

Business Ties and Information Advantage: Evidence from Mutual Fund Trading*

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Abstract

This paper examines whether ties to portfolio firms' management via pension business relationships provides mutual funds with an informational advantage. Funds become related to portfolio companies when fund families serve as trustees for firms' employee pension plans. Selling by related funds is more likely to be motivated by an information advantage than their buying, because the latter is heavily influenced by the desire to secure pension inflows. We find that stocks with larger net-sales by related funds experience lower future returns. Information appears related to firm fundamentals, as the return predictability of related funds' selling concentrates in stocks with negative future earnings surprises. Consistent with an information based explanation, the predictive power of related funds' selling for future returns is more pronounced when information uncertainty about the stock is higher. Our results contribute to a growing literature that shows the sources of informed trading by institutions.

JEL Classification: G23; G32; J32; L14

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1. Introduction

Many corporate pension plans employ mutual fund family companies as trustees for their pension plans. Pension ties change the relationship between the sponsoring firm's management and the trustee fund company in several important ways. The trustee's role as a fiduciary to plan participants and beneficiaries provides opportunities for the mutual fund company to interact with firm management over several years, which facilitates information sharing between the two parties. For example, the trustee can advise on decisions on plan investment options for defined contribution (DC) plans, including investment in the sponsoring firm's own stock. The trustee for a defined benefit (DB) plan advises management on investments and observes the plans' funding and risk-taking decisions. These repeated interactions provide the mutual fund company with a direct connection to the client firms' management, and can provide the trustee with information about the sponsor and/or an advantage in interpreting public information.

In this paper, we argue that mutual fund companies' management of corporate pension plans provides a widespread and economically important but unexplored setting to examine informational advantages.¹ We define a mutual fund to be *related* to a portfolio firm when the firm hires that fund's family company as trustee for its pension plan. An information advantage, if it exists, is expected to affect the investment decisions of trustee firms. Thus, buying or selling of the stock by the related fund, relative to trading by unrelated investors, is predicted to be positively related to subsequent returns on the stock.²

Related fund managers' investment decisions, however, will also reflect their incentive to

¹ At year-end 2014, mutual funds accounted for \$7.3 trillion, or 29 percent, of the \$24.7 trillion United States (U.S.) retirement market. The \$7.3 trillion in mutual fund retirement assets represented 46 percent of all mutual fund assets at year-end 2014 (Investment Company Institute, 2015 Investment Company Fact Book, available at www.icifactbook.org).

² Cohen and Schmidt (2009) and Davis and Kim (2007) examine whether 401K trustee fund families overweight their investment in stocks of pension business clients. Other research documents conflicts of interest in mutual fund voting due to pension ties (Davis and Kim 2007; Ashraf, Jayaraman, and Ryan 2012; Duan and Jiao 2016).

maintain their pension business relationship, which guarantees a large inflow of money in the form of plan assets invested in family funds.³ In the face of negative information about a client firm, the risk of losing their pension business and associated inflows if funds aggressively unload the related stock can be more salient than the potential profits from selling based on their information advantage. This has two important implications for the expected relationship between related fund trading and future returns. First, related funds might sell less or even buy when there is bad news because of the pension business incentive, blurring the expected positive relationship between related fund buying and returns. Second, related funds might sell only when news is sufficiently bad to offset the pension business incentive. In this case, we would observe that selling predicts negative subsequent returns only when there is more extreme negative information about the sponsor.

We use Form 5500 filed with Internal Revenue Services (IRS) to identify a sample of 102 mutual fund families serving as trustees for 660 firms' employee pension plans between 1993 and 2008. We first find that stocks with larger net-sales by related funds experience lower future returns, while no return predictability is observed when unrelated funds are selling. When there is more selling by related funds (trading is one standard deviation more negative), returns are economically and statistically lower – on average, 2.1 percent lower over the next quarter. In contrast, there is an insignificant association between related funds' buying in the current quarter and firms' future stock returns.

We then provide evidence that the informational advantage is related to firm fundamentals. The relationship between related funds' net-sales and future returns is most

³ Cohen and Schmidt (2009) estimate that trustee funds have 35 percent higher inflows on average and are 40 percent less likely to experience outflows than non-trustee funds of the same size, past returns, and same flow to its style. Cohen and Schmidt also find that trustees significantly increase their holdings at times when other fund families are selling large quantities of the sponsor's stock, suggesting the significance of the pension business relationship. Davis and Kim (2007) estimate the smaller but significant value of direct fees paid to pension plan service providers.

pronounced for stocks with negative earnings surprises in the future. We use the earnings surprise relative to analyst forecasts for each of the next four quarters to measure future earnings news. Return predictability of related funds' selling is stronger among stocks with negative earnings news in the next four quarters. These results suggest the informational advantage is linked to the sponsor firm's fundamentals.

Consistent with an information based explanation, we expect the relationship between related funds' net-sales and future returns to be strongest among stocks with higher information uncertainty, where potential profits from informed trading are greatest. Drawing on the existing literature (e.g., Lang and Lundholm 1996; Barron, Kim, Lim, and Stevens 1998; Wermers 1999; Thomas 2002; Campbell and Taksler 2003), we proxy for a stock's information environment using the firm's market capitalization, analyst earnings forecast errors, and idiosyncratic risk. We find that related funds' selling has stronger predictive power for future returns when information uncertainty is higher. These findings are consistent with the previous literature that examines informed trading by institutions. For example, Bennett, Sias, and Starks (2003, 1205) show a trading advantage is concentrated in smaller stocks which "provide greater opportunities for institutional investors to exploit their information advantages". Bushee and Goodman (2007) also find more informed trading for smaller firms.

It is important to consider whether one can plausibly attribute our results to a sharing of information between the firm management and the trustee fund family, and within the trustee fund family with the individuals making investment decisions for the funds. Prior research suggests that information used in investment decisions is shared among funds within a fund family (Pomorski 2009; Elton, Gruber, and Green 2007). We argue that through repeated interactions, the trustee relationship provides the fund family with direct access to firm management and/or information about the pension fund's investments (such as investment in the firm's own stock). Our return predictability results do not hold for other non-trustee service providers to the plan, who do not

share the same advantages as the trustee.⁴ We also find return predictability strengthens when the trustee has been retained for a longer period of time or when the pension plan reduces holdings of the sponsor's stock.

Our evidence is not supportive of alternative explanations for the return predictability results we document. One such alternative is mutual fund managers pay more attention to related stocks because they overweight them. However, when restricting the analysis to fund families overweighting a given stock, we find the return predictability of selling holds only for the related funds. For fund families that do not overweight our sample stocks, related funds' selling continues to be significantly related to lower future returns. Thus, it does not appear that attention to overweighted stocks drives our main result. Another potential explanation is that mutual fund managers with greater skill are more likely to be selected as trustees. Two pieces of evidence cast doubt on this alternative. First, return predictability holds only for stocks where there is a trustee relationship, and not for other stocks held by the same manager. Second, among funds with superior past performance, return predictability holds only for related stocks and not for other stocks.

Note that an informational advantage does not necessarily imply sharing of nonpublic information, but rather that some investors have a comparative advantage at obtaining information for certain firms. Still, some research more strongly argues that non-public information is shared within financial conglomerates. Ritter and Zhang (2007) study information transmission between investment banks and affiliated mutual funds. Massa and Rehman (2008) show that mutual funds owned by financial conglomerates can exploit information generated in-house by their lending activities. Their results question the effectiveness of regulations that limit information flows (i.e. Chinese walls) between different parts of the same financial group. In our context, Chinese walls

⁴ While we are not the first to study pension trusteeship links, Cohen and Schmidt (2009) find little return predictability. We further explain the differences in our research approaches in Sections 4 and 6.

may fail to separate mutual fund company employees who manage pension trustee relationships from those making trading decisions in funds.⁵ Regardless of whether there are comparative advantages in obtaining public information, or ineffective barriers to sharing confidential information, our results show that information advantages obtained via the trustee relationship can have economically important consequences for fund investors.

The framework for our paper broadly draws from three areas of research in the accounting and finance literature. First, a growing literature suggests that certain institutional investors can gain information about firms' fundamentals that leads to profitable trades. Gompers and Metrick (2001) are among the first to show that the level of institutional ownership of a stock predicts subsequent stock returns. Bushee and Goodman (2007) argue that overall informed trading by institutions is not great, but is concentrated amongst investment advisors including mutual funds. Exploring the nature of the private information, additional papers show that changes in holdings of certain institutions are positively associated with firms' future earnings and returns (Ali, Durtschi, Lev, and Trombley 2004; Ke and Petroni, 2004; Pinnuck, 2005; Ke, Ramalingegowda, and Yu, 2006). For example, Ali et al. (2004) show that changes in institutional ownership predict subsequent earnings announcement returns. They further show this behavior occurs when "fewer differentially informed investors make disproportional large purchases or sales of stocks".

Although these papers suggest informed trading by institutions, the mechanism through which some institutions gain information about firms is not clear.⁶ A second set of papers argues

⁵ The potential information advantages have been noticed by both practitioners and academicians. For example, security regulation expert and law professor David Webber notes that "... analysts at these funds are loathe to jeopardize their relationships with corporate management. They prize their ability to pick up the phone and get a manager to answer their questions. What questions? Folks I've spoken to inside the industry quickly say, "It's nothing like insider trading or anything", and folks I've spoken to outside the industry say "it's insider trading"". (*Laborcapital.org*, October 2010).

⁶ Ali et al. (2004, 247) conclude that "the source of superior information about forthcoming earnings on which the institutions trade is not clear".

institutions obtain an advantage through social connections to management and by investing in geographically closer firms. Cohen, Frazzini and Malloy (2008) find that mutual fund managers that are connected to board members via a common education network invest more in those stocks and earn abnormal returns on those investments relative to their non-connected holdings. Coval and Moskowitz (2001) show that mutual fund managers earn abnormal returns from nearby investments, suggesting that investors trade local securities at an informational advantage.

While social and educational connections broadly suggest a tie to firms' managers, the third set of related papers utilizes settings where the interaction between firm management and investors or analysts can be more directly observed and can lead to profitable trading opportunities. Bushee, Jung, and Miller (2011, 2013) examine the information content of invitation-only investor conferences where formal offline meetings occur either before or after a public presentation; they suggest that selective access to management benefits the investors that have been invited to attend. Solomon and Soltes (2015) use a unique dataset which identifies investors who meet privately with the management of an NYSE-traded firm, and find that some of these investors, primarily hedge funds, make more informed trading decisions. Green, Jame, Markov, and Subasi (2014) find that changes of analyst recommendations have larger price impacts when the analyst's firm has a conference-hosting relation with the company, suggesting that access to management is an important source of analysts' information advantage.

In our paper, we argue that mutual funds' management of corporate pension plans provides a unique but unexplored setting to examine informational advantages. The pension business setting is important across all firms including smaller ones with less analyst coverage and lower institutional holdings. Further, the asymmetric effects of buys versus sales in the case of pension ties provides a novel and economically important setting to demonstrate these information flows. Overall, our results support the idea that pension trustee relationships facilitate information transfers to mutual fund managers, and add to our understanding of the mechanisms through

which institutional investors become informed.

The rest of the paper is organized as follows. Section 2 discusses institutional background and empirical predictions. Section 3 describes the data and sample. Section 4 presents evidence for related funds' return predictability. Section 5 analyzes the link between trustees' roles in the pension plan and the return predictability of their trades. Section 6 examines alternative explanations. Section 7 concludes.⁷

2. Background and empirical predictions

Under the Employee Retirement Income Security Act of 1974 (ERISA), the pension trustee has a fiduciary responsibility to the plan's participants/beneficiaries. The trustee holds and manages the plan assets. For DB plans, the plan assets belong to the company, and pension assets and liabilities are reported in financial statements of the firm. For DC plans, the assets are property of the plan participants. Both as part of its fiduciary role and as a practical matter, the trustee along with the sponsor has responsibilities relating to the investment of plan assets, and in the case of DC plans for determining the investment options available to plan participants.⁸

Each plan has a "named fiduciary" which for example would be a committee of the sponsoring company's board of directors or senior managers of the sponsor. The named fiduciary has a number of responsibilities under ERISA including selection of the trustee and other service providers, monitoring their performance, and working with the trustee on the investment of plan

⁷ Robustness checks and further results are reported in the Internet Appendix, available in the supporting information section of the online article.

⁸ Our discussion of the roles of financial service providers including pension plan trustees is based on our reading of information provided by the Department of Labor (DOL) available at <http://www.dol.gov/ebsa/pdf/2014ACreport3.pdf>, and at <http://www.dol.gov/ebsa/pdf/meetingyourfiduciaryresponsibilities.pdf>. Discussion of the specific responsibilities of trustees for DC plans is also provided by Cohen and Schmidt (2009).

assets. This provides the basis for the theory that pension ties provide access to sponsor senior management and can convey an information advantage.⁹

For DC plans, investment options often include the sponsoring company's own stock. In addition to being involved in investment option decisions including whether to continue to offer company stock, the trustee will observe trades of plan participants in company stock, putting them in a unique position relative to other investors. For DB plans, the trustee can observe plan funding and investment decisions.¹⁰ Pension trustees are expected to better detect the underlying reasons from knowledge and experience gained through direct access to and repeated interaction with firm management. Investment in the sponsor's stock occurs less often and under ERISA cannot exceed 10 percent of plan assets, though the trustee will observe when plan assets are invested in the stock. Therefore, we expect that an informational advantage would apply for trustees of either a DB or DC plan.

The pension trustee relationship is special relative to that of others that might have access to the sponsor's management, such as important institutional investors or financial analysts, for several reasons. One reason is the long term nature of these relationships, as turnover of the trustee is infrequent and costly. Relatedly, the sponsor interacts directly with the trustee versus with a more dispersed and likely more quickly changing group of investors and analysts. Another reason would be the importance of this relationship to the sponsors' managers themselves. The pension assets in the case of DB plans can be a significant share of the assets of the company. In the case

⁹ The link between top management and pension investment choices is demonstrated by Anantharaman and Lee (2014), who show that the top executives' compensation structure (particularly that of the sponsor's chief financial officer) is systematically associated with pension plan investment choices. In practice, in the case of DC plans, the employer has a fiduciary obligation to employees and designs and operates the plan. For DB plans, plan assets are assets of the corporation; directors of the sponsor make decisions regarding the plan such as how to invest its assets (Cocco and Volpin 2007).

¹⁰ Multiple factors can drive DB plan funding and investment decisions. For example, a sponsor's decision to increase the risk profile of pension assets could be due to risk-shifting incentives indicating that the sponsor is sliding towards distress, or it could indicate that the sponsor's underlying creditworthiness is improving (Rauh 2009).

of DC plans, they can be a large component of employees' wealth, including top managers. This would seemingly provide senior managers with a strong and widespread incentive across firms to interact with the trustee that holds and manages those assets.

We first consider whether buying by related funds predicts subsequent returns for the sponsor's stock. One would expect that the related funds would buy more of the stock relative to other less informed investors when they obtain positive news about the sponsor; we would then predict that buying by related funds predicts positive future returns. However, there are two potentially offsetting factors. First, if the related fund is already overweighted in the stock, good news may not lead to purchases if aggressive buying would exacerbate overweighting. Second, related funds might also buy (or sell less) when there is bad news because of the pension business incentive. This is similar to the behavior documented by Cohen and Schmidt (2009) that related funds buy at times of large selling by other investors. Therefore, it is unclear whether buying by related funds will be positively related to subsequent returns.

We next consider whether selling by related funds predicts subsequent returns. Because of the pension business incentive, the related funds will be reluctant to sell the stock and may even be buying the stock when there is bad news about the sponsor. At some point, if the mutual fund family has information predicting large enough losses on the sponsor's stock, the funds should sell the stock to avoid losses (improving the fund's performance) despite the pension business concerns. Since funds are predicted to sell only when news is sufficiently bad, we expect that selling by the related funds predicts negative future returns. We also expect the information advantage, and therefore return predictability, to be stronger when the trustee has a longer term relationship with the sponsor company because of the strengthened ties to management and improved ability to interpret information over time. An information advantage is also more likely for firms where there is greater information uncertainty. Therefore, we expect the predictive power of trading by related funds to be more pronounced when information uncertainty about the

sponsor's stock is greater.

The information content of related funds' trading is expected to be linked to firm fundamentals. This suggests that return predictability will be stronger for firms that have negative future earnings surprises. Further, for DC plans where holdings of the sponsor's stock can be high, observing that the plan reduces its ownership of the stock would provide negative information. We therefore expect trading of related funds will exhibit stronger return predictability when DC plans reduce ownership of sponsor's stock.

Pension plans can employ several financial service providers for their plans, which would then be reported as required on Form 5500. Besides the trustee, other common provider types that are relevant in our setting are investment managers, investment advisers, and record keepers. Other provider types from Form 5500 include accountants (including auditors), actuaries, contract administrators, insurance agents and brokers, and legal consultants to plan participants. A plan may employ an investment manager for some portion of the assets, which then has fiduciary responsibilities to plan beneficiaries when the manager has discretion over investment of those assets.¹¹ The firm would not need an investment manager to invest in the firm's own stock, and an investment manager would not invest in the company's own stock under prudent investing guidelines. The investment manager also does not serve some of the other functions of the trustee such as holding the assets, observing flows and so forth that we describe for the trustee. Thus, it seems less likely that the direct interaction with management and an information advantage would extend to investment managers. Investment advisers, as they are classified on Form 5500, have no fiduciary role under ERISA and solely provide advice to the plan, for example on selection of investment managers. For our sample, mutual fund companies typically do not serve in this role.

¹¹ This would apply, for example, to investment managers for a "separate account" for a DB plan. We note that when plan assets are invested in mutual funds, the assets are held by the trustee and the plan owns shares in the mutual fund, not the underlying assets of the mutual fund. The managers of the specific mutual fund are not "investment managers" under ERISA and are not reported on Form 5500.

Finally, record keepers would observe flows to the plan, but are not a fiduciary under ERISA and do not have to be a financial services firm. To the extent we observe record keepers that are matched to a mutual fund company for our sample, they are often also the trustee company. In sum, we do not expect an information advantage (and therefore return predictability) to extend to non-trustee service providers.

3. Data and sample

Mutual fund companies as trustees to pension plans

We identify mutual fund families which provide financial services to firms' pension plans from Form 5500 filed annually with the IRS and the DOL's Employee Benefits Security Administration. Information on service providers is given in Schedule C, which corporate pension plan sponsors are required to file for plans with 100 or more participants where the service provider is paid fees exceeding \$5,000 from the plan. Form 5500s become available from DOL approximately two years after filing.

Firms in Form 5500s are matched to COMPUSTAT using their IRS Employer Identification Number (EIN). We then manually compare firm names in the two databases to filter mismatches.¹² Not all companies report their service providers, and not all service providers are mutual fund families. Several firms have more than one pension plan, sometimes for different types of employees, separate lines of business, or as a result of inheriting plans via mergers and acquisitions. We keep a plan only if at least one of its service providers is a fund family in the CRSP Survivor-Bias-Free US Mutual Fund database by manually matching the name of each provider in Form 5500 with family names in CRSP. Firms without valid stock price and return information from CRSP are excluded. The sample selection is described in Appendix 1. Our final

¹² The method of Gron and Madrian (2003) leads to almost identical matches as those we use for our sample. When we are unsure whether names are for the same company, we conduct FACTIVA searches to verify our matches.

sample includes 102 mutual fund families serving as trustee for pension plans of 660 firms in the period 1993–2008.

Mutual fund families provide various financial services to pension plans, including the plan trustee. Among the mutual fund families in our sample, those serving as pension trustee for the largest number of firms includes: Wells Fargo, Northern Trust Investments, Bankers Trust, Fidelity, State Street Bank, Bank of New York, Vanguard, Putnam Investments, Chase Manhattan Bank, and Allegiant Asset Management.¹³ When plan trustees are not matched to mutual fund companies, they are primarily banks and trust companies. For 96 percent of the plans we match to mutual fund companies, there is only one trustee for the pension plan. When a firm has more than one pension plan, for example when a firm has both a DB and a DC plan, in 60 percent of the cases the same mutual fund company serves as the trustee for both plans.¹⁴

We classify funds of the family serving as a firm’s trustee as “related” to the firm, and otherwise as “unrelated” funds. Note that the unrelated funds may be of a family providing non-trustee services (e.g., investment managers) as well as funds in families not providing any financial services to the firm. In matching firms to Form 5500s, it is possible that we miss some matches because some firms have multiple EIN’s, whereas Compustat provides only one EIN. Although we verify firm names for the matches we find, it is possible that the pension plan filing is made by a subsidiary or division of the firm that has a different name or EIN from the traded entity. Thus, incomplete matches between Form 5500s and Compustat/CRSP induce measurement error in the sense that mutual funds that are classified as “unrelated” might actually be “related” if

¹³ The expected impact of fund family size on our results is unclear, as it is not obvious that the pension business incentive is greater for smaller or larger families. Within our sample, return predictability is not related to family size.

¹⁴ We consider both DB and DC plans in our analyses. In un-tabulated analysis we find that our return predictability findings still hold for the subsample of firms having a DC plan. We cannot easily test whether return predictability is stronger in cases of DB versus DC plans because relatively few of the sample firms have only DB plans, and when firms have both plan types they often employ the same trustee. In unreported results, we do not find that return predictability is stronger for firms with larger DB plans relative to total assets of the sponsor.

their families serve as a trustee of a pension plan that has not been traced to that sponsoring company. This kind of measurement error can happen when we have matched a different plan (having a different trustee) to the same company in our sample, and is more likely for larger firms and firms with complex holding company structures such as utilities and banks. Our return predictability results described in Section 4 are unchanged when we exclude utilities, banks, and the largest five percent or 10 percent of firms (based on size) from our sample.

Ownership and trading in related and unrelated stocks

We locate the equity ownership data of individual funds in our fund family sample from the Thomson-Reuters Mutual Fund Holdings database. This includes funds that are investment options directly offered by the sample firms' pension plans as well as other funds of those families. Holdings are reported on a quarterly basis, within 45 days of the end of the calendar quarter (and therefore are publicly observable to all investors at that point). We exclude index funds in all analyses, except as noted in Section 4.

Each quarter, all funds in a mutual fund family are classified as related to a given stock if the family serves as the pension trustee for that firm, and classified as unrelated funds otherwise. At the firm level, we define the equity ownership by related funds of stock i in quarter t , $MO^R_{i,t}$, as the number of shares related funds collectively hold at the end of that quarter divided by the number of shares outstanding. Similarly, the equity ownership of unrelated funds ($MO^N_{i,t}$) is defined as the number of shares collectively owned by unrelated funds at the end of the quarter divided by the number of shares outstanding. Trading by related and unrelated funds are defined as $TR^R_{i,t} = MO^R_{i,t} - MO^R_{i,t-1}$ and $TR^N_{i,t} = MO^N_{i,t} - MO^N_{i,t-1}$. The magnitude of trading and ownership differs between related and unrelated funds; ownership of related funds in a given stock averages 0.8 percent over the sample, while unrelated ownership averages 7.6 percent.¹⁵ Therefore, we

¹⁵ Sample firms have only one related fund family (or two for some firms with both DB and DC plans) but many unrelated fund families. Since we aggregate the holdings of each group, the latter group's holdings are greater. At the fund level, related funds on average hold 0.17 percent of the

standardize the trading of each group by its mean and standard deviation, allowing us to compare coefficients across these groups.¹⁶ Specifically, the standardized values of related (unrelated) funds' trading, denoted by $STR_{i,t}^R$ ($STR_{i,t}^N$), are calculated as the raw trading values minus their individual cross-sectional mean and divided by their cross-sectional standard deviation.¹⁷ All variables used in our analyses are defined in Appendix 2.

Descriptive statistics

Insert Table 1 about here

Panel A of Table 1 provides summary statistics for the 660 stocks in our sample. 55 of these firms have only DB plans throughout the sample period, 242 have only DC plans, and remaining 363 firms have both DB and DC plans at some point in the sample period. We note that these firms are generally large, with relatively low book-to-market ratios. Cross-sectionally, we expect the potential for information advantages to be strongest for smaller, lower book-to-market firms with significant growth potential. Panel B of Table 1 reports summary statistics for the 102 mutual fund families and 897 funds where the family is the pension trustee for at least one sample firm. The average fund family in our sample has approximately \$35.62 billion in total assets under management (*TNA*). Funds in our sample are also relatively large, with an average size of approximately \$1.83 billion.

Panel C shows that related funds are not selling contemporaneously with negative

outstanding shares of related firms and unrelated funds hold 0.10 percent. The difference between these two groups is statistically significant.

¹⁶ Bennett et al. (2003) use a similar approach. The statistical significance of regression coefficients for the raw trading variables (TR_{it}^R , etc.) still holds, as explained in Bennett et al. Table IA.3 uses an alternative approach, defining a measure of abnormal trading relative to the buying or selling of other stocks held by the fund at the same time; as explained below, our main results are robust to this alternative measure.

¹⁷ The stock i itself is included in computing the cross-sectional mean and standard deviation, which are then used to construct the standardized variable. Excluding stock i and restricting the calculation of the mean and standard deviation to other stocks ($j \neq i$) generates similar results. Results are also unchanged when we calculate ownership as a fraction of average shares outstanding over the quarter rather than shares at the quarter end.

information about the stock. We report trading at the stock/quarter level based on whether related funds, in aggregate, are net-buyers or net-sellers of the stock in the same quarter (based on raw changes in ownership). We also report the contemporaneous and prior quarter's stock returns in panel C. Even when related funds are net sellers of the stock, returns in the prior quarter (-6, -3) are positive, and for the contemporaneous quarter (-3, 0) are small but still positive. For example, when related funds are net-sellers (-0.23 percent), the average market adjusted stock return is 0.01 percent in the contemporaneous quarter and 0.82 percent in the prior quarter. Note that in these cases, unrelated funds are not net sellers of the stock. Repeating these calculations but stratifying the sample by unrelated funds' buying and selling (panel D) shows that market adjusted return contemporaneous to selling by unrelated funds is negative (-0.20 percent), and more generally that there is not an obviously strong relationship between selling by unrelated and related funds.

Though not reported in the table, related funds sell (reduce raw ownership) less frequently than unrelated funds; 33 percent of related funds and 46 percent of unrelated funds engage in selling in any given quarter. Conditional on selling, the median selling of related funds is more than double that of unrelated funds. While selling by related funds is less frequent, it may be very informative when it does occur.

4. Fund trading and future returns

Related funds' return predictability

In this section, we analyze the predictive power of related funds' trading for future stock returns. We distinguish between buying and selling by related funds (relative to unrelated funds) because the pension business incentive makes the relationship between buying and future returns less clear. Further, we expect the relationship for selling to hold for more extremes of negative information about the firm.

Drawing on related literature (e.g., Gompers and Metrick, 2001; Bennett et al., 2003; Solomon and Soltes, 2015), we estimate the following equation:

$$\begin{aligned}
ret_{it,t+k} = & \alpha + \beta_1 STR_{i,t}^R \times D^R + \beta_2 STR_{i,t}^R \times (1 - D^R) + \beta_3 STR_{i,t}^N \times D^N + \beta_4 STR_{i,t}^N \times (1 - D^N) \\
& + \beta_5 MO_{i,t-1}^R + \beta_6 MO_{i,t-1}^N + \gamma X_{i,t} + e_{i,t},
\end{aligned} \tag{1}$$

where $ret_{it,t+k}$ is the monthly return to stock i averaged over the next k months. Prior literature (included those cited above) focuses largely on the return over the subsequent quarter ($k=3$); we also consider longer horizons ($k = 6, 9, \text{ or } 12$) to allow for the possibility that informed trading by related funds forecasts longer term returns. We report average returns because of their advantages in long-run analyses discussed in Fama (1998).¹⁸

As defined in Section 3, STR_t^R (STR_t^N) is the standardized trading of related (unrelated) funds based on the change in holdings from month -3 to month 0. D^R is a dummy equal to one if related funds are selling (i.e., $TR^R < 0$) and 0 otherwise. Note that this dummy is constructed based on whether the *raw* trading of related funds (TR^R) is negative or not. Thus, the interaction of $STR_t^R \times D^R$ measures standardized trading by related funds' when they are selling, while $STR_t^R \times (1 - D^R)$ measures standardized trading when they are buying. D^N is a dummy equal to one if unrelated funds are selling (i.e., $TR^N < 0$) and 0 otherwise. Similarly, $STR_t^N \times D^N$ measures trading of unrelated funds that are selling, while $STR_t^N \times (1 - D^N)$ measures trading when unrelated funds are buying. Our main coefficients of interest are for the above four interacted variables. We also include the prior level of ownership, $MO_{i,t-1}^R$ and $MO_{i,t-1}^N$, in all regressions; therefore our specifications are similar to those in Bennett et al. (2003) and Gompers and Metrick (2001). Note that the trading variables in equation (1) are measured as the change in the quarter ending at month 0, while ownership levels are measured at the beginning of that quarter. The trading variables are winsorized at the one percent level to remove potential outliers.

¹⁸ Fama (1998) discusses the advantage of average returns relative to cumulative returns in long-run analyses. In un-reported analysis, we replace average returns with cumulative returns to gauge the robustness of our findings, and obtain qualitative similar results to those reported in the paper. We also discuss results using average monthly returns over non-overlapping three month windows (months 1–3, 4–6, 7–9, and 10–12) below.

$X_{i,t}$ includes six stock characteristics as control variables, based on the existing literature: (1) *Size*: market capitalization, defined as the product of the share price and the number of shares outstanding; (2) *B/M ratio*: the book-to-market ratio, defined as the book value of equity for the fiscal year ended before the most recent June 30 divided by size as of December 31 during that fiscal year; (3) *Price*: price per share from CRSP; (4) *Age*: number of months since the stock first appears in CRSP; (5) $RET_{-3,0}$: cumulative raw return over the past three months; (6) $RET_{-12,-3}$: cumulative raw nine-months-return preceding the filing quarter.¹⁹ Because mutual fund ownership and trading are measured in percentage, we use natural logs for the control variables except for the book to market ratio (*B/M ratio*) and the two momentum measures, $RET_{-3,0}$ and $RET_{-12,-3}$. A correlation table for the variables used in our regressions is provided in Table IA.1.

The two selling dummies for the fund groups, D^R and D^N , are also included in $X_{i,t}$ to allow for intercept differences between buying and selling in each fund group, though omitting them does not change our interpretation of the main variables of interest. Quarter dummies are also included in all regressions to control for time fixed effects. We estimate equation (1) using pooled ordinary least squares (OLS) regressions and cluster standard errors at the stock level.²⁰ The coefficients and associated *p*-values from these regressions are presented in columns 1–4 of Table 2.²¹

¹⁹ Evidence for the effects of various stock characteristics on mutual funds' holdings is provided by, among others, Grinblatt, Titman, and Wermers (1995), Falkenstein (1996), and Chen, Jegadeesh, and Wermers (2000).

²⁰ Gompers and Metrick (2001) and Bennett et al. (2003) use Fama-MacBeth (FM) regressions; we use a panel approach because Petersen (2009) shows that the FM estimates will be biased when the number of stocks in cross-sectional regressions is small, and some quarters in our sample have fewer than 50 stocks. We conduct FM regressions with Newey-West corrections in un-tabulated analyses and find consistent results with significance at the 10 percent level for related funds' return predictability. Clustering standard errors by both stock and quarter also produces very similar results to those in Table 2.

²¹ Matching the Form 5500 data with the CRSP mutual fund database, Thomson-Reuters mutual fund holding data, and control variables leads to 17,434 firm-quarter observations for 1,122 firms. We further drop the firms whose pension trustees are not mutual fund families or whose trustee families have zero holdings of their stocks, which leaves us with 7,857 firm-quarter observations for 660 firms. Finally, we drop observations when either related or unrelated funds have zero

Insert Table 2 about here

From the coefficients on $STR_t^R \times D^R$ in Table 2, trading by related funds which sell is significantly related to subsequent three-, six-, nine-, and 12-month stock returns, suggesting that related funds shift their portfolios away from stocks with deteriorating future performance. The predictive power of related funds' selling for future returns is strongest for three-month returns and is economically large; when there is more selling (trading is one standard deviation more negative), monthly returns are on average 0.7 percent lower over each of the next three months – cumulatively, 2.1 percent over the three month window. The cumulative return effect of selling by related funds over a full 12 months (0.3 percent per month) remains large (3.6 percent annually).²² Related funds' buying, in contrast, has no significant association with future stock returns (insignificant coefficients for $STR_t^R \times (1 - D^R)$). Further, trading by unrelated funds that sell or buy is not related to subsequent returns (insignificant coefficients for $STR_t^N \times D^N$ and $STR_t^N \times (1 - D^N)$). Table IA.2 reports alternative regressions using non-overlapping returns horizons.

Interestingly, we also find that the level of holdings for related, but not unrelated, funds (MO_{t-1}^R) is related to subsequent returns over each return horizon. Looking at institutional investors as a whole, Gompers and Metrick (2001) note that if institutional demand shocks impact security returns, then future returns should be positively related to current ownership levels – a proxy for future institutional demand. If these investors engage in informed trading, future returns will be related to changes in ownership – a proxy for the level of informed trading. Both Gompers

trading in the corresponding quarter, which leaves us with 5,575 firm quarter observations for 619 firms. Keeping the observations with zero trading by related or unrelated funds leads to similar results.

²² Selling pressure may attenuate our results, as it would cause a reversal in prices in the quarter subsequent to a quarter in which funds sell. In other words, selling pressure should lead to more positive returns (negative coefficients) in subsequent quarters. The net effect we observe results in positive coefficients in our regressions (i.e. selling is associated with lower subsequent returns), though it may explain the generally lower coefficient for returns over the six month horizon. We also examine returns in each of the next four individual quarters (un-tabulated), but do not observe return reversals in any quarter.

and Metrick (2001) and Bennett et al. (2003) find support for the former, and thus our results for the level of ownership are consistent with theirs. Bennett et al. further find support for the latter, but it is sensitive to the proxy for informed trading. For the mutual funds in our sample, our evidence supports informed trading only for related fund families with a trustee connection to the particular stock.

In Table IA.3.a, we show that our main results are robust to an alternative measure of trading for our independent variables. Here, we define abnormal trading for each group of related funds (ATR_t^R) or unrelated funds (ATR_t^N) as the raw trading of stock i minus the cross-sectional mean of the same group of funds' trading of other stocks ($j \neq i$). This measure controls for common components in the trading of funds across stocks due to investor flows within the fund family, and is very highly correlated with our standardized trading measure (see Table IA.3.b).

In sum, these findings are consistent with the idea that selling by related funds reflects information about subsequent stock price declines. It is important to note that it is not the case that the firm is experiencing large stock price declines either prior to or concurrently with these sales; in other words, the funds are not simply reacting to negative information that is already reflected in stock prices (see Table 1, panel C).²³

Information content and firm fundamentals

In this section, we examine whether trading appears related to information about firm fundamentals. If informed traders have information concerning firm fundamentals, we expect this information to be reflected in unexpected future earnings news. We measure the earnings surprise relative to analyst earnings forecasts, calculated as the reported earnings per share minus the most recent median analyst earnings forecast from I/B/E/S, scaled by stock price at the end of the

²³ Note that our empirical approach differs from that of Cohen and Schmidt (2009), who look at 401(k) trustees' changes in holdings in *response* to negative shocks to the firm, where negative shocks are defined as large selling in aggregate by other mutual funds or as negative stock returns at the time of an earnings announcement. Selling by related firms in our tests does not coincide with negative shocks, but rather predicts *future* negative performance.

previous quarter.²⁴ In each quarter, we construct two stock groups: the first includes stocks with negative earnings surprises in any of the next four quarters and the second includes the remaining stocks with non-negative earnings surprises in each of the next four quarters. We then re-estimate equation (1) for each group and report results in Table 3.

Insert Table 3 about here

Columns 1–4 of Table 3 present the results for stocks with negative earnings surprises in any of the next four quarters. Trading by related funds which sell is significantly related to subsequent stock returns. The magnitude of the coefficient for the three-month return (one percent per month, or three percent over the three month window) is economically large, and the statistical significance is strong for each return horizon.²⁵ We do not see any predictive power of trading for the remaining firms with non-negative news; from columns 5–8, related funds’ trading is not significantly related to future returns (similar results, unreported, are obtained for firms with positive earnings news). Trading of unrelated funds also does not have predictive power for future returns among stocks in either subsample. These results suggest that the return predictability of selling by related funds appears to be driven by future negative earnings news. Further evidence verifying this result is provided in Table I.A.5, where we show selling of related funds forecasts the incidence of future poor market reactions to earnings news.

Stocks’ information environment and potential for informed trading

To further investigate whether the return predictability documented in the previous

²⁴ In these regressions, the earnings surprise is observed subsequent to the trading decision. However, we view the earnings surprise as a proxy for the private information at the time of trading. We examine the correlation between the average earnings surprise in the next four quarters with market-adjusted returns in these quarters in untabulated analyses, and find all correlation coefficients are positive and significant at the one percent level.

²⁵ Table IA.4 shows similar regressions using non-overlapping return windows, for the subsample of firms with negative earnings surprises in the quarter of the future return; this again shows that the most economically and statistically significant effect appears in the first quarter following selling by related funds.

sections is related to trading based on information, we examine the information environment of the sample stocks. Specifically, potential profits to informed trading are greater for trading in firms with greater information uncertainty. We use three alternative measures – size, idiosyncratic risk, and analyst earnings forecast errors – which, while not independent, have each been suggested in prior literature as proxies for stocks’ information uncertainty.

In each quarter we classify stocks whose size, idiosyncratic risk, and analyst earnings forecast errors are above or below the sample median of each characteristic. Size is measured by the market capitalization of the stock. Idiosyncratic risk is measured by the standard error of residuals from the Carhart (1997) four-factor model, using monthly returns in the prior five years. Analyst earnings forecast errors are calculated as the absolute value of the difference between the reported earnings per share and the most recent mean consensus analyst earnings forecast from I/B/E/S, scaled by stock price at the end of the previous quarter.

Insert Table 4 about here

We re-estimate equation (1) for each subsample in Table 4, omitting control variables for reporting. For brevity we only present the results for the three-month horizon; longer horizon results are available upon request. Results for larger and smaller stocks are in the first two columns.²⁶ Trading by related funds which sell is significantly related to smaller stocks’ future returns but has no association with future returns of larger stocks.²⁷ These results are consistent with the idea that our main findings are related to an information advantage. Note that as before,

²⁶ Alternatively, we run regressions interacting our trading measures with a dummy variable for the small size group (or the high idiosyncratic risk or high analyst earnings forecast error group), producing identical interpretation to the results shown in Table 4. Further, we examine regressions for non-overlapping return windows of 1–3, 4–6, 6–9, or 10–12 months following the trading quarter; our results and interpretations follow our main results already reported - statistical significance remains strongest (positive coefficient significant at the one percent level) in the first quarter ($Ret_{0,3}$).

²⁷ For robustness, we run the same regressions but first remove the largest five percent of sample firms before dividing the remaining sample by size, and again find return predictability only for the smaller firm subsample. Thus, we do not believe that misclassification of unrelated funds for larger firms is driving the differences we find for smaller versus larger firms.

the level of ownership of related, but not unrelated funds, is significantly related to returns, but only for smaller stocks. These results are also consistent with Bennett et al. (2003), in that the ability to forecast returns arises primarily in smaller stocks (thus described as “greener pastures” for informed traders).²⁸

The remaining four columns of Table 4 report the results for stocks with high and low idiosyncratic risk or analyst earnings forecast errors. They are similar to the results in columns 1–2, consistent with the prediction that related funds’ informed trading are greater in stocks with greater information uncertainty. Similar results are also obtained when we use analyst forecast dispersion as an alternative proxy for the information environment (see Table IA.6).²⁹

The portfolio approach

In this section, we employ a portfolio approach to gauge the robustness of our results on related funds’ return predictability, and to provide further information on their economic importance. We focus on the smaller firms (based on market capitalization relative to the sample median) because of the findings for small stocks in the previous section and in prior research. At the end of each quarter, we divide stocks into two portfolios based on related funds’ raw selling (Table 5, panel A), or unrelated funds’ raw selling (panel B). The first portfolio contains stocks in the highest quintile of related (or unrelated) funds’ selling, and we call it the “high selling” portfolio. The remaining stocks bought or sold by related (or unrelated) funds are included in the

²⁸ It is also likely that top management has a larger stake in plans of smaller firms, especially since alternative plans such as Nonqualified Deferred Compensation Plans (NQDCPs), which are not reported on Form 5500, are used less often by smaller firms. This implies that trading in the related stock may be more informative for smaller firms, and suggests an alternative explanation for our finding of stronger return predictability for smaller firms. Still, our results in this section are robust to other proxies for information asymmetry.

²⁹ If the predictive power of related funds’ selling for future returns is indeed driven by an information advantage relative to unrelated funds, this predictive power should only hold for related funds which trade based on information (i.e. non-index funds). In unreported results, we verify this in by adding index funds back to our sample, which we identify by name in the CRSP Survivor-Bias-Free US Mutual Fund database (index funds are otherwise excluded from our tests in this paper). The results show a positive predictive power for future stock returns only among non-index funds whose families serve as the pension trustees of the firm.

second portfolio. Similar results are obtained when we include selling/buying of larger stocks in the portfolio. We then compare the average monthly Daniel, Grinblatt, Titman, and Wermers (1997; DGTW hereafter) benchmark-adjusted returns to these portfolios in the next four quarters.³⁰ We also form a zero-investment strategy for each stock group in each quarter by buying the high selling portfolio and shorting the remaining stock portfolio.

Insert Table 5 about here

The average monthly DGTW benchmark-adjusted returns are computed for each portfolio in each of the next four quarters, and the time-series means of these averages, as well as the time-series means of the differences in returns between the two portfolios are reported in Table 5. As can be seen from this table, selling by related funds has stronger predictive power for future returns than unrelated funds (selling is associated with negative returns). The average returns to the zero-investment strategy constructed based on related funds' selling of small stocks are negative and highly significant in all of the next four quarters. The same strategy based on unrelated funds' selling does not generate significant negative returns. At the three-month horizon, the zero-investment strategy based on related funds' selling generates a return of 1.35 percent per month (4.05 percent over the next quarter). In other words, the relationship between selling and negative future returns is largely due to strong selling of smaller stocks.

5. Return predictability and financial services provider's roles

In this section, we test specific hypotheses related to the role of the trustee, to provide insight on possible sources of their information advantage. While we expect an information advantage based on the role of the pension trustee, this advantage is not expected to extend to

³⁰ Specifically, we group stocks into quintile portfolios based on size, book-to-market ratio, and return momentum in each month, and the DGTW benchmark-adjusted return for a stock in that month is the raw return minus the value-weighted average return of the portfolio to which the stock belongs. See Daniel, Grinblatt, Titman, and Wermers (1997) for a detailed description of this method.

other types of service providers. We also expect the trustee's information advantages to be stronger for trustees that have had a longer term relationship with the sponsor. Further, we expect return predictability from related fund selling to be stronger when the pension plan itself concurrently reduces its investment in the sponsor's stock.

Mutual funds' role as non-trustee pension service providers

In Table 6, we compare the return predictability of trading by trustee funds with that of funds of other types of pension service providers, and with that of other unrelated funds. Note that the number of observations drops for specifications that require non-zero trading by other provider (non-trustee) funds.

Insert Table 6 about here

Columns 1–4 of Table 6 compare trading of trustee funds (“related”) and investment manager funds (“IM”) while excluding all other funds, and show return predictability is concentrated in the former group. The results are similar when comparing trustee funds with funds of all non-trustee service providers including investment managers (columns 5–8). Finally, when directly comparing trading of investment manager funds to that of other non-trustee service providers plus unrelated funds in columns 9–12, we do not find any return predictability for either group. Overall, these results highlight that trustees are uniquely positioned to obtain an information advantage through pension business relationships.

Length of the trustee-sponsor relationship

Insert Table 7 about here

In Table 7, we differentiate between longer-relationship trustees and newer trustees. In each quarter, we divide related funds based on the median observed length of the trustee's relationship. At the start of our sample period, we cannot observe how long the trustee has served in that role, since their hiring date is not available from Form 5500. We therefore drop observations for the first five years of our sample, and for each subsequent quarter compute the

number of quarters the trustee has appeared for that firm. We then decompose related trades into those by longer-relationship trustee funds and by other related funds. The regressions in Table 7 show that although both groups predict future returns, the economic magnitude of forecast ability is greater for the former group, and the statistical significance is concentrated in the former group at the 9- and 12-month horizons. These results support the broader story that an information advantage accrues through access to internal high-level management and the personal and social bonds formed with these executives over time.

Pension trustees may be more likely to trade on negative information in quarters prior to their termination as trustee, as the pension business incentive is removed at that point. We cannot observe this behavior, however, because of the low incidence of trustee turnover. Further, for the cases of turnover we do observe, related funds sell large amounts regardless of information about the stock, consistent with their overweighting in the stock.³¹ We also verify that our main results are unaffected when we remove the four quarters before and after a change in trustee from our regressions.

Plans' trading of the firm's own stock

We next test whether trading of related funds' predictive power for future returns is stronger when the pension plan reduces direct investment in the sponsor's own stock. The trustee observes changes in the level of investment in the firm's own stock made by plan participants. Plan investment in the stock is much more common for DC plans because DB plans can invest no more than 10 percent of assets in the stock under ERISA. Indeed, in our sample, only five percent of DB plans invest in the firm's own stock, whereas 49 percent of DC plans do so. 95 percent of observations with non-missing investment in the firm's own stock are from firms with DC plans. Conditional on owning stock, DC plans have a median 22 percent of the reported market value of

³¹ For cases of trustee turnover in our sample, trustee fund families own on average 0.18 percent of sponsor's stock per fund two years prior the change, 0.09 percent in the year prior, and only 0.06 percent following the change.

pension assets invested in the stock (18 percent across all DB and DC plans), and hold two percent of the outstanding shares of the sponsor firm.

We identify each pension plan's direct investment in its own firm's stock from Schedule H of Form 5500. Form 5500 filings become public roughly two years subsequent to the corresponding year, which provides the related funds with the advantage of observing the plans' investment in the firm's own stock prior to other market participants.³²

We restrict the sample to firms with non-zero pension investment in the company's own stock, and divide the stocks into two groups in each quarter. The first group includes firms whose pension plans reduce their investment in the firms' own stocks in the current year, and the second group includes other firms. We construct a dummy variable, denoted by D^{Plan} , to indicate the former group. On average, 36 percent of plans reduce investment in the firms' own stock in a given year. We re-estimate equation (1), adding the interaction of this dummy and trading by related funds which sell ($STR_t^R \times D^R \times D^{Plan}$). Results in Table 8 show that relative to other stocks, related funds' selling has stronger predictive power for three-, six- and nine-month-ahead stock returns when the pension plan reduces its investment in its own firm's stock. Consistent with our earlier results, these effects are also stronger for the subsample of smaller firms where top management is more likely to have a larger stake in the plan (not reported for brevity).

Insert Table 8 about here

Our results in the previous sections show the relationship between trading by related funds and subsequent realizations of negative earnings events, and suggest that the return predictability we document stems from information about firm fundamentals. The results in this section also show that the mechanism is further related to sales of the firm's own stock within the

³² Form 11-K, available through SEC Edgar within six months of the fiscal-year-end, also contains information on the investment in the firm's own stock for 401(k) plans. However, 11-Ks are only filed by companies that have their own company stock in the 401(k) plan and issue new shares to fund it. As a result, information for all other firms' investment in their own stock can be obtained only from Form 5500.

pension plan. This is likely if insiders reduce their investment in the stock in anticipation of bad earnings news, and the plan trustee observes this behavior. Regardless, the consistent implication is that trading behavior reflects an information advantage related to firm fundamentals.

6. Interpretation of results

Information advantage versus attention to overweighted stocks

An alternative explanation of our results is fund managers may simply pay more attention to, and spend more resources following stocks which are their largest portfolio holdings. As noted by Merton (1987), and empirically supported by Hirshleifer, Lim, and Teoh (2009) and Da, Furun, and Warachka (2014), a particular manager cannot follow all publicly traded securities. If the mutual funds in our sample tend to overweight stocks for which the family has pension ties, particular attention to these stocks would seem likely.³³ Drawing from Bushee and Goodman (2007), we construct two measures of overweighting. First, a fund family is classified into the overweighting group for a stock in a specific quarter if any of its funds' holding of the stock is in the top quintile for that fund. Second, we aggregate the holdings of stocks across all funds in each family and classify a family into the overweighting group if its holding of the stock is in the top quintile across all stocks.

Insert Table 9 about here

We restrict our analysis to funds which are overweighted in a given stock so that we can focus on the effect of funds being related versus unrelated, and report results for equation (1) in Table 9. Given that all funds included in the analysis are overweighted in stocks, the important comparison is the coefficients for selling by related ($STR_t^R \times D^R$) versus unrelated ($STR_t^N \times D^N$)

³³ While it is not the focus of their paper, Cohen and Schmidt (2009) report no significant correlation between pension trustee funds' overweighting of related firms' stocks and future returns. The authors interpret this finding as evidence that an information advantage is not the main factor driving trustee funds' excessive holding of related stocks. Our results below show that it is not overweighting per se that drives our results on return predictability. Davis and Kim (2007) find no evidence of overweighting when they include other service providers.

funds; we again observe the significant and positive coefficient for related but not for unrelated funds. We also examine (but do not report for brevity) similar regressions for trading in stocks in which the funds are not overweighted, and find that the coefficients for trading when related funds sell continue to be significant and of similar magnitude. These results suggesting that overweighting is not the key source of related funds' return predictability.

Information advantage versus trading skill

One factor that might confound our results is the possibility that firms select mutual fund families to be their pension trustees based on funds' trading skill. Evidence in several studies (e.g., Grinblatt and Titman 1992; Wermers 2000; Fama and French 2010) suggests that only a fraction of mutual fund managers have skill. If these managers are more likely to be selected to be pension trustees, they should exhibit superior return predictability regardless of whether they have pension business ties with the specific firm or not. Our previous results contradict this prediction, because trading is related to future returns only when the fund family serves as the pension trustee of the firm, and not for the other stocks held by the same manager.

To further test this alternative, we identify funds with a high likelihood of having skill. We draw on the existing evidence that the persistence of superior performance is an indicator of skill. In each quarter, we classify funds with above-median Carhart (1997) four-factor alphas (in the past 36 months) as "winning" funds, and compare the return predictability of these funds' selling of related and unrelated stocks.

Insert Table 10 about here

The results reported in Table 10 show that trading by winning related funds that sell ($STR_t^R \times D^R$) forecasts subsequent stock returns, whereas trading by winning unrelated funds' that sell ($STR_t^N \times D^N$) does not. Adding fixed effects by mutual fund families has little impact on the coefficients for our trading variables, which suggests the differences in return predictability of trading in related versus unrelated stocks hold within fund family. Overall, these results suggest

that the return predictability of related funds' selling is not driven by the superior skill of fund managers selected as pension plan trustees.

7. Conclusion

This paper provides evidence suggesting that mutual fund trading reflects an information advantage obtained through fund families' pension business ties. Funds become related to their portfolio firms when their families serve as trustees for firms' employee pension plans. We find that stocks with larger net-sales by related funds experience lower future returns. Related funds' buying, in contrast, generally has no significant association with future stock returns. No consistent relationship is found between funds' trading of non-related stocks and future returns.

Information appears related to firm fundamentals: the relationship between selling by related funds and subsequent returns is strongest when the firm experiences negative earnings surprises in the next four quarters. Consistent with our information based explanation, return predictability is more pronounced when the information uncertainty about stocks is higher. Our results are robust to a number of alternative specifications and alternative explanations for the return predictability.

Our description of the specific role of the pension trustee highlights the potential sources of such an information advantage. Our results appear specific to the trustee's role and do not extend to other service providers to the pension plan. Most broadly, our findings that return predictability is stronger when the trustee has a longer term relationship with the sponsor firm supports the idea that the information advantage stems from access to internal high-level management and the personal and social bonds formed with these executives over time. The pension trustee's ability to observe trades in the sponsor's own stock, as well as being involved in sponsor decisions to offer or discontinue stock as a plan investment option suggest a further mechanism by which information is conveyed.

Our results contribute to a growing literature which provides evidence that ties to management can lead to informed trading based on information about firm fundamentals. Despite the economic importance of U.S. pension assets, the pension mechanism we document has not been previously suggested or demonstrated. Our results are economically large in magnitude and extremely robust, particularly at the three month horizon. Our examination of pension ties utilizes a unique and important setting to understand the sources of such an information advantage.

Appendix 1
Sample selection

	Number of firms
Firms with valid information in Compustat and CDA Mutual Funding Holdings database	3,604
Less: Firms with missing Form 5500s	(231)
Less: Firms without service providers in CRSP Mutual Fund database	(715)
Less: Firms for which service providers in CRSP cannot be linked to the CDA holdings data	(1,285)
Less: Firms for which no mutual fund service providers hold stocks	(251)
Less: Firms for which trustees are not mutual funds or do not hold stocks	(462)
Final sample	660

Appendix 2

Variable definitions

Mutual funds' equity trading and ownership

STR^R	Standardized trading of related funds.
STR^N	Standardized trading of unrelated funds.
MO^R	Ownership of related funds.
MO^N	Ownership of unrelated funds.
D^R	A dummy variable equal to one if related funds are selling and zero otherwise.
D^N	A dummy variable equal to one if unrelated funds are selling and zero otherwise.

Stock returns

$ret_{0,k}$	Average return from month 0 to month k, where k = 3, 6, 9 or 12.
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Pension plans' trading in the firm's own stock

D^{Plan}	A dummy variable equal to one if the pension plans reduce ownership in the firm's own stock and zero otherwise.
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Control variables

B/M ratio	Book-to-market ratio, defined as the book value of equity for the fiscal year ended before the most recent June 30 divided by size as of December 31 during that fiscal year.
Age	Number of months since the stock first appears in CRSP.
$Price$	Price per share from CRSP.
$Size$	Market capitalization (in \$ millions), defined as the product of the share price and the number of shares outstanding.
$RET_{-3,0}$	Cumulative raw return from month -3 to month 0.
$RET_{-12,-3}$	Cumulative raw return from month -12 to month -3.

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TABLE 1

Summary statistics

Panel A: Stock summary statistics (660 sample firms)

	<i>Size (Mil)</i>	<i>B/M</i>	<i>Age</i>	<i>RET</i> _{-12,-3} (%)	<i>RET</i> _{-3,0} (%)	<i>Price</i>
Mean	17,262	0.429	404	13.7	3.4	42.22
Median	3,994	0.349	372	10.9	3.1	37.26
Std.	40,559	0.410	277	46.7	18.8	30.59

Panel B: Mutual fund families and funds

	Number of Families/Funds	Average <i>TNA</i> (Mil)	<i>Std.</i> of <i>TNA</i> (Mil)
Fund Families	102	35,618	125,073
Funds	897	1,828	5,196

Panel C: Related funds' trading

Stock Groups:	Related Funds' Trading (%)	% of Selling Funds in Related Funds	Unrelated Funds' Trading (%)	% of Selling Funds in Unrelated Funds	<i>RET</i> _{-3,0} (%)	<i>Market-adjusted RET</i> _{-3,0} (%)	<i>RET</i> _{-6,-3} (%)	<i>Market-adjusted RET</i> _{-6,-3} (%)
Related funds buy	0.22	8.69	0.19	28.49	4.17	1.87	3.89	1.56
Related funds sell	-0.23	66.52	0.05	31.07	2.07	0.01	3.36	0.82

Panel D: Unrelated funds' trading

Stock Groups:	Related Funds' Trading (%)	% of Selling Funds in Related Funds	Unrelated Funds' Trading (%)	% of Selling Funds in Unrelated Funds	<i>RET</i> _{-3,0} (%)	<i>Market-adjusted RET</i> _{-3,0} (%)	<i>RET</i> _{-6,-3} (%)	<i>Market-adjusted RET</i> _{-6,-3} (%)
Unrelated funds buy	0.01	24.35	1.08	25.08	4.14	1.76	4.70	2.03
Unrelated funds sell	0.02	26.63	-1.01	33.17	2.50	-0.20	2.65	-0.00

This table presents summary statistics for sample firms, mutual fund families, and funds. The sample period is 1993:Q1 to 2008:Q4. Panel A reports summary statistics for the 660 sample firms. Panel B presents summary statistics for fund families and funds. Each fund family has a pension trustee relationship with at least one of the sample firms. Panel C (D) presents summary statistics based on

whether related (unrelated) funds in aggregate are net buyers or net sellers in stocks. Each quarter, all funds in a given mutual fund family are classified as *related* to a given stock if the family serves as a pension trustee for that firm and classified as *unrelated* otherwise. Trading is measured as the change in holdings from month -3 to month 0. “Related funds buy (sell)” indicates the subset of firm/quarter observations where related funds in aggregate are net-buyers (sellers) of the stock. “Unrelated funds buy (sell)” indicates the subset of firm/quarter observations where unrelated funds in aggregate are net-buyers (sellers) of the stock. $RET_{t,t+k}$ is the cumulative raw stock return from month t to month $t+k$. TNA is total assets under management. All other variables are defined in Appendix 2.

TABLE 2

Fund trading and future stock returns

	(1)	(2)	(3)	(4)
	$ret_{0,3}$	$ret_{0,6}$	$ret_{0,9}$	$ret_{0,12}$
$STR_t^R * D^R$ [trading by related funds that sell]	0.007*** (0.004)	0.003* (0.069)	0.003*** (0.009)	0.003*** (0.002)
$STR_t^R * (1 - D^R)$ [trading by related funds that buy]	0.001 (0.655)	0.000 (0.676)	-0.001 (0.187)	-0.001 (0.159)
$STR_t^N * D^N$ [trading by unrelated funds that sell]	-0.003 (0.166)	-0.001 (0.305)	-0.002 (0.119)	-0.001 (0.132)
$STR_t^N * (1 - D^N)$ [trading by unrelated funds that buy]	-0.001 (0.571)	0.000 (0.942)	0.000 (0.841)	0.000 (0.779)
D^R	0.003* (0.079)	0.000 (0.736)	0.000 (0.791)	0.001 (0.345)
D^N	0.001 (0.728)	0.001 (0.360)	0.001 (0.601)	0.000 (0.901)
MO_{t-1}^R [ownership level of related funds]	0.095** (0.017)	0.093*** (0.009)	0.089*** (0.004)	0.087*** (0.003)
MO_{t-1}^N [ownership level of unrelated funds]	-0.007 (0.722)	-0.000 (0.997)	-0.001 (0.952)	0.003 (0.841)
B/M ratio	0.010*** (0.009)	0.012*** (0.001)	0.011*** (0.000)	0.012*** (0.000)
$Ln(age)$	0.001 (0.496)	-0.000 (0.950)	-0.000 (0.902)	-0.001 (0.379)
$Ln(price)$	0.004* (0.067)	0.002 (0.147)	0.002 (0.220)	0.002 (0.191)
$Ln(size)$	-0.000 (0.561)	0.000 (0.977)	-0.000 (0.589)	-0.000 (0.698)
$RET_{-3,0}$	-0.009 (0.175)	-0.006 (0.150)	-0.003 (0.442)	0.000 (0.948)
$RET_{-12,-3}$	-0.006 (0.136)	-0.007** (0.037)	-0.005*** (0.008)	-0.006*** (0.001)
Constant	-0.023 (0.102)	-0.011 (0.311)	-0.002 (0.796)	-0.004 (0.589)
Quarter Dummies	Yes	Yes	Yes	Yes
Obs.	5,575	5,531	5,476	5,423
R-squared	0.222	0.234	0.248	0.257

This table presents multivariate regressions of future returns on related and unrelated funds' trading and other stock characteristics. The sample period is 1993:Q1 to 2008:Q4. All variables are defined in Appendix 2. Regressions are run using pooled OLS regression with quarter fixed effects and standard errors clustered at the firm level. Coefficients on quarter dummies are omitted from reporting. Numbers in parentheses are p -values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 3

Mutual fund trading, future earnings surprises, and future stock returns

	Negative Earnings Surprises				Non-negative Earnings Surprises			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$ret_{0,3}$	$ret_{0,6}$	$ret_{0,9}$	$ret_{0,12}$	$ret_{0,3}$	$ret_{0,6}$	$ret_{0,9}$	$ret_{0,12}$
$STR_t^R * D^R$	0.010*** (0.000)	0.005*** (0.004)	0.006*** (0.001)	0.004*** (0.002)	0.001 (0.775)	-0.002 (0.351)	-0.001 (0.736)	0.001 (0.408)
$STR_t^R * (1 - D^R)$	0.001 (0.718)	0.001 (0.289)	-0.001 (0.317)	-0.001 (0.146)	0.000 (0.927)	-0.001 (0.337)	-0.001 (0.231)	-0.001 (0.291)
$STR_t^N * D^N$	-0.003 (0.238)	-0.002 (0.115)	-0.002 (0.182)	-0.001 (0.445)	-0.004 (0.258)	-0.001 (0.673)	-0.002 (0.135)	-0.003** (0.034)
$STR_t^N * (1 - D^N)$	0.000 (0.836)	0.001 (0.568)	0.000 (0.808)	0.000 (0.942)	-0.003 (0.213)	-0.001 (0.451)	-0.000 (0.680)	-0.000 (0.795)
D^R	0.005** (0.038)	0.002 (0.153)	0.001 (0.294)	0.001 (0.285)	0.001 (0.656)	-0.003 (0.215)	-0.001 (0.328)	0.000 (0.783)
D^N	0.003 (0.149)	0.002 (0.278)	0.000 (0.930)	0.000 (0.929)	-0.004 (0.271)	0.001 (0.737)	0.002 (0.341)	0.000 (0.793)
MO_{t-1}^R	0.096* (0.091)	0.091* (0.079)	0.121** (0.017)	0.114** (0.015)	0.055 (0.366)	0.037 (0.497)	0.011 (0.825)	0.028 (0.538)
MO_{t-1}^N	-0.034 (0.169)	-0.020 (0.287)	-0.012 (0.506)	0.001 (0.967)	0.014 (0.604)	0.002 (0.916)	-0.008 (0.693)	-0.018 (0.332)
B/M ratio	0.013*** (0.006)	0.016*** (0.001)	0.013*** (0.000)	0.014*** (0.000)	0.010 (0.206)	0.010 (0.210)	0.008* (0.054)	0.011*** (0.001)
$Ln(age)$	0.002 (0.235)	0.001 (0.309)	0.001 (0.368)	0.000 (0.924)	0.001 (0.384)	0.000 (0.990)	-0.001 (0.632)	-0.001 (0.367)
$Ln(price)$	0.007*** (0.003)	0.004** (0.025)	0.004** (0.024)	0.004*** (0.010)	-0.004 (0.200)	-0.004 (0.238)	-0.004* (0.061)	-0.004** (0.040)
$Ln(size)$	-0.001 (0.278)	0.000 (0.892)	-0.000 (0.948)	0.000 (0.846)	0.001 (0.552)	-0.000 (0.607)	-0.001 (0.171)	-0.001 (0.106)
$RET_{-3,0}$	-0.026*** (0.001)	-0.009* (0.087)	-0.004 (0.407)	-0.001 (0.760)	0.011 (0.268)	-0.007 (0.338)	-0.004 (0.432)	-0.002 (0.769)
$RET_{-12,-3}$	0.004 (0.323)	0.002 (0.619)	-0.000 (0.873)	-0.002 (0.455)	-0.010*** (0.000)	-0.010*** (0.000)	-0.007*** (0.000)	-0.008*** (0.000)
Constant	-0.039** (0.015)	-0.029** (0.013)	-0.019* (0.051)	-0.020** (0.026)	-0.016 (0.495)	0.019 (0.392)	0.054* (0.073)	0.032*** (0.003)
Quarter Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	3379	3370	3346	3319	2,110	2,077	2,046	2,020
R-squared	0.240	0.254	0.256	0.256	0.243	0.266	0.306	0.346

This table presents multivariate regressions of future returns on related and unrelated funds' trading and other stock characteristics. In columns (1) to (4), the sample is restricted to stocks with negative earnings surprises. In columns (5) to (8), the sample is restricted to stocks with non-negative earnings surprises in the next four quarters. The sample period is 1993:Q1 to 2008:Q4. All variables are defined in Appendix 2. Regressions are run using pooled OLS regression with quarter fixed effects and standard

errors clustered at the firm level. Coefficients on quarter dummies are omitted from reporting. Numbers in parentheses are p -values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 4

Information uncertainty, mutual fund trading, and future stock returns

	Smaller	Larger	High Idiosyncratic Risk	Low Idiosyncratic Risk	High Forecast Error	Low Forecast Error
	(1)	(2)	(3)	(4)	(5)	(6)
	$ret_{0,3}$	$ret_{0,3}$	$ret_{0,3}$	$ret_{0,3}$	$ret_{0,3}$	$ret_{0,3}$
$STR_t^R * D^R$	0.009*** (0.001)	-0.001 (0.699)	0.009*** (0.001)	0.001 (0.664)	0.011*** (0.005)	0.003 (0.268)
$STR_t^R * (1 - D^R)$	0.001 (0.421)	0.002 (0.409)	-0.000 (0.995)	0.001 (0.495)	0.001 (0.580)	-0.001 (0.578)
$STR_t^N * D^N$	-0.002 (0.338)	-0.003 (0.197)	-0.002 (0.466)	-0.003 (0.147)	-0.002 (0.573)	-0.004* (0.072)
$STR_t^N * (1 - D^N)$	-0.003 (0.105)	0.002 (0.509)	-0.003 (0.155)	0.003 (0.183)	-0.002 (0.361)	0.001 (0.657)
D^R	0.006** (0.038)	-0.000 (0.825)	0.005 (0.130)	0.001 (0.651)	0.005** (0.048)	0.002 (0.306)
D^N	-0.003 (0.358)	0.003 (0.304)	-0.003 (0.435)	0.004* (0.073)	-0.001 (0.805)	0.002 (0.505)
MO_{t-1}^R	0.103** (0.023)	0.029 (0.704)	0.099* (0.079)	0.097* (0.071)	0.155** (0.012)	0.036 (0.574)
MO_{t-1}^N	-0.006 (0.831)	-0.011 (0.689)	0.005 (0.868)	-0.020 (0.367)	-0.020 (0.535)	0.012 (0.600)
Quarter Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2750	2825	2766	2805	2723	2766
R-squared	0.248	0.245	0.249	0.283	0.237	0.256

This table presents multivariate regressions of future returns on related and unrelated funds' trading and other stock characteristics for stocks with differing information uncertainty. The dependent variable is the average return in the next three months. Columns 1-2 present results for stocks with *Size* below or above cross-sectional sample medians (smaller and larger stocks, respectively). Columns 3-4 present results for stocks with idiosyncratic risk higher or lower than cross-sectional sample medians, where idiosyncratic risk is defined as standard error of residuals in Carhart (1997) four-factor model in the past 60 months. Columns 5-6 present results for stocks with analyst earnings forecast errors higher or lower than cross-sectional sample medians, where forecast errors are calculated as the absolute value of the difference between the reported earnings per share and the most recent consensus analyst earnings forecast, scaled by stock price at the end of the previous quarter. The sample period is 1993:Q1 to 2008:Q4. All other variables are defined in Appendix 2. Regressions are run using pooled OLS regression with quarter fixed effects and standard errors clustered at the firm level. Coefficients on control variables and quarter dummies are omitted from reporting. Numbers in parentheses are *p*-values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 5

The portfolio approach

	(1)	(2)	(3)	(4)
Panel A: Related funds	<i>aret</i> _{0,3}	<i>aret</i> _{0,6}	<i>aret</i> _{0,9}	<i>aret</i> _{0,12}
i. High selling (top quintile)	-0.0116*	-0.0039*	-0.0045**	-0.0026*
	(0.065)	(0.091)	(0.039)	(0.070)
ii. Other trading	0.0019	0.0020*	0.0024**	0.0020
	(0.180)	(0.066)	(0.024)	(0.107)
Difference (i – ii)	-0.0135**	-0.0060***	-0.0069***	-0.0046***
	(0.041)	(0.009)	(0.003)	(0.001)
Panel B: Unrelated funds				
i. High selling (top quintile)	0.0000	0.0026	0.0043	0.0043
	(0.996)	(0.298)	(0.217)	(0.156)
ii. Other trading	0.0007	0.0011	0.0015	0.0013
	(0.611)	(0.296)	(0.142)	(0.254)
Difference (i – ii)	-0.0007	0.0015	0.0028	0.0030
	(0.878)	(0.555)	(0.409)	(0.273)

This table presents the average monthly DGTW-adjusted returns in the next four quarters for portfolios of stocks experiencing intense selling by related or unrelated funds and other stocks. The sample is restricted to stocks with market capitalization below the cross-sectional median. The sample period is 1993:Q1 to 2008:Q4. The high selling portfolio includes stocks in the top quintile of related (panel A) or unrelated (panel B) funds' selling in the quarter and the other trading portfolio includes other stocks. The average returns are computed for each portfolio in each quarter and the time-series means of these averages, as well as the time-series means of the differences in returns between the two portfolios are reported. Numbers in parentheses are *p*-values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 6

Trustees versus other service providers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	<i>ret</i> _{0,3}	<i>ret</i> _{0,6}	<i>ret</i> _{0,9}	<i>ret</i> _{0,12}	<i>ret</i> _{0,3}	<i>ret</i> _{0,6}	<i>ret</i> _{0,9}	<i>ret</i> _{0,12}	<i>ret</i> _{0,3}	<i>ret</i> _{0,6}	<i>ret</i> _{0,9}	<i>ret</i> _{0,12}
$STR_t^R * D^R$	0.010*** (0.002)	0.005* (0.050)	0.004** (0.046)	0.002 (0.140)	0.007** (0.027)	0.006** (0.022)	0.004* (0.061)	0.002 (0.145)				
$STR_t^R * (1 - D^R)$	0.000 (0.940)	0.000 (0.932)	0.000 (1.000)	-0.001 (0.602)	0.001 (0.671)	0.000 (0.768)	0.000 (0.827)	-0.000 (0.795)				
$STR_t^{IM} * D^{IM}$	0.004 (0.242)	0.001 (0.748)	0.001 (0.515)	0.002 (0.227)					0.001 (0.458)	0.002 (0.255)	0.001 (0.566)	0.001 (0.369)
$STR_t^{IM} * (1 - D^{IM})$	-0.001 (0.424)	-0.001 (0.286)	-0.001 (0.396)	-0.000 (0.739)					-0.001 (0.600)	-0.001 (0.208)	-0.001 (0.355)	-0.000 (0.677)
$STR_t^N * D^{OSP}$					0.002 (0.429)	0.001 (0.586)	0.002 (0.294)	0.001 (0.274)				
$STR_t^N * (1 - D^{OSP})$					-0.002 (0.256)	-0.001 (0.284)	-0.000 (0.862)	-0.000 (0.901)				
$STR_t^N * D^N$									0.002 (0.357)	0.003 (0.116)	0.001 (0.423)	-0.000 (0.656)
$STR_t^N * (1 - D^N)$									-0.001 (0.546)	-0.001 (0.500)	-0.000 (0.740)	-0.000 (0.553)
D^R	0.006 (0.108)	0.001 (0.582)	0.001 (0.699)	-0.000 (0.747)	0.001 (0.734)	0.000 (0.868)	0.000 (0.914)	-0.000 (0.836)	0.001 (0.689)	-0.001 (0.546)	-0.001 (0.445)	0.001 (0.465)
D^N	-0.002 (0.548)	0.000 (0.962)	0.002 (0.411)	0.003* (0.074)	0.002 (0.513)	0.003 (0.151)	0.003* (0.087)	0.003** (0.023)	0.001 (0.722)	0.003** (0.047)	0.001 (0.404)	-0.000 (0.960)
MO_{t-1}^R	0.222 (0.150)	0.196* (0.076)	0.089 (0.327)	0.071 (0.345)	0.169 (0.238)	0.192** (0.041)	0.094 (0.214)	0.079 (0.213)	0.110** (0.014)	0.128*** (0.002)	0.101** (0.011)	0.090** (0.019)
MO_{t-1}^N	-0.015 (0.876)	0.046 (0.550)	0.045 (0.519)	0.093* (0.092)	0.041 (0.562)	0.046 (0.466)	0.034 (0.567)	0.064 (0.216)	-0.000 (0.982)	-0.002 (0.901)	-0.009 (0.513)	-0.008 (0.530)
Quarter Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,138	1,133	1,122	1,114	1,533	1,524	1,511	1,497	5,439	5,398	5,349	5,299
R-squared	0.252	0.312	0.309	0.358	0.245	0.295	0.306	0.348	0.246	0.263	0.279	0.289

This table presents multivariate regressions of future returns on trading of funds and other stock characteristics. STR^R is trading of trustee funds. STR^{IM} is trading of investment manager funds. In columns 5-8, STR^{OSP} is trading of funds of non-trustee service providers including investment managers. In columns 9-12, STR^N is trading of unrelated funds and of other service providers excluding trustees and investment managers. D^{IM} is a dummy equal to 1 if investment manager funds are selling and 0 otherwise; D^{OSP}

and D^N are similarly defined. The sample period is 1993:Q1 to 2008:Q4. All other variables are defined in Appendix 2. Regressions are run using pooled OLS regression with quarter fixed effects and standard errors clustered at the firm level. Coefficients on control variables and quarter dummies are omitted from reporting. Numbers in parentheses are p -values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 7

Longer-relationship trustees vs. other trustees

		(1)	(2)	(3)	(4)
		$ret_{0,3}$	$ret_{0,6}$	$ret_{0,9}$	$ret_{0,12}$
$STR_t^R * D^R * D^L$	[Selling by longer-relationship trustee funds]	0.009** (0.047)	0.001 (0.575)	0.004** (0.043)	0.003** (0.010)
$STR_t^R * (1 - D^R) * D^L$	[Buying by longer-relationship trustee funds]	0.000 (0.942)	-0.000 (0.842)	-0.001 (0.340)	-0.001 (0.345)
$STR_t^R * D^R * (1 - D^L)$	[Selling by other trustee funds]	0.006** (0.033)	0.003 (0.157)	0.002 (0.190)	0.002 (0.222)
$STR_t^R * (1 - D^R) * (1 - D^L)$	[Buying by other trustee funds]	0.003 (0.180)	0.002 (0.145)	0.001 (0.423)	0.001 (0.471)
$STR_t^N * D^N$	[Selling by unrelated funds]	-0.002 (0.382)	-0.001 (0.472)	-0.001 (0.251)	-0.001 (0.182)
$STR_t^N * (1 - D^N)$	[Buying by unrelated funds]	-0.002 (0.277)	-0.000 (0.882)	0.000 (0.725)	0.000 (0.804)
D^L		0.005*** (0.007)	0.003* (0.088)	0.003** (0.049)	0.003** (0.031)
D^R		0.005** (0.014)	0.001 (0.607)	0.001 (0.486)	0.001* (0.094)
D^N		-0.000 (0.965)	0.001 (0.646)	0.001 (0.642)	0.000 (0.719)
MO_{t-1}^R		0.102** (0.019)	0.099** (0.014)	0.087** (0.011)	0.081** (0.013)
MO_{t-1}^N		0.003 (0.887)	0.005 (0.788)	0.010 (0.583)	0.015 (0.351)
B/M ratio		0.009* (0.065)	0.012*** (0.009)	0.010*** (0.001)	0.013*** (0.000)
$Ln(age)$		0.000 (0.911)	-0.000 (0.794)	-0.000 (0.716)	-0.001 (0.265)
$Ln(price)$		0.004 (0.127)	0.002 (0.278)	0.001 (0.434)	0.002 (0.252)
$Ln(size)$		-0.001 (0.133)	-0.000 (0.428)	-0.001 (0.125)	-0.001 (0.112)
$RET_{-3,0}$		-0.007 (0.353)	-0.007 (0.160)	-0.004 (0.384)	-0.001 (0.746)
$RET_{-12,-3}$		-0.007* (0.058)	-0.008*** (0.006)	-0.006*** (0.000)	-0.007*** (0.000)
Constant		-0.019 (0.180)	-0.035*** (0.006)	-0.002 (0.832)	-0.003 (0.715)
Quarter Dummies		Yes	Yes	Yes	Yes
Obs.		4,308	4,273	4,231	4,187
R-squared		0.226	0.240	0.254	0.271

This table presents multivariate regressions of future returns on trading of related funds in families that have longer trustee relationships with the firm and trading of other related funds and unrelated funds, and other stock characteristics. The sample period is 1998:Q1 to 2008:Q4. Longer-relationship trustees are those with the length of the trustee relationship greater than the cross-sectional median, denoted by D^L , which is equal to 1 if the fund belongs to a longer-relationship trustee family, and 0 otherwise. All other variables are defined in Appendix 2. Regressions are run using

pooled OLS regression with quarter fixed effects and standard errors clustered at the firm level. Coefficients on quarter dummies are omitted from reporting. Numbers in parentheses are p -values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 8

Plan's trading in the firm's own stock, mutual fund trading, and future returns

	(1)	(2)	(3)	(4)
	$ret_{0,3}$	$ret_{0,6}$	$ret_{0,9}$	$ret_{0,12}$
$STR_t^R * D^R * D^{Plan}$	0.011** (0.015)	0.008** (0.021)	0.006** (0.020)	0.002 (0.324)
$STR_t^R * D^R$	0.001 (0.701)	0.001 (0.635)	0.001 (0.619)	0.002 (0.210)
$STR_t^R * (1 - D^R)$	0.001 (0.524)	-0.000 (0.938)	-0.000 (0.645)	-0.001 (0.365)
$STR_t^N * D^N$	0.001 (0.649)	-0.001 (0.717)	-0.001 (0.675)	-0.000 (0.926)
$STR_t^N * (1 - D^N)$	-0.002 (0.333)	-0.001 (0.684)	-0.000 (0.902)	0.000 (0.665)
D^{Plan}	-0.002 (0.870)	-0.010 (0.233)	-0.013 (0.160)	-0.013 (0.193)
D^R	0.004 (0.145)	0.001 (0.565)	0.001 (0.625)	0.002 (0.265)
D^N	0.003 (0.309)	0.002 (0.369)	0.003 (0.205)	0.003** (0.037)
MO_{t-1}^R	0.072 (0.130)	0.090* (0.056)	0.079* (0.068)	0.070* (0.098)
MO_{t-1}^N	0.033 (0.268)	0.026 (0.330)	0.024 (0.351)	0.022 (0.373)
B/M ratio	0.013** (0.030)	0.013*** (0.003)	0.014*** (0.000)	0.014*** (0.000)
$Ln(age)$	0.001 (0.575)	0.001 (0.674)	0.001 (0.750)	0.000 (0.962)
$Ln(price)$	0.003 (0.273)	0.001 (0.516)	0.001 (0.647)	0.001 (0.689)
$Ln(size)$	0.000 (0.995)	0.000 (0.764)	0.000 (0.883)	0.000 (0.860)
$RET_{-3,0}$	-0.007 (0.475)	-0.006 (0.359)	-0.001 (0.848)	0.001 (0.880)
$RET_{-12,-3}$	0.005 (0.254)	0.001 (0.838)	-0.000 (0.927)	-0.002 (0.636)
Constant	-0.014 (0.510)	-0.003 (0.846)	-0.004 (0.772)	-0.008 (0.535)
Quarter Dummies	Yes	Yes	Yes	Yes
Obs.	2,079	2,064	2,043	2,018
R-squared	0.252	0.266	0.278	0.286

This table presents multivariate regressions of future returns on trading of related funds and other stock characteristics for firms with pension plans reducing investment in their own firms' stocks versus the remaining firms. The sample period is 1993:Q1

to 2008:Q4. D^{Plan} is a dummy variable equal to 1 if the pension plan reduces ownership in the firm's own stock and 0 otherwise. All variables are defined in Appendix 2. Regressions are run using pooled OLS regression with quarter fixed effects and standard errors clustered at the firm level. Coefficients on quarter dummies are omitted from reporting. Numbers in parentheses are p -values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 9

Related funds' trading and future stock returns for overweighted stocks

	Top ownership 20% by any fund				Top ownership 20% by any fund family			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>ret</i> _{0,3}	<i>ret</i> _{0,6}	<i>ret</i> _{0,9}	<i>ret</i> _{0,12}	<i>ret</i> _{0,3}	<i>ret</i> _{0,6}	<i>ret</i> _{0,9}	<i>ret</i> _{0,12}
$STR_t^R * D^R$	0.005*** (0.008)	0.002 (0.190)	0.002* (0.070)	0.002* (0.097)	0.007*** (0.001)	0.003** (0.027)	0.003** (0.021)	0.002** (0.013)
$STR_t^R * (1 - D^R)$	0.004 (0.228)	0.006** (0.044)	0.004* (0.079)	0.004** (0.023)	0.004 (0.151)	0.002 (0.326)	0.002 (0.371)	0.002 (0.159)
$STR_t^N * D^N$	-0.001 (0.604)	-0.001 (0.508)	-0.001 (0.228)	-0.001 (0.183)	0.001 (0.545)	0.001 (0.647)	-0.001 (0.575)	-0.000 (0.965)
$STR_t^N * (1 - D^N)$	-0.000 (0.916)	0.001 (0.663)	0.000 (0.858)	-0.002 (0.179)	-0.006 (0.167)	-0.003 (0.343)	-0.003 (0.223)	-0.004 (0.120)
D^R	0.003 (0.243)	0.002 (0.282)	0.002 (0.308)	0.003* (0.059)	0.004 (0.111)	0.001 (0.616)	0.001 (0.581)	0.002 (0.150)
D^N	0.001 (0.841)	0.003 (0.280)	0.002 (0.443)	-0.001 (0.623)	-0.005 (0.228)	-0.003 (0.338)	-0.004 (0.164)	-0.003 (0.212)
MO_{t-1}^R	0.140** (0.031)	0.079 (0.133)	0.077* (0.096)	0.043 (0.297)	0.155** (0.019)	0.117** (0.032)	0.112** (0.022)	0.079* (0.065)
MO_{t-1}^N	-0.006 (0.870)	0.011 (0.710)	-0.010 (0.713)	-0.010 (0.709)	0.049 (0.146)	0.026 (0.363)	0.007 (0.775)	0.011 (0.620)
B/M ratio	0.004 (0.668)	0.012* (0.099)	0.014** (0.015)	0.013** (0.012)	0.006 (0.580)	0.009 (0.208)	0.008 (0.127)	0.008* (0.063)
$Ln(age)$	0.001 (0.402)	0.001 (0.525)	0.000 (0.875)	-0.000 (0.869)	0.002 (0.266)	0.001 (0.506)	0.000 (0.774)	-0.000 (0.700)
$Ln(price)$	-0.002 (0.425)	-0.002 (0.260)	-0.001 (0.472)	-0.000 (0.970)	-0.004 (0.269)	-0.002 (0.348)	-0.001 (0.618)	-0.001 (0.651)
$Ln(size)$	-0.002 (0.125)	-0.002** (0.045)	-0.001* (0.086)	-0.001** (0.046)	-0.002* (0.054)	-0.002* (0.057)	-0.002* (0.079)	-0.001* (0.096)
$RET_{-3,0}$	-0.020* (0.052)	-0.005 (0.489)	0.001 (0.918)	-0.001 (0.913)	-0.015 (0.104)	-0.010 (0.142)	-0.005 (0.418)	-0.005 (0.278)
$RET_{-12,-3}$	0.003 (0.547)	-0.003 (0.339)	-0.003 (0.242)	-0.005* (0.091)	0.001 (0.787)	-0.004 (0.201)	-0.005* (0.071)	-0.003 (0.234)
Constant	0.039* (0.064)	0.025* (0.082)	0.012 (0.366)	0.021* (0.098)	0.063** (0.015)	0.005 (0.765)	0.040** (0.012)	0.043*** (0.002)
Quarter Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2327	2315	2299	2284	2186	2173	2158	2145
R-squared	0.241	0.289	0.289	0.313	0.261	0.318	0.337	0.355

Regressions include only stocks that are overweighted by the sample funds. Regressions 1-4 include stocks in the top ownership quintile by any sample fund. Regressions 5-8 include stocks in the top aggregate ownership quintile by any sample fund family.

The sample period is 1993:Q1 to 2008:Q4. All variables are defined in Appendix 2. Regressions are run using pooled OLS

regression with quarter fixed effects and standard errors clustered at the firm level. Coefficients on quarter dummies are omitted from reporting. Numbers in parentheses are p -values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE 10

Winning funds' trading and future stock returns

	(1)	(2)	(3)	(4)
	$ret_{0,3}$	$ret_{0,6}$	$ret_{0,9}$	$ret_{0,12}$
$STR_t^R * D^R$	0.007** (0.032)	0.003** (0.043)	0.004** (0.024)	0.003** (0.011)
$STR_t^R * (1 - D^R)$	0.001 (0.576)	0.001 (0.549)	-0.000 (0.744)	-0.000 (0.975)
$STR_t^N * D^N$	-0.003 (0.187)	-0.002 (0.379)	-0.003** (0.041)	-0.002** (0.037)
$STR_t^N * (1 - D^N)$	-0.001 (0.676)	0.001 (0.605)	0.001 (0.464)	0.001 (0.352)
D^R	0.000 (0.903)	-0.000 (0.800)	0.000 (0.837)	0.000 (0.686)
D^N	-0.002 (0.495)	-0.000 (0.810)	-0.001 (0.664)	0.000 (0.816)
MO_{t-1}^R	0.159*** (0.008)	0.106** (0.042)	0.097** (0.039)	0.081* (0.067)
MO_{t-1}^N	0.018 (0.553)	-0.004 (0.883)	-0.009 (0.673)	-0.007 (0.732)
B/M ratio	0.015** (0.036)	0.012*** (0.005)	0.013*** (0.000)	0.015*** (0.000)
$Ln(age)$	-0.000 (0.957)	-0.001 (0.370)	-0.001 (0.269)	-0.001 (0.187)
$Ln(price)$	0.000 (0.858)	0.001 (0.558)	0.001 (0.542)	0.002 (0.179)
$Ln(size)$	-0.001 (0.440)	-0.001 (0.138)	-0.001 (0.101)	-0.001 (0.147)
$RET_{-3,0}$	-0.014* (0.064)	-0.007 (0.138)	-0.002 (0.599)	-0.000 (0.964)
$RET_{-12,-3}$	-0.004 (0.218)	-0.008** (0.018)	-0.005*** (0.000)	-0.006*** (0.000)
<i>Constant</i>	-0.006 (0.747)	0.009 (0.475)	0.012 (0.261)	0.003 (0.762)
Quarter Dummies	Yes	Yes	Yes	Yes
<i>Obs.</i>	3320	3295	3266	3239
<i>R-squared</i>	0.226	0.239	0.263	0.268

This table presents multivariate regressions of future returns on related and unrelated funds' trading and other stock characteristics, restricting the sample to "winning" funds. In each quarter, a fund is classified as a winning fund if its Carhart (1997) four-factor alpha at the last quarter-end is above the cross-sectional median. Carhart (1997) four-factor alpha is computed using performance in the last 36 months. The sample period is 1993:Q1 to 2008:Q4. All variables

are defined in Appendix 2. Regressions are run using pooled OLS regression with quarter fixed effects and standard errors clustered at the firm level. Coefficients on quarter dummies are omitted from reporting. Numbers in parentheses are p -values. *, ** and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.