Informed Trading in Business Groups, Ownership Concentration, and Market Liquidity

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Policy Research Working Paper 7688
Abstract

Business groups, which are collections of publicly traded companies with significant amount of common ownership, dominate private sector activity in developing countries. This paper studies how information flows within these groups by analyzing the trading behavior of pension fund managers in firms that belong to the same group. The paper shows that while pension fund managers are momentum traders on non-affiliated companies, they trade in anticipation of future abnormal returns in affiliated firms. Ownership concentration and business group ties exacerbate information asymmetries, discouraging investment and depressing stock market participation. Using the merger and acquisition activity among pension fund managers as a natural experiment, the paper provides evidence that increases in stock ownership concentration, via the threat of informed trading, adversely affect liquidity. The results indicate that cross-ownership structures and extensive investor-industry relations might curb the expected benefits from the presence of institutional investors, limiting market development.

This paper is a product of the Finance and Private Sector Development Team, Development Research Group. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at apedrazamorales@worldbank.org.
Informed Trading in Business Groups, Ownership Concentration, and Market Liquidity

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JEL Classification: G12, G14, G23

Keywords: Insider trading, Institutional Investors, Liquidity.
1 Introduction

Institutional investors have become the majority owners of most large corporations\(^1\) and are expected to play a key role for financial development by providing funding for firms, enhancing market liquidity through more active trading and better information disclosure (Stulz, 1999a,b), and by promoting better corporate governance in the companies in which they invest (Aggarwal et al., 2011). Motivated by these ideas, policy makers around the world have promoted institutional investors as a way to develop financial systems, manage long-term savings, expand maturities, and increase access to finance for corporations (World Bank, 2015).

For developing countries, the empirical literature has focused on the role of foreign institutional investors (e.g. Rhee and Wang, 2009; Gul et al., 2010), yet little is known about the relation between domestic institutional investors with local trading activity, transactions costs, and governance practices. Understanding the role of domestic investors is particularly important since in many of these countries, business groups, which are typically collections of publicly traded companies with significant amount of common ownership, dominate private sector activity.\(^2\) In such context, money management institutions which belong to these business groups are prone to conflicts of interest between their fiduciary responsibilities and the objectives of their own management. For example, business groups relations can be used by controlling managers as a mechanism to enhance the entrenchment of corporate control. Alternatively, an institutional investor which belongs to a business group might have access to private information in affiliated firms. Ownership concentration and business group ties potentially exacerbates information asymmetries, discouraging investment, depressing stock

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\(^1\) Holderness (2009) finds that 96% of US firms contain at least one blockholder (defined as a shareholder who holds at least 5%); this ratio is the 15th highest out of the 22 countries that he studies. Porta et al. (1998) finds that institutional ownership is high in both developed and developing countries.

\(^2\) In Latin America, listed firms that are part of a business group account for more than 80% of market capitalization (OECD, 2015). In Mexico and Brazil more than 97% of listed companies is part of a group. The wide spread presence of this type of groups is commonly explain by market failures and lack of access to finance (e.g. Khanna and Palepu, 2000; Claessens et al., 2006; Masulis et al., 2011).
market participation and liquidity (Copeland and Galai, 1983; Kyle, 1985; Glosten and Milgrom, 1985). As a result, cross-ownership structures and extensive investor-industry relations might curb the expected benefits from the presence of institutional investors, limiting market deepening and development.

Despite the prevalence of business groups structures in developing countries, little research has analyzed how institutional money managers which belong to these groups use their access to in-house information, and the consequences for secondary market liquidity.

In this paper we investigate these issues in the context of a developing country. We examine trading behavior of Colombian institutional investors in publicly traded firms that belong to their business group and analyze the effects of institutional ownership concentration on secondary market liquidity. We divide our analysis as follows. First, we test whether institutional investors have private information on the firms that belong to their business group by studying whether trading activity in affiliated firms better predicts future stock returns than trading in non-affiliated firms. Second, we use the merger and acquisition activity of money management institutions in the country as a natural experiment to study the extent to which greater institutional stock ownership concentration affects trading activity and transaction costs.

We use data on monthly portfolio holdings of all active Colombian pension funds in domestic stocks from 2004 to 2014. These funds are managed by Pension Fund Administrators (PFAs) which are asset management companies, either foreign-owned or owned by domestic business groups. We use ownership data on publicly traded companies and take pyramiding and cross-holdings into account to determine the control rights of the principal shareholder, as is now common in the literature (e.g. Claessens et al., 2002; Faccio and Lang, 2002). We classify each stock-PFA pair as part of the same business group when they share the same principal shareholder.

We test whether trades by affiliated funds are more correlated with future stock performance than trades by non-affiliated funds in the same stock, and relative to trades by the
same fund in other similar stocks with no affiliation. We find that PFAs are momentum traders on non-affiliated companies, purchasing (selling) stocks after positive (negative) returns. On the contrary, we find that PFAs are not momentum traders on affiliated stocks. Instead, PFAs purchases (sells) on affiliated firms are followed by positive (negative) abnormal returns in the next month. The results are robust to the inclusion of firm and fund fixed effects, which account for time-invariant firm-specific characteristics that might affect returns, as well as fund managers’ constraints. The results are also robust to using a variety of alternative specifications. For example, since large shareholders are expected to have access to private information (e.g. Parrino et al., 2003), in addition to controlling for pension fund holdings in each firm, we restrict our sample to trading in related firms for which the fund manager is not among one of the largest shareholders (i.e. the PFA is not among the largest five shareholders in the company) and find similar results. Overall, the evidence suggests that group affiliation seems to be a source of private information for pension fund managers.

In an environment with information asymmetries, outside investors without adequate protection may be reluctant to invest, limiting trading activity. In the second part of the paper, we investigate the effects of PFAs ownership concentration on secondary market liquidity. There are, however, at least two challenges to determine if in fact liquidity is affected by information asymmetries resulting from the ownership structure of the firm. First, if PFAs trade less than other investors, lower trading activity will increase transaction costs by spreading the liquidity provision costs over fewer trades. In such case, secondary market liquidity might be driven by the amount of trading of institutional investors and not by information frictions. Second, secondary market liquidity is potentially endogenous to the firm’s optimal choice of ownership structure, which might result form balancing the trade-offs between ownership control and the potential intervention from outsiders (Bolton et al., 1998).

This is consistent with Raddatz and Schmukler (2012) who also document momentum trading for Chilean PFAs. According to the World Bank (2015), between 2001 to 2011, institutional ownership concentration in emerging markets was on average 60% larger than in developed economies, while turnover was 50% smaller.
In order to overcome these challenges, we use a natural experiment to estimate the effects of institutional ownership on liquidity. We use the cross sectional variation in stock ownership concentration resulting from the merger and acquisition (M&A) activity within PFAs in 2012 and 2013. Our empirical strategy follows a difference-in-difference approach by assessing whether there were any disproportional changes in trading activity and bid-ask spreads for stocks in which PFAs had large common ownership. The effects we document are economically and statistically significant. For the average stock, a one percent increase in institutional ownership concentration implies a 3.4% rise in the bid-ask spread and a 4.0% reduction in turnover. These adverse liquidity effects are present after controlling for the pension funds direct impact on trading activity, i.e. after taking into account PFAs trading volume in each stock. Overall, our results suggest that increased institutional ownership, via the threat of informed trading, is adversely affecting liquidity in the domestic stock market.

Our paper is related to several strands of the literature. Studies on group affiliation in emerging markets have generally seek to study firms’ performance (Khanna and Palepu (2000) for India and Claessens et al. (2006) for East Asia). We instead focus on the trading strategies of asset managers in companies which belong to these business groups. To the best of our knowledge, our paper is the first to document information flows within these business groups.

Our work is also related to the empirical literature that studies whether different types of institutional investors trade based on private information (Sias, 2004; Bushee and Goodman, 2007; Massa and Rehman, 2008). One of the main drawback of our exercise is the lack of data on PFAs’ actual trading activity. We infer PFAs’ trades from their monthly portfolio changes, which is a noisy measure of the actual transactions conducted by the PFAs over a month. As shown by Puckett and Yan (2011), the inability to account for interim trades is likely to underestimate the information advantage of different type of investors. Using transactional data, Pedraza et al. (2016) find that Colombian PFAs buy (sell) stocks at lower (higher) prices than other domestic and foreign investors. Unfortunately, their database is not well suited
for our exercise since their transactional information only reports investor type and does not disclose the actual investor for each transaction. Without such information one cannot match PFAs with the listed companies that belong to their business group. The advantage of our empirical exercise is that we are able to estimate the relation between current trades of affiliated funds and future stock performance relative to the trades of non-affiliated funds in the same stock, and trades by the same fund in other similar stocks with no affiliation.

Finally, our analysis is related to the empirical literature that studies the negative relationship between ownership concentration and market liquidity.\(^5\) Brockman et al. (2009) find that block ownership, defined as shareholders who hold 5\% or more of a firm’s shares, affects liquidity via a relative lack of trading, and not by information frictions. We follow Brockman et al. (2009) in that we control for the reduction of trading activity by the merging or acquire PFA. Interestingly, the effect of ownership concentration on liquidity (larger bid-ask spreads) remains economically and statistically significant. We interpret this result as the effect due to the perceived threat of informed trading in stocks in which PFAs increased their ownership concentration.

The rest of the paper is organized as follows. In section 2 we provide some background on the Colombian institutional setting. We introduce our main hypothesis and describe the data in section 3. In section 4 we study trading by PFAs in group-related stocks. Section 5 studies the relation between institutional ownership concentration and liquidity. We conclude in Section 6.

\(^5\)Rhee and Wang (2009) documents a negative correlation between the presence of foreign institutional investors and liquidity in Indonesia.
2 The institutional setting

2.1 Business groups and ownership concentration

Corporate ownership concentration is the exception rather than the rule outside the United States and the United Kingdom. Since the seminal work of Porta et al. (1999), which considered a small group of developed economies, there has been extensive evidence for East-Asia (Claessens et al., 2000), continental Europe (Barca and Becht, 2001), and Latin America (OECD, 2015), showing that controlling shareholders typically have power over firms which significantly exceed their cash flow rights through the use of pyramids, cross-ownership, participation in management, and other complex web structures.

The formation of conglomerates and business groups in Colombia dates back to the 1950s, where vertical integration was introduced to control productive chains from upstream to downstream industries. Most of these firms started as a family businesses and then became corporate groups with strategic investments in their core business, and later expanded to many other industries. In these groups, non-core activities along with holdings investment and fiduciary funds play a central role to form coalitions and control boards.

In a recent comparative review of 45 countries, Colombia ranks third in terms of the proportion of aggregate market capitalization attributable to family-led company group firms (Masulis et al., 2011). Two prominent examples of the scale and ample presence of these conglomerates in several economic sectors are the Business Group of Antioquia (GEA for its Spanish name) and Grupo Aval. GEA is a business group formed by more than 120 listed and non-listed firms in several industries. Its core businesses are cement, processed food, construction, textiles, and financial services. Among its financial companies are the largest commercial bank and insurance company in the country, and the second largest PFA, Proteccion.\textsuperscript{6} Grupo Aval on the other hand is the largest financial conglomerate in the country. The conglomerate comprises four commercial banks, an investment bank, and the

\textsuperscript{6}Measured by total assets at the end of 2014.
largest PFA, Porvenir. The group is controlled by its founder Luis Carlos Sarmiento. The group also has presence in other industries such as telecommunications, energy and real state, in firms with sufficient amount of voting stocks to control their policies.

To deal with the challenges associated with corporate governance in business groups, financial authorities have established regulatory frameworks with special focus on disclosure (OECD, 2015). For example, many jurisdictions require business groups and their companies to report their ownership structure and consolidated financial statements. In Colombia, listed firms being part of a group are require to disclose the general structure of the group and any changes in control.

2.2 The private pension system

The Colombian private pension industry is a fully funded defined contribution system with personal retirement accounts. These funds are managed by PFAs. These management companies collect compulsory contributions by workers, manage the investment portfolio, and payout benefits. Before 2011, the worker investment decision was restricted to the choice of a PFA. During this time, each PFA would pool workers’ contributions into one fund. In other words, any two workers associated with a particular PFA would have the same asset allocation independent of their age or income. Starting in 2011, PFAs were allowed to offer a menu of three funds with different risk profiles, i.e. risky, moderate, and conservative (translated from their Spanish names). Consequently, the worker was allowed to chose a PFA and the share of her personal account that would be invested in each of the three funds subject to some age restrictions.

PFAs are required to invest part of their net worth in the funds they manage. More precisely, 1% of each fund has to be constituted by the managing company with their own net worth. The government regulates PFAs’ portfolio strategies by imposing limits on specific asset classes and individual securities. For example, by December 2010 some of these

\footnote{Most of its design follow the leading example of Chile.}
limits were: (i) Maximum 50% on domestic government debt, (ii) maximum 40% on equity securities, (iii) maximum 40% on foreign securities, and (iv) maximum 10% per issuer.\(^8\)

To limit the exposure of pension funds in parent companies of the PFA and those in which pension fund managers might have conflict of interest, there is a 10% ceiling on investments in related companies. These are shareholders with at least 5% ownership of the PFA, or companies in which the PFA has at least 5% of total voting rights.\(^9\) There are, however, no explicit restrictions on investment in companies of the same business group. That is, PFAs might invest more than 10% of assets under management in companies that belong to their business group, as long as these are not related companies, and the 10% limit per issuer is satisfied.\(^10\)

3 Hypothesis and Data

We define group affiliation between a PFA and a listed firm when the two companies share the same principal shareholder. In this case, the PFA is essentially a firm insider. Knowledge of private forecasts, confidential reports, and future deals, could be an invaluable source that might help the PFA to identify the precise time to trade a particular stock. While sharing of private information violates the Colombian insider trading laws, it is unclear whether the regulation has been effective in deterring the flow of information between different companies of a business group. A PFA with group affiliation can benefit from the use of group-related information by making better trades and outperforming other pension fund managers, possibly attracting additional money flows, and increasing future compensation.

If information flows between listed companies and their affiliated pension fund managers, we expect that changes in holdings of these funds to be systematically correlated with the future performance of the stock. That is, if changes in holdings in affiliated stocks are driven

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\(^8\) Excluding the Colombian government.

\(^9\) This restriction is common in many countries, for example, pension funds in Mexico and Peru have a 5% and 10% limit respectively on related firms.

\(^10\) In contrast, Chile bans PFAs from trading in related companies and in those that belong to the same business group as the PFA.
by private information, then the performance in stocks in which affiliated funds increase (decrease) their holdings should be superior (inferior) to that of other non-affiliated similar stocks. Moreover, trades by affiliated PFAs should outperform those of non-affiliated PFAs in the same firm. We posit our first hypothesis as follows:

**H1.** Trades by affiliated funds should be more correlated with stock future performance than: (i) trades by non-affiliated funds in the same stock, and (ii) trades by the same fund in other similar stocks with no affiliation.

The alternative hypothesis is that in the absence of information flows within business groups, the relationship between PFAs’ trades and future stock performance should be the same for affiliated and non-affiliated firms.

Next, we investigate whether pension funds ownership concentration impacts secondary market liquidity. In particular, if PFA holdings are used by their owners to form coalitions, control boards, or increase their cross-ownership and voting rights in listed firms, the resulting information structure of the firm is likely to increase transaction costs, as less-informed investors and financial intermediaries require additional compensation for adversely selected trades. During the sample period, there were two M&A deals between domestic and foreign PFAs. As a result there was a significant increase in stock ownership concentration, particularly for listed companies in which both merging PFAs and both acquire and target PFA had significant amount of common ownership. If large increases in ownership concentration by institutional investors alter the information structure of the firm and increase the threat of informed trading, such changes are expected to be detrimental for secondary market liquidity. Our second testable hypothesis reads as follows:

**H2.** Stocks with large common ownership among PFAs involved in M&A deals are more likely to exhibit lower trading activity and higher transactions costs.
3.1 Data sources and main variables

Data in this paper were collected from three sources. Information on portfolio holdings by Colombian Pension Funds was provided by the Superfinanciera de Colombia (SFC), a supervisory agency within Colombia’s Finance and Public Credit Ministry which oversees all financial, insurance and pension services in the country. The data include detailed security allocations for all private pension funds on a monthly basis between January 2004 and December 2014. Figure 1 presents the time series of pension funds monthly cumulative net flows into stocks (solid line) normalized by the size of the domestic stock market. PFAs have consistently increased their participation in the stock market, with the exception of a few short-lived periods of net outflows. By December 2010, these Colombian Pension Funds had 32% of their $59.6 billion invested in domestic stocks, which amounted to 13% of total market capitalization.

We augment our dataset by including monthly trading activity from the Colombian Securities Exchange. The data include monthly trading volume in each stock by all PFAs. The information, however, is not disaggregated by PFA and only includes industry totals. Figure 1 displays PFAs monthly trading volume as a percentage of the total amount traded in the stock exchange (dash lines). On average, pension fund trades represent over 12% of the value traded in each month. Overall, not only do these funds make up for a significant portion of the domestic equity market, but they also represent a large fraction of the trading volume.

We use Compustat Global for daily stock prices and firms’ quarterly balance sheet information.\(^\text{11}\) To avoid stocks with small trading activity, we restrict our sample to stocks that trade at least 25% of the business days when the stock was active. We also limit our sample to stocks in which at least one PFA had any holdings during the period. Our final sample includes 57 different stocks, which represent 93% of total stock market capitalization and 95% of the trading volume.

\(^\text{11}\)Compustat Global has missing information for several small Colombian firms. We collect balance sheets for these companies directly from the SFC.
The SFC also reports quarterly equity ownership information, i.e. names and holdings of the largest twenty shareholders, total institutional ownership, and total ownership by foreign investors in each stock. We classify each stock-PFA pair as part of the same business group when they share the same principal shareholder. Thirty stocks are matched with a particular PFA (only one PFA has no match). These listed firms with group-affiliation represent 41% of the total market capitalization and 49% of trading activity. Table 2 reports assets under management as of December 2010, average monthly net flows as a percent of assets under management, number of stocks in the portfolio, and stocks with group affiliation for each PFA. We end up with 10,704 monthly observations of PFAs’ stock holdings.

Table 3 presents summary statistics sorted by affiliation type. The last column includes t-statistic for a difference in means test for each of the variables in the table (group-affiliated minus non-affiliated). Affiliated firms have on average more assets, greater institutional ownership, and are more leveraged than non-affiliated firms.

4 Information flows in business groups

In this section we test hypothesis H1 by studying the trading patterns of pension funds in affiliated and non-affiliated firms. Our strategy is to test whether trading activity of a pension fund in group-affiliated firms are more correlated with future stock returns than those trades of the same fund in non-affiliated stocks. We also test whether the trades in an affiliated firm are more correlated to future performance relative to those trades of other PFAs in the same stock.

Our main dependent variable is a measure of fund trading activity. We define the percentage of stock $s$ held by each fund at the end of month $t$ as

$$H_{f,s,t} = \frac{A_{f,s,t}}{SO_{s,t}}$$

where $A_{f,s,t}$ is the number of shares in the portfolio of pension fund $f$ and $SO_{s,t}$ is the
number of shares outstanding. Our measure of trading is defined as the change in monthly holdings

\[ \Delta H_{f,s,t} = H_{f,s,t} - H_{f,s,t-1}. \] (2)

For each stock, we calculate monthly abnormal returns \((ARET_{s,t})\) as \(ARET_{s,t} = r_{s,t} - E[r_{s,t}]\), where \(r_{s,t}\) are stock returns between \(t-1\) and \(t\), and expected returns \((E[r_{s,t}])\) are calculated relative to the IGBC index, a widely used value- and liquidity-based index for the Colombian stock market.\(^{12}\)

To check for momentum versus contrarian style of trading, we relate changes in holdings to firms’ past abnormal returns. In order to assess whether trades are informative, we test whether changes in holdings predict firms’ future returns. We estimate the following regression model:

\[ \Delta H_{f,s,t} = \alpha_0 + \beta_1 X_{s,t} + \beta_2 X_{s,t} \times AFFIL_{f,s,t} + \beta_3 AFFIL_{f,s,t} + \gamma CONTROLS_{f,s,t} + \varepsilon_{f,s,t} \] (3)

where \(X_{s,t}\) is either stock \(s\) lagged monthly abnormal returns \(ARET_{s,t-1}\) or future monthly abnormal return \(ARET_{s,t+1}\). \(AFFIL_{f,s,t-1}\) is a dummy variable equal to one if the stock \(s\) and pension fund \(f\) belong to the same business group at time \(t\). We include fund- and firm-level controls that are commonly used in the literature. We use fund net-flows \(NETFLOW_{f,t}\), fund assets under management \(AUM_{f,t}\), and fund lagged annual returns \(LAGRET_{f,t}\). At the stock level, we include firm size \(SIZE_{s,t}\), book-to-market ratio \(BM_{s,t}\), returns over assets \(ROA_{s,t}\), and stock trading activity \(TURNOVER_{s,t}\). The complete list of variables with their corresponding definitions and source are presented in Table 1.

In our specification, we include year, firm and fund fixed effects for several reasons. It is otherwise possible that the results are driven by a selection bias. If there are some

\(^{12}\)As a robustness test, we perform the empirical analysis using raw monthly returns and find similar results.
omitted firm or fund characteristics that drives the ability of pension fund managers to collect information, the results could be entirely explained by the fund manager selection. The coefficient \( \beta_2 \) measures how past and futures returns are related to pension funds’ trading behavior over time and across firms, when the fund belongs to the same business group as the firm. Given the potential persistence, we allow the error term \( \epsilon_{f,s,t} \) to be correlated within stocks or funds and correct the standard errors as in Petersen (2009). We standardize \( \Delta H_{f,s,t} \) such that the magnitude of the estimated coefficients is directly informative about economic significance.

Table 4 presents the results. The estimated parameter on \( ARET_{t-1} \) in column 1 is positive and significant at the 5% confidence level. Pension fund managers appear to be momentum traders on non-affiliated stocks. There is extensive evidence of momentum trading among institutional asset managers. Perhaps the closest set-up to the Colombian institutional environment is Chile, where Raddatz and Schmukler (2012) document momentum strategies among PFAs. According to Pedraza (2015), momentum trading by PFAs in these countries is exacerbated by regulation which explicitly penalizes pension fund managers for underperformance relative to their peers.\(^{13}\) In these circumstances, if a PFA is under-invested relative to its peers in a stock with high returns, it might have to increase its holdings in the stock in order to avoid the likelihood of underperforming its peers in the future.

In the context of international portfolios, Brennan and Subrahmanyam (1996) show that it is optimal for less-informed investors to chase returns. Interestingly, the estimated parameter on \( ARET_{t-1} \times AFFIL_{f,s,t} \) is not statistically different from zero, which implies that current trades in affiliated firms are not related to past returns. In other words, while there is some evidence of momentum strategies in non-affiliated firms, there is no evidence of such behavior in affiliated companies, perhaps as a first indication of differences in the information structure between these two types of firms and fund managers.

To answer the question of whether trades by affiliated pension funds are informative

\(^{13}\)This regulation is popular in many countries in the region with pension systems based on individual retirement accounts, e.g. Chile, Peru, Uruguay, among several others.
about future returns we turn to column 2 in Table 4. The coefficient of $ARET_{s,t+1}$ is not significantly different from zero, i.e. there is no evidence that pension fund managers’ trades on non-affiliated firms predict future abnormal returns. The estimated parameter on the interaction term $ARET_{s,t+1} \times AFFIL_{f,s,t}$ is positive at 0.028 and significant with a t-statistic of 2.60. The result suggests that trades of pension funds on affiliated firms are in general informative about future abnormal returns. Consistent with table 3, group affiliation is not correlated with monthly trading behavior. That is, PFAs do not seem to trade more on affiliated stocks vis-á-vis non-affiliated stocks. The results are robust to controlling for PFA holdings in each stock, columns 2 and 4 in Table 4.

4.1 Ownership or affiliation

There is extensive evidence that supports the notion that institutional investors trades contain private information. Parrino et al. (2003) show that sales by institutional investors precede CEO turnover and negative long-run returns. Bushee and Goodman (2007) find that the private information content of an institutional investors trade increases in his stake. In addition to having greater incentives to collect additional information regarding the firms future potential, institutions with large fractional ownership often have access to board members, senior managers, suppliers, and customers. Such access is typically not available to smaller investors.

We test whether the trades of pension funds that are among the largest shareholders of the firm are also good predictors of future returns. We replace the affiliation dummy in equation (3) by a dummy equal to 1 if the fund is among the largest five ($Top5$), ten ($Top10$), or twenty ($Top20$) shareholders in the company. Table 5, columns 2 and 4 reveal that trades by pension funds with large stakes in a firm are good predictors of future short-term abnormal returns, consistent with other findings in the literature. In particular, the estimated parameter on $ARET_{s,t+1} \times TOP5_{f,s,t-1}$ is positive at 0.054 and significant with a t-statistic of 7.97. The coefficient is not statistically different from zero when we consider pension funds among the
top 20 largest shareholders ($ARET_{s,t+1} \times TOP20_{f,s,t-1}$ in column 6). For this group, PFAs appear to be momentum traders, significantly increasing (decreasing) their stakes following positive (negative) abnormal returns (coefficient of $ARET_{s,t-1} \times TOP20_{f,s,t-1}$ is 0.032 and statistically significant).

It is possible that our observation that trades by group-affiliated PFAs precede future abnormal returns is simply capturing those pension funds with high fractional ownership. In other words, PFAs among the largest shareholders in each company. In this case information might not be derived from group affiliation but through direct ownership in the firm as we documented above. In order to address this issue we exclude from our definition of affiliation PFA-stock pairs in which the PFA is among the largest five shareholders in the firm. We present the results of this specification in columns 7 and 8 of Table 5. The evidence suggests that trades on affiliated firms still predict future short-term abnormal returns after excluding trades in stocks with large fractional ownership.

As a final robustness check, we test whether higher predictability stems from larger stock ownership relative to other pension funds. For instance, PFAs might specialize in a subset of listed firms, in which they end up with larger ownership relative to other pension fund managers. We denote $w_{f,s,t}$ as the weight of stock $s$ in the portfolio of pension fund $f$ at the end of month $t$. For each stock we calculate the weight on the industry portfolio, which refers to the holdings of all six pension funds in each stock ($\pi_{s,t}$). We define overexposure as the weight of stock $s$ in the portfolio of fund $s$ relative to the weight in the industry portfolio, i.e. $OEXP_{f,s,t} = w_{f,s,t} - \pi_{s,t}$. We test whether trades by PFAs in stocks with large overexposure better predict future returns. We estimate equation (3) including $OEXP_{f,s,t}$ and the interaction with future abnormal returns in replacement of the affiliation dummy. Table 6 presents the results. We find once again that PFAs are momentum traders on the average stock. However, there is no evidence that trades by pension funds with greater exposure relative to other PFAs are more correlated with future returns.

In summary, we show that while PFAs are momentum traders in non-affiliated stocks,
trades on affiliated firms anticipate future returns. The evidence is robust to controlling for both fractional ownership and relative ownership with respect to peers. Overall the evidence is consistent with PFAs trading on private information in listed companies of their own business group.

5 Ownership Concentration and Liquidity

It is well known that secondary markets in developing countries are not as liquid as those in developed economies. The lack of liquidity is regarded as a key factor for the high volatility and a significant impediment for financial market development. High levels of ownership concentration and business group ties such as the ones studied in the previous section are likely to exacerbate information asymmetries, potentially discouraging investment and negatively impacting liquidity. In this section we study these issues and test whether institutional ownership concentration has been detrimental for liquidity.

In addition to information frictions, institutional ownership concentration can affect secondary market liquidity by directly altering the firm’s trading activity.\footnote{Previous empirical research has shown that trading volume is negatively related to bid-ask spreads and price impact (Stoll, 2000; Brockman et al., 2009).} For example, if institutional investors such as pension funds trade less relative to other investors, the liquidity-provision costs are spread out over fewer trades. In turn, the relation between liquidity and ownership concentration is likely to compound the direct effects from lower trading, together with those related to adverse selection.

Understanding the relation between institutional ownership and market liquidity is important because of its direct implications for asset pricing and corporate governance.\footnote{For example, the causal link between market liquidity and cost of capital is well known (Amihud, 2002; Brennan and Subrahmanyam, 1996, e.g.).} In this section we use the M&A activity between PFAs as a natural experiment to test whether greater institutional ownership concentration negatively impacts secondary market liquidity. Moreover, we study whether liquidity effects are driven by information frictions as opposed
to those resulting from changes in trading activity.

5.1 Baseline specification

We start by documenting the average relationship between liquidity and ownership concentration. Our baseline specification can be written as follows:

\[ liq_{s,t} = \alpha_s + \gamma_t + \beta_1 CONC_{s,t-1} + \beta_2 INS_{s,t-1} + \beta_3 FOREIGN_{s,t-1} + \nu PFAT_{s,t} + X_{s,t-1} + \phi + \varepsilon_{s,t} \] (4)

where \( liq_{s,t} \) is either the natural log of turnover during each quarter to capture trading activity, or the natural log of the bid-ask spread to account for transaction costs. \( \alpha_s \) and \( \gamma_t \) are stock and year fixed effects to account for time-invariant stock characteristics and for aggregate trends in trading activity and liquidity. \( X_{s,t} \) are stock time-varying controls which include firm size, book-to-market ratio, leverage, and returns over assets. Consistent with the previous section, we define ownership concentration in stock \( s \) as the total ownership of the largest five shareholders (\( CONC_{s,t} \)). We also include the percentage of institutional ownership (\( INS_{s,t} \)) and foreign ownership (\( FOREIGN_{s,t} \)) in each stock. Finally, we include the quarterly trading activity of all active pension funds (\( PFAT_{s,t} \), measured as the shares traded during the period over the total number of shares outstanding.\(^{16}\)

Table 7 presents the results. We find that ownership concentration and institutional ownership are negatively related to trading activity. These results are likely to reflect the trading styles of blockholders and other institutional investors in each listed company. We also find that PFAs trading activity is positively related to total stock turnover and negatively related to bid-ask spreads. However, we cannot assess whether PFAs active trading actually lowers overall transaction costs, or these managers simply prefer more liquid stocks.

Table 7 also shows that stocks with higher book-to-market ratios report larger bid-ask

\(^{16}\)Once again, we allow for the error term \( \varepsilon_{s,t} \) to be correlated within stocks and correct the standard errors.
spreads. A common explanation for this observation is that less liquid stocks are more likely to be mispriced.

Notably, we do not find any evidence that concentration and institutional ownership are related to bid-ask spreads. There are, however, several limitations to our baseline approach. First, according to Bolton et al. (1998), the ownership structure of a company and in turn the extent to which its shares are traded in secondary markets is an optimal choice that balances the trade-offs between ownership control and intervention from outsiders. If we are omitting any variable related to corporate decisions that affects both ownership concentration and liquidity (e.g. leverage, dividend payouts, stock buybacks), the coefficient of $CONC$ is likely biased. Second, in the baseline empirical strategy, we cannot establish the relative importance of the adverse selection channel. In other words, we cannot ascertain whether the negative relation between concentration and turnover is due to the lack of trading activity among the largest shareholders in a company, or whether the threat of informed trading discourages trading activity in stocks with high ownership concentration.

5.2 A Natural Experiment

In order to overcome the identification issues mention above, we exploit a natural experiment based on two separate M&A deals between PFAs. In December 2012, Proteccion, the second largest pension fund manager in the country at the time, completed a merger with ING. The operation was part of a larger deal that included the asset management business of ING in Latin America. In the following December, Porvenir, acquired BBVA-Horizonte, reducing the private pension industry from six managers in 2012 to four by the beginning of 2014.

In the domestic equity market, an implication of these deals was the resulting increase in stock ownership concentration, particularly in listed companies in which both merging PFAs or acquire and target PFA had a significant amount of common ownership. While the decision to acquire or to merge with a competing PFA is the result from a strategic business choice, we argue that the cross-sectional increase in ownership concentration arising from
these deals is exogenous to corporate decisions of publicly traded companies that are likely to affect secondary market liquidity.

Our specific instrument is the ratio of common ownership in every stock by each pair of PFAs at the time of the merger/acquisition. More precisely, we define common ownership for each stock as the geometric average between the holdings of the two funds one year before the deal as follows:

\[ FCAP_{s,k} = (H_{s,f1} \times H_{s,f2})^{1/2} \]  

where \( k \) is either 1 or 2, representing each deal. Our empirical methodology follows a difference-in-difference strategy by assessing whether changes in ownership concentration resulting from the M&A activity of pension fund managers affect liquidity disproportionately in stocks with large common ownership. In this approach, time variation stems from the deals occurring at different times, and the cross-sectional variation is based on PFAs’ ownership distribution across different stocks. To be more precise, the strategy here is to compare changes in liquidity before and after the M&A deals for stocks with high \( FCAP \) vis-à-vis changes in liquidity over the same period for stocks with low common ownership.

Our specification can be represented in two stages. In the first stage, we estimate ownership concentration as follows:

\[
CONC_{s,t} = \alpha_s + \gamma_t + \sum_{k=1,2} \beta_k d_k + \sum_{k=1,2} \lambda_k d_k \times FCAP_{s,k} + \sum_{k=1,2} \phi_k d_k \times X_{s,t} + \varepsilon_{s,t}
\]  

where \( d_k \) is a dummy variable equal to zero before merger \( k \), and equal to one thereafter. As usual, we include stock fixed effects to account for time-invariant stock characteristics and year fixed effect to account for aggregate trends in ownership concentration. To address for potential changes in concentration resulting from other time-varying stock characteristics we

\footnote{We do this to avoid possible portfolio recompositions in anticipation to the M&A deal. In unreported results, we calculate common ownership with the holdings at the time of the deal and find similar results.}
include the controls introduced earlier in equation (4). The coefficients $\lambda_1$ and $\lambda_2$ measure the average increase in ownership concentration for every unit of common ownership after the merger. In all specifications, we cluster the standard errors by industry to control for serial correlation over time and across stocks within an industry.

Table 8-Panel A reports the estimated coefficients of the first stage (6). We find that $\lambda_1$ and $\lambda_2$ are positive and highly statistically significant. To visually examine aggregate ownership dynamics during our sample period, we plot the time series of ownership concentration in Figure 2 for two groups of stocks, those above and below the median of common ownership ($FCAP$). After each deal, there was an average increase of 1.8% in ownership concentration for the high $FCAP$ group, while other stocks did not experience any substantial changes in their ownership concentration trend.

In the second stage, we use the fitted ownership concentration ($\hat{CONC}_{st}$) to estimate the level of trading activity and market liquidity as in equation (4). In order to account for any direct effect on liquidity via less trading activity due to a reduced number of PFAs, we use the following two proxies: (i) The quarterly turnover of all pension funds in each stock during the sample period as introduced in the previous section ($PFAT$), and (ii) the average quarterly change in stock holdings for each of the exiting PFAs, i.e. for ING and Horizonte, interacted with the M&A dummies ($d_1$ and $d_2$).

The first row of estimates in Table 8-Panel B corresponds to the 2SLS coefficients on instrumented $CONC$. In the case of turnover, the coefficient is -4.00, which is statistically significant with a t-statistic of 2.04. This causal effect is economically significant as well, i.e. a one percent increase in ownership concentration implies a 4.00% decrease in turnover. We also find that higher ownership concentration implies an increase in transaction costs. In particular, a one percent increase in concentration implies a 3.40% increase in the bid-ask spread.

The adverse liquidity effects are present after controlling for $d_1 \times ING$, $d_2 \times HORIZONTE$, and $PFAT$ which represent the average trading of the exiting funds in each stock and the
quarterly turnover of all active PFAs respectively.

These findings suggest that market participants internalize the increase in ownership concentration by adjusting the liquidity provision costs in order to protect against adversely selected trades. Whether PFAs actually have access to private information as they increase their ownership in a firm remains an open question. Nonetheless, our results do indicate that the market is anticipating a change in the information structure of the firm.

Figure 3 displays the estimated logs of turnover and bid-ask spreads for the stocks in the high and low common ownership groups. The figure also displays the predicted measures of turnover and bid-ask spreads assuming that neither one of the M&A deals were completed. According to the figure, stocks with high common ownership have more turnover and lower bid-ask spreads on average than those with low common ownership. While turnover has been consistently declining in the sample period for both groups of stocks, there is a significant additional decline in turnover after each M&A deal for stocks with large common ownership. Conversely, for the latter group, bid-ask spreads significantly increased after each deal.

In summary, our evidence indicates that the consolidation of the pension fund management industry in the country had detrimental effects for secondary market liquidity, particularly for stocks in which PFAs had a great amount of common ownership. The differential liquidity effect among stocks, and the fact that the effects are present after controlling for PFAs' trading activity suggest that information frictions resulting from the new ownership structure might be the reason for the observed higher transaction costs.

6 Conclusions

This paper investigates the information available to asset managers when they belong to a business group and the consequences of ownership concentration on secondary market liquidity. We find that changes in portfolio holdings in affiliated firms are more correlated to future abnormal returns, relative to those of the same fund in other non-affiliated stocks, and
relative to trades by other funds in the same stock. The results are robust after controlling for the funds’ past stock holdings in each company and various proxies of risk, such as firm size, book-to-market, past returns, and other year, stock and fund fixed effects.

Our results suggest that business group structures and concentrated ownership benefits asset managers, as they appear to have access to private information. However a broader question arises to whether this set up deteriorates market efficiency and corporate governance. We provide evidence that increases in ownership concentration have been detrimental for liquidity. The results seem to confirm that changes in the information structure play a significant role in the observed increases in transaction costs.

Our findings have several policy implications. The benefits of financial reforms such as the introduction of international standards in accounting, financial disclosure, security trading and clearance are likely to be constrained by each country’s institutional environment (Stulz, 2005). Domestic institutional investors with extensive ties to local industries might hamper financial development by indirectly discouraging outside investors to participate in these markets, increasing the cost of capital for firms (Amihud, 2002; Brennan and Subrahmanyam, 1996, e.g.). Moreover, by discouraging outside investors to produce information, secondary markets might become less informationally efficient (Gul et al., 2010), failing to provide useful signals to households, firms, financial intermediaries, and regulatory authorities. It is possible that the private benefits of information flows between business groups and the potential economies of scale in the asset management industry might be out-weighted by the social costs of higher cost of capital and less efficient markets. Regulation discouraging trading activity in group affiliated firms and investment rules that promote diffuse ownership concentration might need to be considered by the local authorities.

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### Appendix: Tables

#### Table 1

| Variable       | Definition                                                                                           | Source        |
|----------------|-----------------------------------------------------------------------------------------------------|---------------|
| $ARET_{s,t}$   | Monthly abnormal returns defined as $ARET_{s,t} = r_{s,t} - E[r_{s,t}]$ where $r_{s,t}$ are stock   | Datastream    |
|                | returns between $t-1$ and $t$, and $E[r_{s,t}]$ are expected returns, calculated relative to a     |               |
|                | market index                                                                                       |               |
| $CONC_{s,t}$   | Percentage of shares held by the largest 5 owners                                                   | SFC           |
| $INST_{s,t}$   | Percentage of shares held by institutional investors                                               | SFC           |
| $FOREIGN_{s,t}$| The percentage of shares held by foreign investors                                                 | SFC           |
| $B/M_{s,t}$    | Book-to-market ratio, computed as the total net assets, divided by the total market value of equity | SFC           |
|                | at the end of the quarter                                                                          |               |
| $SIZE_{s,t}$   | Firm size computed as the log of total assets at the end                                           | SFC           |
|                | of the quarter                                                                                     |               |
| $ROA_{s,t}$    | Return over assets                                                                                 | SFC           |
| $LEV_{s,t}$    | Leverage computed as total liabilities divided by total assets                                     | SFC           |
| $SPREAD_{s,t}$ | Bid-ask spread of stock defined as $(ask - bid)/(ask + bid)/2$                                     | Datastream    |
| $TURNOVER_{s,t}$| Number of shares traded, divided by the number of shares                                           | Datastream    |
|                | outstanding                                                                                       |               |
| $H_{s,f,t}$    | PFA holdings on stock $s$ divided by the number of shares                                          | SFC           |
|                | outstanding (monthly and quarterly)                                                                |               |
| $AFFIL_{s,f,t}$| An indicator variable for each stock-PFA pair. It equals                                           | SFC           |
|                | if the PFA and the firm belong to the same business group                                          |               |
Table 2
Pension Fund Managers and Group Affiliations

This table reports assets under management (AUM) and monthly net flows for each pension fund manager. The table also reports the number of stocks that are in each PFA portfolio and those that are in the same business group.

| PFA     | AUM (U$ billions) | Flows (% of AUM) | No. of Stocks | Stock with affiliation | No. Obs. |
|---------|--------------------|------------------|---------------|------------------------|----------|
| Ing     | 6.67               | 2.35             | 43            | 2                      | 1977     |
| Colfondos | 8.00                | 2.22             | 40            | 2                      | 1777     |
| Horizonte | 9.27                | 2.02             | 42            | 1                      | 1814     |
| Porvenir | 19.30               | 2.32             | 29            | 8                      | 1639     |
| Proteccion | 13.77               | 2.32             | 41            | 17                     | 2036     |
| Skandia  | 2.53               | 3.60             | 29            | 0                      | 1461     |
| Total    | 59.54              | 2.28             | 57            | 30                     | 10704    |

Table 3
Summary Statistics

Descriptive statistics for publicly traded companies. Mean, median and standard deviation of variables split by affiliated and non-affiliated companies. Variables are defined in Table 1.

| Variable                  | Group-Affiliated Mean | Median | SD   | Non-affiliated Mean | Median | SD   | t - statistic |
|---------------------------|-----------------------|--------|------|---------------------|--------|------|--------------|
| Market Value (U$ billions)| 1.678                 | 1.716  | 0.747| 2.427               | 2.398  | 0.723| -4.025       |
| CONC                      | 0.601                 | 0.619  | 0.265| 0.633               | 0.716  | 0.294| -1.90        |
| INS                       | 0.888                 | 0.920  | 0.134| 0.848               | 0.938  | 0.202| 3.94         |
| FOREIGN                   | 0.130                 | 0.020  | 0.228| 0.303               | 0.052  | 0.379| -9.35        |
| GOVNT                     | 0.047                 | 0.000  | 0.120| 0.30                 | 0.000  | 0.412| -14.06       |
| B/M                       | 1.223                 | 0.755  | 1.284| 1.292               | 0.681  | 2.244| -0.62        |
| SIZE                      | 15.655                | 15.896 | 1.250| 14.427              | 14.313 | 1.66 | 14.05        |
| ROA                       | 0.022                 | 0.014  | 0.035| 0.042               | 0.030  | 0.067| -6.26        |
| LEV                       | 2.399                 | 0.613  | 3.139| 1.219               | 0.372  | 2.805| 6.68         |
| SPREAD                    | -3.294                | -3.547 | 1.191| -3.090              | -3.157 | 1.222| -2.49        |
| TURNOVER                  | -9.150                | -8.659 | 2.230| -8.407              | -8.347 | 1.980| -5.86        |
| ARET                      | 0.000                 | -1.263 | 8.025| 0.000               | -1.120 | 0.922| 2.648        |
| ΔH                        | 0.083                 | 0.005  | 1.086| 0.086               | 0.022  | 0.363| -0.27        |
| H                         | 0.041                 | 0.029  | 0.033| 0.013               | 0.013  | 0.006| 42.58        |
Table 4
Trading by Pension Funds and Abnormal Stock Returns

The dependent variable is monthly change in holdings $\Delta H_{f,s,t}$ of pension fund $f$ in stock $s$. $ARET_{s,t}$ is the monthly abnormal returns calculated relative to a market index. $AFFIL_{f,s,t-1}$ is a dummy variable equal to one if the stock $s$ and fund $f$ belong to the same business group. Errors are corrected for serial correlation and clustered at the stock level. Note: ***/**/* indicate that the coefficient estimates are significantly different from zero at the 1%/5%/10% level. T-statistic in parenthesis.

|                      | (1)  | (2)  | (3)  | (4)  |
|----------------------|------|------|------|------|
| $ARET_{t-1}$         | 0.009** | 0.009** |      |      |
|                      | (1.982) | (2.109) |      |      |
| $ARET_{t+1}$         | 0.005  | 0.005  |      |      |
|                      | (0.954) | (0.931) |      |      |
| $ARET_{t-1} \times AFFIL$ | 0.020  | 0.021  |      |      |
|                      | (1.011) | (1.070) |      |      |
| $ARET_{t+1} \times AFFIL$ | 0.028*** | 0.033** |      |      |
|                      | (2.601) | (2.448) |      |      |
| $AFFIL$              | -0.108 | -0.144 | -0.084 | -0.107 |
|                      | (-0.732) | (-0.943) | (-0.589) | (-0.734) |
| $SIZE$               | 0.063  | 0.069  | 0.021 | 0.027 |
|                      | (0.193) | (0.201) | (0.063) | (0.077) |
| $TURNOVER$           | 0.118  | 0.081  | 0.116 | 0.088 |
|                      | (0.397) | (0.307) | (0.374) | (0.307) |
| $H_{t-1}$            | -6.663** | -6.799*** |      |      |
|                      | (-2.370) | (-2.584) |      |      |
| $CONSTANT$           | -1.506 | -1.644 | -0.735 | -0.880 |
|                      | (-0.259) | (-0.271) | (-0.126) | (-0.145) |

Cluster: Stock | Stock | Stock | Stock
Fixed effects: Yes | Yes | Yes | Yes
$R^2$: 0.05 | 0.05 | 0.05 | 0.05
No.Obs.: 4215 | 4150 | 4215 | 4134
Table 5
Largest shareholders

The dependent variable is monthly change in holdings $\Delta H_{f,s,t}$ of pension fund $f$ in stock $s$. $ARET_{s,t}$ is the monthly abnormal returns calculated relative to a market index. $TOP$ is a dummy variable equal to one if the PFA is among the largest 5 (columns 1 and 2), 10 (columns 3 and 4), or 20 (columns 5 and 6) shareholders in each company. $AFFIL_{f,s,t-1}$ is a dummy variable equal to one if the stock $s$ and fund $f$ belong to the same business group and if the PFA is not among the top 5 shareholders (columns 7 and 8). Errors are corrected for serial correlation and clustered at the stock level. Note: ***/***/** indicate that the coefficient estimates are significantly different from zero at the 1%/5%/10% level. T-statistic in parenthesis.

| $GROUP =$ | Top 5 | Top 10 | Top 20 | AFFIL-TOP5 |
|-----------|-------|--------|--------|------------|
| $ARET_{t-1}$ | 0.012** | 0.009 | -0.003 | 0.009** |
|           | (2.070) | (1.624) | (-0.769) | (1.991) |
| $ARET_{t+1}$ | 0.006 | 0.003 | 0.007 | 0.005 |
|           | (1.028) | (0.692) | (1.357) | (0.946) |
| $GROUP$ | -0.300 | -0.296 | 0.206** | 0.323*** | 0.297*** | -0.074 | -0.113 |
|           | (-1.304) | (-1.586) | (2.470) | (2.768) | (2.949) | (-0.498) | (-0.739) |
| $ARET_{t-1} \times GROUP$ | -0.020 | 0.011 | 0.032*** | 0.019 |
|           | (-1.044) | (1.574) | (5.026) | (0.954) |
| $ARET_{t+1} \times GROUP$ | 0.054*** | 0.020** | 0.003 | 0.028*** |
|           | (7.965) | (2.372) | (0.402) | (2.712) |
| $CONSTANT$ | -1.469 | -1.525 | -1.895 | -1.779 | -1.832 | -1.502 | -1.631 |
|           | (-0.254) | (-0.255) | (-0.316) | (-0.300) | (-0.299) | (-0.258) | (-0.269) |

Cluster | Stock | Stock | Stock | Stock | Stock | Stock | Stock | Stock |
Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
$R^2$ | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.05 | 0.05 |
No. Obs. | 4215 | 4150 | 4215 | 4150 | 4215 | 4150 | 4215 | 4150 |
Table 6
Relative ownership vs. other pension funds

The dependent variable is the monthly change in holdings $\Delta H_{f,s,t}$ of pension fund $f$ in stock $s$. $ARET_{s,t}$ is the monthly abnormal returns calculated relative to a market index. Overexposure is defined as the weight ($w_{f,s,t}$) in stock $s$ of fund $f$ relative to the peer portfolio $OEXP_{f,s,t} = w_{f,s,t} - \pi_{s,t}$. The peer portfolio refers to the holdings of all six pension funds in each stock ($\pi_{s,t}$). Errors are corrected for serial correlation and clustered at the stock level. Note: ***/*/* indicate that the coefficient estimates are significantly different from zero at the 1%/5%/10% level. T-statistic in parenthesis.

|                     | (1)       | (2)       | (3)       | (4)       |
|---------------------|-----------|-----------|-----------|-----------|
| $ARET_{t-1} \times OEXP$ | -1.019    | -1.019    |           |           |
|                     | (-0.951)  | (-1.166)  |           |           |
| $ARET_{t+1} \times OEXP$ |           |           | 1.116     | 1.116     |
|                     |           |           | (1.417)   | (0.921)   |
| $ARET_{t-1}$       | 0.012**   | 0.012*    |           |           |
|                     | (2.164)   | (1.863)   |           |           |
| $ARET_{t+1}$       | 0.008*    | 0.008     |           |           |
|                     | (1.758)   | (1.621)   |           |           |
| $OEXP$              | -19.105***| -17.384***| -19.105** | -17.384** |
|                     | (-3.282)  | (-2.958)  | (-2.539)  | (-2.422)  |
| $H_{t-1}$          | 1.662     | 1.237     | 1.662     | 1.237     |
|                     | (0.533)   | (0.403)   | (0.690)   | (0.603)   |
| CONSTANT            | -1.194    | -1.208    | -1.194    | -1.208    |
|                     | (-0.372)  | (-0.358)  | (-0.227)  | (-0.219)  |
| Cluster             | Fund      | Fund      | Stock     | Stock     |
| Controls            | Yes       | Yes       | Yes       | Yes       |
| Fixed effects       | Yes       | Yes       | Yes       | Yes       |
| $R^2$               | 0.05      | 0.05      | 0.05      | 0.05      |
| No.Obs              | 4087      | 4006      | 4087      | 4006      |
### Table 7
Liquidity and Ownership Concentration

This table examines the relation between turnover and bid-ask spread with ownership concentration. \( \text{CONC}_{s,t} \) is the percentage of shares held by the largest five shareholders in stock \( s \). \( \text{PFA} \) is the quarterly trading activity of all active PFAs, measured as the shares traded during the period over shares outstanding for each stock. \( \text{INS} \), \( \text{FOREIGN} \), and \( \text{GOVNT} \) are the percentage shares held by domestic institutional investors, foreign investors, and by the government respectively. Errors are corrected for serial correlation and clustered at the stock level. We report t-statistics in parentheses. Note: ***/**/* indicate that the coefficient estimates are significantly different from zero at the 1%/5%/10% level.

|        | Turnover | Bid-Ask Spread |
|--------|----------|----------------|
| \( \text{CONC} \) | -2.635** | -0.680 |
|        | (-2.07)  | (-0.70)        |
| \( \text{PFA} \) | 0.184*** | -0.177***      |
|        | (4.67)   | (-5.73)        |
| \( \text{INS} \) | -3.963*** | 0.413 |
|        | (-3.87)  | (0.94)         |
| \( \text{FOREIGN} \) | 0.547 | 0.566 |
|        | (0.75)   | (1.18)         |
| \( \text{GOVNT} \) | 0.298 | -0.507 |
|        | (1.05)   | (-1.11)        |
| \( \text{SIZE} \) | 0.044 | -0.079 |
|        | (0.12)   | (-0.29)        |
| \( \text{B/M} \) | 0.017 | 0.220*** |
|        | (0.26)   | (4.73)         |
| \( \text{LEV} \) | -0.018 | -0.000 |
|        | (-0.49)  | (0.00)         |
| \( \text{ROA} \) | 0.378 | -1.785 |
|        | (0.44)   | (-1.42)        |
| \( \text{CONSTANT} \) | -4.615 | -2.182 |
|        | (-0.84)  | (-0.51)        |

Cluster Stock | Stock  
Stock fixed effects Yes | Yes  
\( R^2 \) 0.1412 | 0.2464  
N 1031 | 729
### Table 8
M&A Activity of Pension Fund Administrator

This table reports 2SLS instrumental variable regression based on a natural experiment. Panel A presents estimates of ownership concentration ($CONC$). $FCAP$ is the measure of common ownership among merging PFAs. $d_1$ and $d_2$ are dummy variables equal to one after each deal. Panel B presents second stage estimates of the natural log of turnover and bid-ask spread. $PFA$ is the quarterly trading activity of all active PFAs, measured as the shares traded during the period over shares outstanding for each stock. $ING$ and $HORIZONTE$ measure average trading activity in each stock by the exiting PFAs. We report t-statistics in parentheses. Note: ***/**/*** indicate that the coefficient estimates are significantly different from zero at the 1%/5%/10% level.

#### Panel A. First Stage

| Ownership Concentration | Turnover | Bid-Ask Spread |
|-------------------------|----------|----------------|
|                         | (A1)     | (A2)           | (A3)     | (A4)     |
| $d_1 \times FCAP_1$     | 0.737**  | 1.245***       | 0.560**  | 0.744*** |
|                         | (1.96)   | (4.31)         | (2.47)   | (4.48)   |
| $d_2 \times FCAP_2$     | 3.708*** | 2.711***       | 3.199*** | 2.152*** |
|                         | (8.00)   | (5.33)         | (6.68)   | (6.27)   |

| $R^2$                   | 0.970    | 0.969          | 0.967    | 0.979    |

#### Panel B. Second Stage

| Turnover | Bid-Ask Spread |
|----------|----------------|
|          | (B1)           | (B2)           | (B3)     | (B4)     |
| $CONC$   | -10.083***     | -4.000**       | 3.813*** | 3.403*** |
|          | (-4.31)        | (-2.04)        | (2.63)   | (2.42)   |
| PFAs Trading | 0.186***  | 0.186***       | -0.159***| -0.159***|
|          | (4.31)         | (4.31)         | (-3.41)  | (-3.41)  |
| $d_1 \times ING$  | 519.598***   |               | -75.061  |          |
|          | (5.83)         |               | (-1.55)  |          |
| $d_2 \times HORIZONTE$ | -65.542  |               | -18.171  |          |
|          | (-0.64)        |               | (-0.21)  |          |

Controls: Yes | Yes | Yes | Yes
Fixed effects: Yes | Yes | Yes | Yes
$R^2$: 0.7261 | 0.7515 | 0.606 | 0.7586
N: 1069 | 1069 | 844 | 733
Appendix B: Figures

Figure 1. Pension funds monthly cumulative net flows in domestics stocks normalized by total market capitalization (solid line) and PFAs value traded as a percentage of total traded value in each month (dash line). Vertical solid lines represent each M&A deal.
Figure 2. Time series of ownership concentration for stocks with high (solid) and low (dash) common ownership. Vertical solid lines represent each M&A deal.
Figure 3. Estimated time series of turnover and bid-ask spread for stocks with high and low common ownership (FCAP). For each group we present the estimated turnover and bid-ask spread in the absence of M&A activity.

(a) Turnover

(b) Bid-Ask Spread