (0.013) | (0.024) | (0.021) | (0.023) | (0.023) |
| Connected*Post | | 4.321*** | 3.625*** | 3.904*** | 3.591*** |
| | | (0.069) | (0.061) | (0.065) | (0.062) |
| Family_connected*Post_family | | 1.313*** | 0.605*** | 0.752*** | 0.644*** |
| | | (0.028) | (0.025) | (0.027) | (0.026) |
| Ln(Industry Size) | | | 1.479*** | 1.472*** | 1.367*** |
| | | | (0.002) | (0.002) | (0.002) |
| Industry past return | | | 0.963*** | 1.226*** | 1.150*** |
| | | | (0.036) | (0.040) | (0.038) |
| Industry BM | | | -0.094*** | -0.179*** | -0.124*** |
| | | | (0.008) | (0.009) | (0.009) |
| Ln(Fund TNA) | | | | -0.156*** | -0.048*** |
| | | | | (0.001) | (0.004) |
| Ln(Fund Age) | | | | 0.106*** | 0.037*** |
| | | | | (0.003) | (0.010) |
| Fund Ret Vol | | | | 0.222*** | 0.062*** |
| | | | | (0.007) | (0.008) |
| Constant | 3.135*** | 3.135*** | -15.495*** | -15.297*** | -14.135*** |
| | (0.003) | (0.003) | (0.023) | (0.030) | (0.058) |
| Observations | 2541073 | 2541073 | 2541073 | 2109617 | 2109617 |
| Adjusted R2 | 0.039 | 0.044 | 0.254 | 0.262 | 0.333 |
| Year-Quarter FE | No | Yes | Yes | Yes | Yes |
| Fund FE | No | No | No | No | Yes |

**Panel B: Returns on family-connected industries**

| Dependent variable: Industry quarter return | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Connected | 0.010*** | 0.002 | 0.001 | -0.003 | -0.004** |
| | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) |
| Family_connected | 0.007*** | -0.002*** | -0.003*** | -0.004*** | -0.004*** |
| | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) |
| Connected*Post | | 0.012*** | 0.009*** | 0.012*** | 0.010*** |
| | | (0.002) | (0.002) | (0.002) | (0.002) |
| Family_connected*Post_family | | 0.013*** | 0.009*** | 0.010*** | 0.010*** |
| | | (0.001) | (0.001) | (0.001) | (0.001) |
| Ln(Industry Size) | | | 0.002*** | 0.002*** | 0.002*** |
| | | | (0.000) | (0.000) | (0.000) |
| Industry past return | | | 0.066*** | 0.066*** | 0.066*** |
| | | | (0.001) | (0.001) | (0.001) |
| Industry BM | | | -0.015*** | -0.014*** | -0.014*** |
| | | | (0.000) | (0.000) | (0.000) |
| Ln(Fund TNA) | | | | 0.000*** | -0.002*** |
| | | | | (0.000) | (0.000) |
| Ln(Fund Age) | | | | 0.000 | -0.001*** |
| | | | | (0.000) | (0.000) |
| Fund Ret Vol | | | | 0.002*** | 0.003*** |
| | | | | (0.000) | (0.000) |
| Constant | 0.028*** | 0.028*** | 0.014*** | 0.009*** | 0.029*** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.002) |
| Observations | 2531823 | 2531823 | 2531823 | 2102085 | 2102085 |
| Adjusted R2 | 0.000 | 0.388 | 0.390 | 0.384 | 0.385 |
| Year-Quarter FE | No | Yes | Yes | Yes | Yes |
| Fund FE | No | No | No | No | Yes |

**Table 10: Mutual funds and manager-connected industries**

This table reports the results examining whether mutual funds overweight manager-connected industries (Panel A) and earn superior returns from these industries (Panel B). $Connected_{fj}$ receives the value of 1 if mutual fund *f* invests in a pre-IPO stock in industry *j* and $Post_{fjq}$ equals 1 if a mutual fund *f* invests in a pre-IPO stock in industry *j* before quarter $q$. $Manager\_connected_{fj}$ receives value of 1 if a mutual fund f does not invest in pre-IPO stocks of industry j but other mutual fund managed by at least one of the same managers at quarter $q$ does. $Post\_manager_{fjq}$ equals 1 if other mutual fund managed by the same manager invests in pre-IPO stock in industry j before quarter q. Control variables include total industry size (*Industry Size*), the weighted average of industry past-quarter performance (*Past Industry Return*), and the average book-to-market ratio (*Industry BM*), mutual fund size (*TNA*), mutual fund age (*Fund Age*), and mutual fund's daily return volatility (*Fund Ret Vol*). Stocks are classified into industries using Fama & French 48 industry classification.

**Panel A: Portfolio weights on manager-connected industries**

| **Dependent variable: Industry weight** | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Connected | 7.910*** | 4.888*** | 3.462*** | 3.423*** | 4.093*** |
| | (0.032) | (0.058) | (0.051) | (0.055) | (0.054) |
| Manager_connected | 4.175*** | 2.376*** | 1.044*** | 1.021*** | 1.313*** |
| | (0.030) | (0.057) | (0.050) | (0.054) | (0.052) |
| Connected*Post | | 4.312*** | 3.614*** | 3.888*** | 3.564*** |
| | | (0.069) | (0.061) | (0.065) | (0.062) |
| Manager_connected*Post_Manager | | 2.502*** | 1.912*** | 2.006*** | 1.953*** |
| | | (0.067) | (0.059) | (0.062) | (0.060) |
| Ln(Industry Size) | | | 1.493*** | 1.491*** | 1.390*** |
| | | | (0.002) | (0.002) | (0.002) |
| Industry past return | | | 0.984*** | 1.255*** | 1.184*** |
| | | | (0.036) | (0.040) | (0.038) |
| Industry BM | | | -0.117*** | -0.211*** | -0.160*** |
| | | | (0.008) | (0.009) | (0.009) |
| Ln(Fund TNA) | | | | -0.147*** | -0.048*** |
| | | | | (0.001) | (0.005) |
| Ln(Fund Age) | | | | 0.102*** | 0.034*** |
| | | | | (0.003) | (0.010) |
| Fund Ret Vol | | | | 0.218*** | 0.063*** |
| | | | | (0.007) | (0.008) |
| Constant | 3.210*** | 3.210*** | -15.637*** | -15.512*** | -14.349*** |
| | (0.003) | (0.003) | (0.023) | (0.030) | (0.058) |
| Observations | 2541073 | 2541073 | 2541073 | 2109617 | 2109617 |
| Adjusted R2 | 0.031 | 0.035 | 0.254 | 0.262 | 0.332 |
| Year-Quarter FE | No | Yes | Yes | Yes | Yes |
| Fund FE | No | No | No | No | Yes |

**Panel B: Returns on manager-connected industries**

| Dependent varibale: Industry quarter return | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Connected | 0.010*** | 0.002 | 0.001 | -0.003* | -0.005** |
| | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) |
| Manager_connected | 0.008*** | 0.003** | 0.001 | -0.002 | -0.003 |
| | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) |
| Connected*Post | | 0.012*** | 0.009*** | 0.012*** | 0.010*** |
| | | (0.002) | (0.002) | (0.002) | (0.002) |
| Manager_connected*Post_Manager | | 0.006*** | 0.005** | 0.007*** | 0.006*** |
| | | (0.002) | (0.002) | (0.002) | (0.002) |
| Ln(Industry Size) | | | 0.002*** | 0.002*** | 0.002*** |
| | | | (0.000) | (0.000) | (0.000) |
| Industry past return | | | 0.066*** | 0.067*** | 0.066*** |
| | | | (0.001) | (0.001) | (0.001) |
| Industry BM | | | -0.015*** | -0.014*** | -0.014*** |
| | | | (0.000) | (0.000) | (0.000) |
| Ln(Fund TNA) | | | | 0.000*** | -0.002*** |
| | | | | (0.000) | (0.000) |
| Ln(Fund Age) | | | | 0.000 | -0.001*** |
| | | | | (0.000) | (0.000) |
| Fund Ret Vol | | | | 0.002*** | 0.003*** |
| | | | | (0.000) | (0.000) |
| Constant | 0.028*** | 0.028*** | 0.014*** | 0.008*** | 0.028*** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.002) |
| Observations | 2531823 | 2531823 | 2531823 | 2102085 | 2102085 |
| Adjusted R2 | 0.000 | 0.388 | 0.390 | 0.384 | 0.385 |
| Year-Quarter FE | No | Yes | Yes | Yes | Yes |
| Fund FE | No | No | No | No | Yes |

**APPENDIX**

**Figure A1: Pre-IPO investment in Pinterest, Inc. made by Fidelity Contrafund**
This figure shows example of pre-IPO investment made by Fidelity Contrafund in Pinterest. Pinterest went public on April 18, 2019.

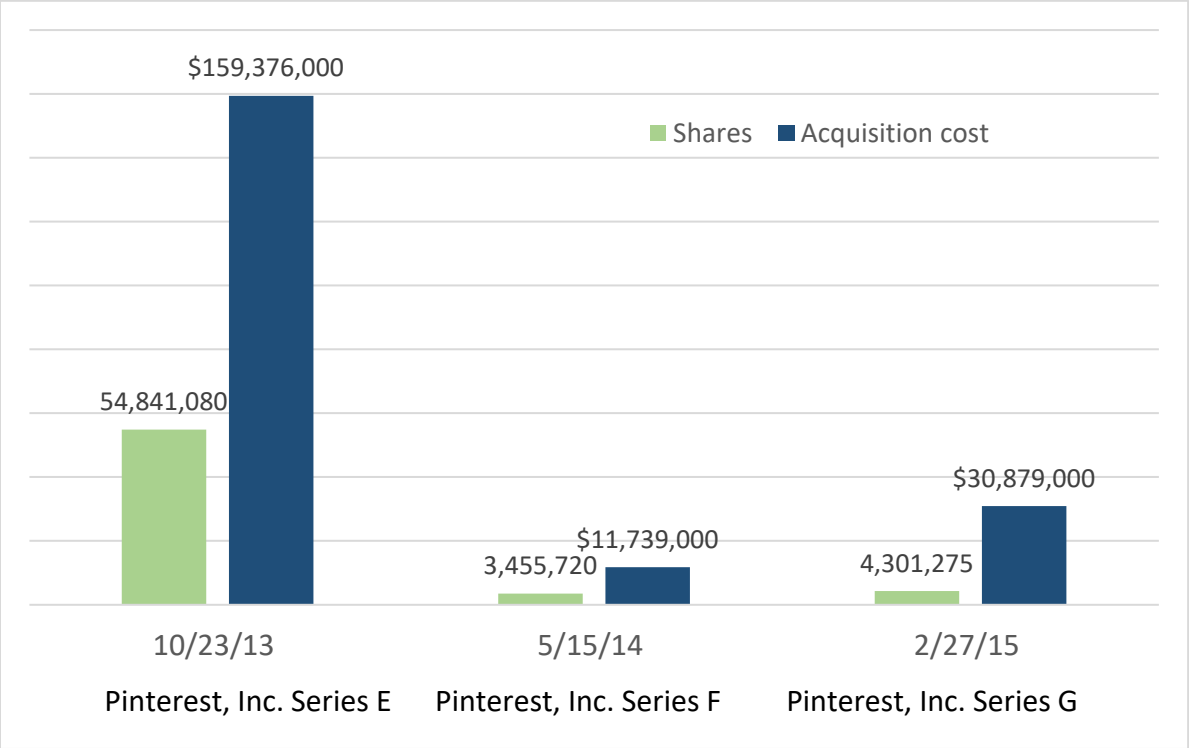

**Table A1: Fund families with the number of pre-IPO funds.**

| Fund family | # pre-IPO funds | Fund family | # pre-IPO funds |
|---|---|---|---|
| Fidelity | 67 | Neuberger Berman | 2 |
| T. Rowe Price | 23 | Columbia Threadneedle | 2 |
| Morgan Stanley | 19 | Arrowpoint Asset Management | 2 |
| Putnam | 15 | Principal Global Investors | 2 |
| John Hancock | 13 | Baron Funds | 2 |
| Franklin Templeton | 9 | GW Capital Management | 2 |
| Fred Alger | 8 | Voya Investments | 2 |
| Janus | 7 | BlackRock | 2 |
| Hartford | 7 | Delaware Management Company | 2 |
| Transamerica | 6 | Eventide | 2 |
| MML Investment Advisers | 6 | Pacific Life | 1 |
| VALIC | 5 | Thornburg Investment Management | 1 |
| Wasatch Advisors | 4 | Calvert Investments | 1 |
| AXA Equitable | 3 | Independence Capital Management | 1 |
| American Funds | 3 | Tocqueville Asset Management | 1 |
| Vanguard | 3 | Nationwide Fund Advisors | 1 |
| Federated Investors | 3 | USAA Mutual Funds | 1 |
| SunAmerica | 3 | Allianz Investment Management | 1 |
| Lincoln Investment | 3 | Thrivent Financial for Lutherans | 1 |
| Invesco | 3 | Directed Services | 1 |
| Jackson National Asset Management | 3 | Prudential Investments | 1 |
| Legg Mason | 3 | AllianceBernstein | 1 |
| Brighthouse | 3 | Callan Associates | 1 |

**Table A2: Industries with pre-IPO mutual fund investment.**

| FF 48 Industries | Number of MF backing IPOs |
|---|---|
| Pharmaceutical Products | 82 |
| Business Services | 38 |
| Medical Equipment | 5 |
| Retail | 5 |
| Banking | 4 |
| Computers | 3 |
| Measuring and Control Equipment | 3 |
| Recreation | 2 |
| Transportarion | 2 |
| Coal | 1 |
| Oil | 1 |
| Chemicals | 1 |
| Electronic Equipment | 1 |
| Insurance | 1 |
| Real Estate | 1 |
| Entertainment | 1 |
| Healthcare | 1 |

**Table A3: Mutual funds trades in newly listed stocks**

This table reports the summary statistics of mutual fund trades in IPOs from 2010 to 2019. The unit of observations is at the fund-stock level. *ΔOwnership,* which is calculated by the product of the number of shares changed and the share price, scaled by the mutual fund's total assets, is a measurement of the magnitude of the trade. Trades are classified as Sell, Hold, and Buy if *ΔOwnership* is less than, equal to, and greater than zero, respectively.

**Trades during the first quarter post-lockup**

| | ***Sell*** | ***Hold*** | ***Buy*** |
|---|---|---|---|
| *MF trades in pre-IPO stocks* | *48.03%* | *21.03%* | *30.94%* |
| Δownership (%) | -0.122 | 0 | 0.160 |
| *MF trades in other newly listed stocks* | *30.12%* | *19.77%* | *50.11%* |
| Δownership (%) | -0.167 | 0 | 0.225 |

**Trades during the second quarter post-lockup**

| | ***Sell*** | ***Hold*** | ***Buy*** |
|---|---|---|---|
| *MF trades in pre-IPO stocks* | *47.32%* | *26.79%* | *25.89%* |
| Δownership (%) | -0.120 | 0 | 0.135 |
| *MF trades in other newly listed stocks* | *32.21%* | *19.37%* | *51.58%* |
| Δownership (%) | -0.186 | 0 | 0.209 |

**Trades during the third quarter post-lockup**

| | ***Sell*** | ***Hold*** | ***Buy*** |
|---|---|---|---|
| *MF trades in pre-IPO stocks* | *40.91%* | *27.21%* | *31.89%* |
| Δownership (%) | -0.132 | 0 | 0.205 |
| *MF trades in other newly listed stocks* | *32.12%* | *20.14%* | *47.74%* |
| Δownership (%) | -0.197 | 0 | 0.212 |

**Trades during the fourth quarter post-lockup**

| | ***Sell*** | ***Hold*** | ***Buy*** |
|---|---|---|---|
| *MF trades in pre-IPO stocks* | *43.36%* | *25.46%* | *31.18%* |
| Δownership (%) | -0.176 | 0 | 0.192 |
| *MF trades in other newly listed stocks* | *32.75%* | *20.77%* | *46.48%* |
| Δownership (%) | -0.199 | 0 | 0.197 |