Asset Managers as Buyers of Last Resort *

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Abstract

We study how business relations between asset management companies and brokerage firms affect portfolio choice of mutual funds. We show that mutual funds systematically overweight financial companies that are ultimate owners of their brokers. Moreover, in times of distress, funds act as buyers of last resort and increase stock holdings in their brokers' companies. We find that these trades contribute significantly to the stability of financial companies and have the effect of reducing the systemic risk of the financial sector. While mutual funds lose money trading brokers' stocks, a fund's overall performance increases with their holdings of brokers' stocks. This suggests that funds act as buyers of last resort for brokers that provide them with investment tips on other companies. The documented relationship is strongest for brokers that have better access to privileged information and funds that have long-lasting business ties with their brokers. Exogenous changes in business ties due to brokerage firm acquisitions confirm the causal nature of this relationship. Our findings contribute to the debate on whether consolidation in the financial sector exacerbates or mitigates systemic risk.

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I Introduction

Consolidation in the financial sector has led to the establishment of large financial conglomerates that provide everything from commercial lending to securities dealing and brokerage services. A large body of work argues that the emergence of financial conglomerates comes at the cost of the increased systemic risk because financial institutions that are "too-big-to-fail" take excessive risks.[1] However, by consolidating and enlarging the scope of their business activities, financial institutions also expanded the network of business ties with their clients. While many studies analyze potential costs of financial conglomeration, little is known about the potential benefits of conglomeration for the stability of financial institutions arising from the expanded network of business relations with their clients.

We address this issue by studying incentives in the relation between financial conglomerates' brokerage divisions and their asset management clients. We focus on these relations because asset managers are important investors in their brokers' ultimate owners. In the period analyzed, between 1996 and 2018, we show that mutual funds owned, on average, as much as 8% of their brokers' parent stock. How funds trade their brokers' parent stock can therefore have an important impact on the financial conglomerates' stock volatility and systemic risk. The Securities Exchange Commission (SEC) has recognized the potential for conflicts of interest, and it requires funds to disclose holdings in their brokers' parent companies in the semi-annual form N-SAR.[2] In this paper, we argue that mutual funds have an incentive to act as buyers of last resort and increase stock holdings in their brokers' parent companies in distress times. We show that this has a measurable effect of reducing the systemic risk of financial companies.

Funds' incentive to act on brokers' behalf is rooted in the fact that brokers play a vital role for institutional investors (Goldstein et al. (2009)). Specifically, brokers not only facilitate funds' trades and provide retail distribution support (Edelen et al. (2012)), but they also are privy to information that can be of great value to asset managers.

[1] See Wagner (2010), Ibragimov et al. (2011), Boot and Ratnovski (2016), and Brunnermeier et al. (2019), among others.

[2] See question 24 and 25 in the Form N-SAR. Except for the mandatory disclosure, there is no special restriction on how and when funds invest in their brokers' parent companies, as long as the securities-dealing business represents less than 15% of the broker's parent company revenue. Even if this criterion is not met, mutual funds can still invest up to 5% of their total net asset value and own up to 5% of their broker's stock. For details, see 1940 Investment Company Act, Section 270.12d3-1.

Such information may leak to brokers from the lending division or the underwriting division of the same financial conglomerate or from their affiliated equity analysts (Kumar et al. (2020); Gokkaya et al. (2019); Qian and Zhong (2018)). Moreover, by facilitating trading, brokers also observe a large part of smart money stock order flow. This gives brokers an additional insight into expected stock price movements of sophisticated investors (Di Maggio et al. (2019); Barbon et al. (2019); Chung and Kang (2016)).

For asset managers, brokers' services and information are crucial in their competition for investors. To get an edge over competitors, asset managers have a strong incentive to curry favors with their brokers. In exchange, brokers can provide prime services and leak information to their most valuable clients. As time evolves, repeated interactions between asset managers and their brokers create incentives for both parties to preserve strong business ties (Goldstein et al. (2009)).

We argue that the value of strong and long-lasting business ties also creates an incentive for asset managers to support the stock price of their brokers' parent companies. Since most brokerage firms are a part of a larger publicly traded financial conglomerate, their future depends not only on how well their brokerage division performs, but also on the performance of the financial conglomerate as a whole. Like management and shareholders of the financial conglomerate, brokers are interested in the stability of the financial conglomerate as a whole. To win over their brokers and preserve long-lasting relations, asset managers have an incentive to step in and invest part of their portfolio in a way that benefits their brokers. There is evidence that funds owned by banks provide price support for their owners and lending clients (Golez and Marin (2015); Ferreira et al. (2018)). Similarly, funds may invest in the brokers' parent stocks with the aim of providing price support during distress times.

Such trades are also in asset managers' own interest. Financial conglomerates in distress could allocate fewer resources to their brokerage division or lose some of their key employees. By investing in broker's parent companies during distress times, asset managers may help prevent a severe financial shock of the broker's financial conglomerate and, hence, preserve the continuity of business ties with their brokers.

To sum up, our main hypothesis is that there exists an implicit contract between brokers and asset managers that emerges in the process of repeated interactions between the brokers and their clients. Brokers provide asset managers with investment tips, whereas

asset managers act as buyers of last resort for their brokers' parent stocks during distress times. Portfolio managers and fund investors benefit from higher fund performance, whereas brokers, managers, and shareholders of the brokers' parent companies benefit from higher financial stability of the parent stock.

We test our hypothesis for the U.S. mutual fund industry. Our data extend from 1996 to 2018 and cover all active equity funds. We link mutual funds and brokers using the information in N-SAR reports and restrict the analysis to brokers that are affiliated to publicly traded financial conglomerates. The vast majority (80%) of brokers' ultimate owners are banks and insurance companies.

We first establish that funds are important investors in their brokers' parent companies. About 60% of the funds invest in at least one of their brokers' parent companies. These investments present, on average, about 6% of funds' total net asset. From the brokers' perspective, more than 80% of brokers are connected to at least one fund that is both an investor in their equity and their client. On average, client funds hold around 8% of brokers' stock. These investments are sizable in absolute terms as well as when compared to other funds. Indeed, funds connected to a given broker are much more likely to invest in the broker's parent stock than funds that are not connected to the broker (the probabilities are 22.6% versus 3.6%). In terms of the ownership, connected funds hold, on average, four times as many shares of brokers' parent stocks as unconnected funds. These differences are significant after controlling for fund and stock characteristics and different combinations of fixed effects.

Next, we provide results for our main hypothesis. We show that connected funds increase their stakes in the brokers' parent stocks during times of distress. In contrast, unconnected funds decrease their investments in stocks that are in distress. This holds when we measure distress using the selling pressure of other funds (as in Cohen and Schmidt (2009)) or when we determine distress periods by downward revisions of analysts' recommendations. Results also hold after controlling for all the standard fund and stock characteristics.

We find that these trades are not profitable over the short-run and funds would be better of purchasing stocks of other companies. This confirms that these trades do not contain superior information and are not done to enhance a fund's performance. However, in line with our hypothesis, we find that investments in connected stocks decrease the

riskiness of financial conglomerates. In particular, ownership in brokers' parent stocks is negatively associated with measures of brokers' stock riskiness (e.g. return volatility, idiosyncratic volatility, expected shortfall, and marginal expected shortfall). This suggests that funds not only attempt to act as buyers of last resort, but they also are successful in providing price support in distress times. Moreover, as our results hold for the marginal expected shortfall measure of Acharya et al. (2017), we can confirm that the network effects between the brokers and their clients have broader implications for the systemic risk of the financial sector.

While funds appear to lose money trading their brokers' parent stocks, we find that a fund's overall performance increases with the ownership of their brokers' parent stock. This suggests that brokers compensate funds for acting as buyers of last resort with information on non-connected stocks. As further evidence of the information channel, we show that a fund's overall performance increases with the ownership of their brokers' parent stock especially when the broker works with hedge funds (a proxy for sophisticated investors), when the broker is part of a conglomerate with a commercial lending arm, or when the broker belongs to a financial conglomerate with affiliated equity analysts.

Overall, the fund-broker relation that we document seems beneficial to all the parties involved: asset managers get access to brokers' information; whereas, brokers, shareholders, and managers of a broker's parent company benefit from having a buyer of last resort that absorbs negative shocks.

This leads to an important question. If the relation is beneficial to all the parties, why don't all funds and brokers engage in this exchange of favors? The fund-broker relation is implicit and, hence, fragile. It may take time to establish trust between the brokers and asset managers. We, therefore, expect it to be stronger among funds that have longer relations with their brokers. Indeed, what we see in the data is that the relation strengthens with the length and the intensity of the broker-fund relation.

We also use exogenous changes to business ties that result from acquisitions of brokerage firms by financial institutions to address the issue of causality. In a double difference-in-differences (DID) approach, we confirm all our previous results. This suggests that the relation we document is in fact causal.

Our paper is related to two main strands of the literature. First, we contribute to studies that analyze how asset managers' business connections affect funds' portfolio

choices (Cohen and Schmidt (2009); Golez and Marin (2015); Gil-Bazo et al. (2020); Ferreira et al. (2018)). Cohen and Schmidt (2009) document that 401k trustees overweight holdings of the sponsor firm's stock. In comparison, we show that funds overweight their broker's parent stock. We also show that they act as buyers of last resort around distressed times and that such trading has the real effect on the systemic risk of the financial sector. For the case of the Spanish mutual fund industry, where mutual funds are allowed to hold the securities of the controlling company, Golez and Marin (2015) and Gil-Bazo et al. (2020) show that bank-affiliated funds provide price support for their parent banks. We show that US mutual funds act as buyers of last resort for their brokers' parent stocks. In Golez and Marin (2015), price supporting trades arise because of a conflict of interest and, thus, at the cost of fund investors. In our case, the relation is beneficial for all the parties involved. This is also an important distinction with respect to Ferreira et al. (2018), who study price-support trading in an international setting. Like in Golez and Marin (2015), there is a breach of fiduciary duty, which means that, in equilibrium, the practice of price support can exist only if investors are not very sensitive to performance. In comparison, in our case, fund managers are compensated with information on other stock and, hence, the equilibrium outcome does not hinge upon captive investors. The fact that asset managers provide price support for their brokers' parent stock also helps us understand why brokers share information with asset managers (e.g., Gokkaya et al. (2019)).

Second, we contribute to the literature on the effects of financial consolidation on the stability of the financial system (Brunnermeier et al. (2019); Boot and Ratnovski (2016); Ibragimov et al. (2011); Wagner (2010)). The existing literature mostly emphasizes that financial conglomeration may lead to excessive risk-taking and, thus, to an increase in systematic risk. In comparison, our findings suggest that network effects between the financial conglomerates and their clients can have an important impact on reducing the systemic risk of financial institutions.

The rest of the paper is organized as follows. Section II details the data. Section III presents results on portfolio choices of funds connected to brokers. Section IV delves deeper into the performance of connected funds and presents additional results for the cross-section of fund-broker relations. In the same section, we also consider exogenous changes to business ties between funds and their brokers. Section V concludes.

II Data

In this Section, we discuss data sources and present descriptive statistics for funds and broker's parent companies.

A Data Collection

We obtain data for a sample of open-ended U.S. mutual funds from 1996 to 2018. The data on mutual fund characteristics and net returns are from the Center for Research in Securities Prices (CRSP) Survivor Bias-Free U.S. Mutual Fund database. We calculate gross returns before expenses by adding one-twelfth of the fund expense ratio to the net monthly return.

CRSP has information on multiple share classes issued by the same fund. These share classes have the same underlying portfolio; their main difference is the fee structure. To avoid multiple counting, we aggregate share class level data to the portfolio level. That is, we calculate total assets under management (AUM) as the sum of assets across all share classes, and we compute the value-weighted average of a fund's characteristics across share classes.[3]

Given the nature of our tests, we focus on US actively managed diversified equity funds. In particular, we consider funds with CRSP objective codes EDYG (Growth), EDYB (Blend), EDYI (Value), EDCM (Mid-Cap), EDCS (Small-Cap), and EDCI (Micro-Cap). To avoid passive funds, we do not consider funds with the CRSP objective code EDCL (S&P 500 Index Objective Funds). We also eliminate funds if their names contain the words "index," "S&P," or "ETF." Finally, to exclude the possible presence of hedge funds, we do not consider funds with the CRSP objective code EDYH (Long/Short Equity Funds) and EDYS (Dedicated Short Bias Funds).

We obtain funds' quarterly holdings from the Thomson Reuters mutual fund holdings database. We merge this database with CRSP data using MFLINKS tables.[4] From 2004 onward, we complement this database with the CRSP Mutual Fund Portfolio Holdings data (CRSP started reporting information on funds' stock holdings in 2004). Our final

[3]We aggregate returns, turnover, and expenses, weighting each share class by its total assets under management (AUM). Fund age is computed as of the month-end relative to the fund's first offer-date. For the qualitative attributes of the funds, such as name or investment objective, we choose that of the oldest among all classes.

[4]The MFLINKS tables are available through Wharton Research Data Services (WRDS) and provide a reliable way to merge Thomson and CRSP databases.

sample contains on average 2,498 funds per year, or 455,730 fund-quarter observations.

Data on mutual funds' brokers come from the Form N-SAR reports. Under the Investment Company Act of 1940, all registered investment companies are required to file Form N-SAR with the Securities and Exchange Commission (SEC) on a semi-annual basis. In the N-SAR filings, investment companies disclose information about fund operations and financials. Of particular interest to us is the identity of brokers that receive the largest commissions from the investment company. The data lists the ten largest brokers per investment company. We extract N-SAR reports filed between 1996 and 2018 from the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system.

To identify ultimate owners of brokers' firms (that is, brokers' parent companies), we proceed in three steps. First, we search for each broker's name in the SEC's IAPD online database and lookup Schedule A of Form ADV, which lists all direct owners and executive officers. We then merge the list of brokers from the N-SAR reports with the investment advisers from forms ADV. This enables us to infer whether brokers are owned by publicly traded companies and the identities of these companies.

Next, we search the CRSP stock database to find the PERMNOs of the corresponding publicly-traded stocks. For the matched PERMNOs, we obtain monthly stock returns for brokers' parent companies from the CRSP stock files. If a broker's firm is a standalone publicly-traded company, we use stock returns for this brokerage firm.

For brokers that we could not find a match using the above procedure, we manually search their ultimate owners using the online *BrokerCheck* tool provided by FINRA.[5] Our final sample contains on average 174 publicly-traded brokers per year, or 86,155 broker-quarter observations.

B Descriptive Statistics

Panel A of Table 1 presents preliminary statistics for our sample of mutual funds. These statistics are reported as time-series averages. The average number of unique funds per year is 2,498. About 60% of these funds hold shares of their brokers' parent companies. On average, funds invest about 6% of their total net assets in their brokers' shares.

Panel B of Table 1 reports similar statistics for brokers' parent companies. On average,

[5]https://brokercheck.finra.org/

there are 174 brokers per year.[6] More than 80% of these brokers (144 on average) have client funds that are also investors in their stock. On average, almost 8% of brokers' shares are held by the client funds.[7]

Panel C of Table 1 reports summary statistics for the mutual fund variables used in our analysis. These include portfolio size, age, expense ratio, load fee, turnover, monthly fund flows, volatility of returns, volatility of fund flows, fund returns, family size, and the number of funds in a fund family. In Panel D of Table 1 are the summary statistics for the characteristics of brokers' parent companies. These include size, book-to-market, lag 12-month return, return volatility, and profitability. These statistics are similar to those reported in other studies.

Finally, in Panel E of Table 1, we report statistics for fund-broker pair variables. The first variable is *Holding (Prob)*, which is an indicator variable that takes a value one when the mutual fund holds the broker's parent shares, and zero otherwise. The second variable is *Ownership (%)*, and it measures the percentage of a broker's parent shares outstanding held by the mutual fund. When a fund does not hold a given stock, we set the value of *Ownership* to 0.

We calculate averages for these two variables separately for connected and unconnected funds. Each fund is ultimately connected to at least one broker. To separate between connected and unconnected funds, we therefore take a perspective of a broker. For a given broker, a fund is connected if it is its client; all other funds are unconnected. We base our statistics on all the possible fund-broker parent stock pairs. The only exception is the case when both the broker and the fund belong to the same financial conglomerate. We eliminate these pairs because funds in the U.S. are generally disallowed from holding the stock of their ultimate owner.

We find that connected funds are much more likely to hold the broker's parent shares than unconnected funds. The probability that a connected fund holds a broker's parent shares is 23%, whereas it is only 4% for an unconnected fund. Connected funds also hold much larger fractions of the broker's parent shares outstanding.

[Insert Table 1 here]

[6]These financial firms represent about 60% of the whole financial sector and around 80% of them are banks and insurance companies.

[7]Holdings of all mutual funds amount to, on average, about 12% of the broker's shares; thus, we can conclude that two-third of these shares are held by their client funds.

III Main Results

In this section, we first test whether funds overweight their brokers' parent stocks. Then we turn to our main hypothesis and analyze how funds trade their brokers' parent stocks around negative shocks.

A Portfolio Allocation of Connected Funds

The descriptive statistics suggest that funds hold a substantial fraction of their broker's shares. The statistics also suggest that connected funds invest in brokers' parent companies more than unconnected funds. Now, we test this formally by estimating the following regression:

$$Ownership\ (\%)_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 X_{ijt} + \delta + \epsilon_{ijt}. \quad (1)$$

The dependent variable $Ownership(\%)_{ijt}$ measures the percentage of broker j shares outstanding held by fund i at quarter t, and 0 if it is not holding any shares. The main independent variable $Connected\ Fund_{ijt}$ is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. X is a vector of control variables defined in Table A1 of the Appendix. δ denotes fixed effects. We report t-statistics clustered at the fund and quarter level.

Given the granularity of the data, we can control for many observable and unobservable factors. We start with a univariate regression with fund style-by-time and stock fixed effects. We then gradually add a set of fund-level and stock-level controls. Fund-level controls include fund size, expense ratio, load fees, turnover, flows, age, and fund family size. Stock-level controls include market capitalization, book-to-market, previous 12-month stock return, stock return volatility, and profitability. To further control for unobservable heterogeneity, we add fund and fund family fixed effects, which absorb any time-invariant differences across funds and management companies.

Table 2 reports the results. All coefficients are multiplied by 100. Multivariate regression setting confirms that being connected to a broker is an important determinant for portfolio allocations. In column (1), which reports results for the baseline specification, the coefficient on the *Connected Fund* indicates that client funds hold, on average, about 2 basis points more shares of the brokers' parent than other funds within the same

investment style and period. The rest of the columns show that this result is robust to the inclusion of additional sets of fixed effects and fund- and stock-level characteristics.

[Insert Table 2 here]

In Table A2 of the Appendix, we estimate equation (1) using as the dependent variable the probability that a fund holds in its portfolio a broker's parent company. In the baseline specification, we find that a connected fund is 14% more likely to hold shares of its broker than an unconnected fund. Even in the most restrictive specification, broker's shares are still 12% more likely to be held by their client funds than by other similar funds that are not clients of the broker.

B Trading Activity Around Negative Shocks

Next, we analyze how funds trade the stock of their brokers' parent companies, as compared to how they trade other stocks in their portfolios. Our main hypothesis states that funds provide price support for the brokers' stocks in times that are most valuable to their brokers, that is in distress times for the broker's parent companines. We thus analyze changes in broker shares held by client funds around negative shocks to brokers' parent companies.

Following Cohen and Schmidt (2009), we first look at downward price pressure events caused by widespread selling of a firm's shares. In particular, we define periods of distress as those when the underlying stock is in the top quintile by the number of shares sold in aggregate by all funds in a quarter.

In Panel A of Table 3, we report the average change in broker's shares held by client funds when other funds are selling these shares. We find that, unconditionally, there is a stark difference in funds trading when it comes to stocks of their brokers' parent companies. Specifically, when a broker's parent stock is suffering selling pressure from other funds, client funds step in and buy their shares. In terms of economic magnitudes, the estimates suggest that funds increase its stake in the broker firm by 13.3% around negative shocks, while they decrease shares held in other stocks in distress by 17% bps.

Next, we verify these unconditional results in a multivariate regression setting. We

run the following baseline specification:

$$\Delta Shares_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 Distress_{ijt} + \beta_3 Connected\ Fund \times Distress_{ijt} + \beta_4 X_{ijt} + \delta + \epsilon_{ijt}. \quad (2)$$

The dependent variable is the logarithm of the ratio ($\text{Shares}_{(t)}/\text{Shares}_{(t-1)}$) held by fund i between quarter *t-1* and quarter t. *Connected Fund* is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. *Distress* is an indicator variable equal to one if the underlying stock is in the top quintile by number of shares sold by funds in quarter t.

The coefficient β_2 is informative about how funds trade stocks in distress. Our main coefficient of interest is β_3, which captures the difference in funds trading between their brokers' parent stocks and other similar stocks. X is a vector of control variables defined in Table A1 of the Appendix. δ denotes fixed effects. We report t-statistics clustered at the fund and quarter level.

Results are reported in Panel B of Table 3. We confirm that funds tend to sell stocks that are in distress. Importantly, we also confirm that funds increase their ownership in their brokers' parent companies when they are in distress. This is true when we compare funds within the same investment objective in the same quarter. It is also true when we add stock fixed effects, fund- and stock-level controls, fund and fund family fixed-effects. All specifications indicate that there is a significant difference in trading behavior between connected and unconnected funds. While funds do sell distress stocks in general, these funds tend to buy their brokers' parent stocks when other funds are selling them.

[Insert Table 3 here]

We also consider an alternative specification of distress in terms of analysts' recommendations. We consider a company to be in distress if the median analyst recommendation in the preceding quarter declines to a sell or a strong sell.

Results are reported in Table 4. Independently of the specification of distress we use, our main findings remain unchanged. Connected funds tend to buy their brokers' parent companies during distress periods. In terms of economic magnitudes, the estimates suggest that funds increase its already high stake in the brokers firms by as much as 20%

around negative shocks, while they decrease shares held in other stocks in distress by 5% bps.

[Insert Table 4 here]

C Trading Profitability

Next, we assess the performance of fund trades in their brokers' parent companies during distress times. If funds act as buyers of last resort, we expect these trades to be less profitable, at least over the short-run, than trades of other stocks unrelated to funds' brokers.

To test this, we run the following baseline specification:

$$\begin{aligned} \textit{Trade Profitability}_{ijt+1} = \alpha_{st} + \beta_1 \textit{Connected Fund}_{ijt} + \beta_2 \textit{Distress}_{jt} \\ + \beta_3 \textit{Connected Fund}_{ijt} \times \textit{Distress}_{jt} + X_{ijt} + \delta + \epsilon_{ijt}. \end{aligned} \quad (3)$$

The dependent variable *Trade Profitability* is measured as $\Delta DollarInvestment \times Return$, that is, the product of the change in the dollar value of a fund investment in a stock between quarter *t-1* and quarter t and the subsequent quarter stock return. The main independent variables are *Connected Fund*, which equal to one if the family of the fund is a client of the broker in quarter t, and *Distress*, which equals to one if the underlying stock suffers a negative shock in quarter t.

In Table 5, we present results for distress measured as an indicator variable equal to one if the underlying stock is in the top quintile by number of shares sold by funds in a given period. Results suggest that funds do not gain trading their brokers' parent stocks during distress times. If anything, the negative sign on the interaction term $\textit{Connected Fund}_{ijt} \times \textit{Distress}_{jt}$ indicates that, on average, they lose money trading their brokers' parent stocks.

[Insert Table 5 here]

In Table 6, we present results for distress measured as an indicator variable equal to one if in the quarter after the median analyst recommendation for a firm declines. We confirm that following negative shocks, funds buying their broker's shares is not profitable.

[Insert Table 6 here]

Overall, funds do not seem to gain trading their brokers' parent companies during times of distress. This is consistent with the notion that these trades are not done to enhance funds' performance, but rather to provide price support for the distressed brokers' ultimate owners.

D Do Connected Funds Provide Financial Stability?

In this section, we study the implications of the documented trading patters for the broker's parent company. Price support around crisis periods is aimed at reducing the downside potential of the stock price. If funds are effective in acting as buyers of last resort, we expect their actions to mitigate the riskiness of brokers' parent firms. We also expect the risk-reducing effects to be strongest on the left tail of the stock-return distribution.

We explore this prediction by estimating the following regression:

$$Y_{jt+1} = \beta_0 + \beta_1 Ownership\ by\ Connected\ Funds_{jt} + Controls_{jt} + \delta + \epsilon_{jt}. \qquad (4)$$

For the dependent variable, we use several risk measures, always computed using daily data over the quarter t+1. We use three standard measures of stock riskiness: stock return volatility, idiosyncratic volatility, and market model beta. These standard measures do not distinguish between the left and the right tail of the stock return distribution, and they do not tell us the contribution of a given company to the systemic risk. Therefore, we also use the expected shortfall and the marginal expected shortfall measures of Acharya et al. (2017). Expected shortfall is the average of the worst 5% of daily stock j returns in quarter $t + 1$. Marginal expected shortfall is the average of stock j returns on days denoted as worst 5% market outcomes during quarter $t + 1$. The main independent variable *Ownership by Connected Funds* measures the broker's fraction of shares held by their client funds. We control for market capitalization, book to market ratio, previous 12-month stock return, and profitability. We limit ourselves to the financial sector, as defined in Acharya et al. (2017).

Panel A of Table 7 reports the results. We find a clearly detectable effect on the financial stability of brokers' parent stocks. An increase in the shares held by client funds

leads to a statistically significant reduction in firm total volatility, idiosyncratic volatility, and market beta. The effects are economically important. For example, a one-standard-deviation increase in *Ownership by Connected Funds* leads to a 2.3% reduction in return volatility. An increase in the shares held by client funds also has an important effect on the shortfall measures. A one-standard-deviation increase in *Ownership by Connected Funds* leads to a 2.1% increase in the average of worst-case returns. The same increase in funds holdings increases the marginal expected shortfall by 1.6%.

To control for macroeconomic effects, we repeat the analysis at the sector-level. For the dependent variable, we use measures of sector risk: average return volatility, average idiosyncratic volatility, average market beta, sector expected shortfall, and the sector marginal expected shortfall of Acharya et al. (2017). The main independent variable *Portfolio Holdings in Connected Brokers* measures the aggregate fraction of total assets managed by mutual funds in quarter t that are invested in their funds' connected brokers. We additionally control for real GDP, short-term interest rates, CPI, VIX, NBER crisis dummy, average growth in P/E ratio in the financial sector, average book-to-market ratio, average capitalization ratio, and average debt/equity ratio.

As reported in Panel B of Table 7, even when we perform the analysis at the sector level with additional macroeconomic controls, higher ownership held by client funds is associated with higher financial sector stability. This suggests that funds liquidity provision not only contributes to the stability of financial institutions in isolation, but it also decreases the systemic risk and makes the financial system less fragile.

[Insert Table 7 here]

IV Additional Results

We have documented that funds act as buyers of last resort for their brokers' parent companies. A natural question that arises is: what do funds gain by engaging in such behavior? In this section, we explore the possibility that brokers compensate funds with investment tips.

Several papers argue that brokers are privy to valuable investment information. Brokers may obtain such information from the lending division or the underwriting division of the same financial conglomerate or from their affiliated equity analysts (Kumar et al. (2020); Gokkaya et al. (2019); Qian and Zhong (2018)). Brokers also observe a large part

of stock order flow. This exposes them to insights into who are informed traders and how they trade (Di Maggio et al. (2019); Barbon et al. (2019); Chung and Kang (2016)). If brokers share their insights with the client funds, we should observe a measurable impact of a fund-broker relation on a fund's trading patterns and overall performance. Below, we provide several tests that establish this link.

A Connected Fund Performance

If funds obtain investment information from their brokers and such information is compensation for acting as buyers of last resort, we expect a fund's performance to increase with a fund's holdings of the brokers' parent companies. We test this prediction by running the following regression:

$$R_{it+1} = \beta_0 + \beta_1 \textit{Connected Holding}_{it} + X_{it} + \delta\epsilon_{it} \tag{5}$$

The dependent variable is the next month's fund performance. For each mutual fund, we define performance as the style-adjusted return before fee (gross returns). The main independent variable *Connected Holding* measures the percentage of fund total net assets invested in their brokers' shares. X is a vector of control variables at the fund level. With δ, we denote style-by-date, fund and fund family fixed effects.

Results are reported in Table 8. Across all different specifications, the estimated coefficients indicate that brokers' connections have a positive impact on a fund's performance. The results are statistically significant and economically important. For example, 1% increase in *Connected Holding* leads to an increase of 0.3% returns per month.

[Insert Table 8 here]

B Information Channels

So far, we have shown the evidence consistent with our hypothesis that brokers compensate funds with information on other stocks. However, we have not discussed the potential information channels. As described above, brokers may get information from many different sources. Brokers may get information from servicing sophisticated investors, e.g. hedge funds (Di Maggio et al. (2019); Barbon et al. (2019); Chung and Kang (2016)). Information may also leak to brokers from the lending division of the

same financial conglomerate (Kumar et al. (2020)) or from their affiliated equity analysts (Gokkaya et al. (2019); Qian and Zhong (2018)).

In order to test for different information channels, we re-estimate equation (5) including interaction terms between *Connected Holding* and variables that proxy for each of the potential information channels. All variables are defined from the perspective of a fund. Recall that each fund can be connected to several brokers. We define *Hedge Fund Connections* as the number of connected brokers that also act as a prime broker for at least one hedge fund; *Lending Connections* is the number of connected brokers that are part of a conglomerate with a lending division; *Analyst Connections* is the number of connected brokers that are part of a conglomerate with sell-side equity analysts.

Results are reported in Table 9. We find support for all information channels. All interaction terms are large and significant, whereas none of the standalone variables are significant. This means that a fund's performance improves only if a fund invests in the parent company of a broker that is potentially informed through one of the information channels.

[Insert Table 9 here]

C Determinants of Holding Broker's Shares

Our evidence suggests that the relation between mutual funds and their brokers is mutually beneficial. This separates our study from other settings where funds' trading arises as a consequence of conflicts of interest (e.g. Golez and Marin (2015); Ferreira et al. (2018)). This means that, in contrast to the aforementioned studies, in our setting, price support as an equilibrium outcome does not hinge upon captive investors. It also means that such trading patterns are not necessarily concentrated among the worst-performing funds. In fact, providing price support to the broker's parent stocks is a means of enhancing a fund's performance. We thus expect it to occur even among the largest and best performing funds.

To gain insights into which funds act as buyers of last resort for their brokers' parent stocks, we first explore which fund characteristics are associated with fund holdings in their broker's parent companies. We estimate the following fund-level regression:

$$Connected\ Holding_{it} = \beta_0 + \beta_1 Fund\ Characteristics_{it} + \delta + \epsilon_{it} \tag{6}$$

The dependent variable *Connected Holding* measures the percentage of fund total net assets invested in their brokers' stock. *Fund Characteristics* include fund size, expense ratio, load fees, turnover, fund flows, age, family size, brokerage commission, volatility of flows, cash holdings, and an indicator variable that takes value one if a fund family pays soft dollars to any of the connected brokers.

Results are reported in Table 10. Funds that pay more in terms of brokerage commissions and soft dollars and charge higher fees tend to have a higher fraction of their assets invested in their brokers. The connected holdings also increase with fund age.

The fact that holdings in brokers' parent companies increase with expense ratios and load fees suggests that liquidity provision is strongest among most active funds, as also evidenced by the significant relation between fund turnover and connected holdings. This is consistent with the notion that we may observe liquidity provision among the best funds. It also indicates that the fund family is not sacrificing the worst-performing funds to provide liquidity as a means of obtaining valuable investment information for their best performing funds. At the same time, because brokerage commission and soft dollar are positively related to investments in brokers' parent companies, we conclude that price support is not a substitute for lower brokerage commissions and fees. Instead, price support and soft dollars are non-mutually exclusive ways of obtaining valuable information from the brokers.

[Insert Table 10 here]

According to our hypothesis, the fund-broker relation evolves through repeated interactions and trust. As it may take time to develop such relations, we expect this behavior to be more prevalent among funds that have long and strong business relationships with their brokers. To test this additional prediction, we next estimate the following linear probability model:

$$\begin{aligned} Ownership\ (\%)_{ijt} =& \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 Relationship_{ijt} + \\ & \beta_3 Connected\ Fund_{ijt} \times Relationship_{ijt} + \beta_4 X_{ijt} + \epsilon_{ijt} \end{aligned} \tag{7}$$

The dependent variable $Ownership(\%)_{ijt}$ measures the percentage of broker j shares outstanding held by fund i at quarter t, and 0 if it is not holding any shares. $Connected\ Fund_{ijt}$

is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. $Relationship_{ijt}$ measures the difference in quarters between the first date in which we observe broker j working for the family of fund i and the current date t. X is a vector of control variables defined in Table A1 of the Appendix.

Results are reported in Table 11. Confirming our previous evidence, we find that funds overweight their broker's parent stocks' in their portfolios. As predicted, the estimated coefficient on the interaction term suggests that the ownership increases with the length of the business relationship between management companies and brokerage firms.

[Insert Table 11 here]

In sum, these results suggest that the business interaction between funds and brokers play a key role in the fund trading behavior and information sharing by brokers that we document.

D Endogeneity

In this subsection, we address the potential concern that our results are driven by an omitted factor that jointly determines fund portfolio choices and a fund decision to use services from a given broker. In the baseline specification, we already ruled out many alternative explanations. The inclusion of stock-by-date fixed effects means that any factor relative to brokers' parent stocks cannot explain our results, even if such factors are time-varying. The documented effect must be a feature of the fund-stock pair. Still, the existence of a connection between a fund and a broker's parent stock is endogenous, as it is a choice on the part of a fund. It is possible that the decisions of a fund to start using the services of a certain brokerage firm is driven by some omitted variable that drives both funds' choices and our results.

In order to address this concern, we rely on a natural experiment that exploits the mergers of brokerage firms as exogenous shocks to business ties between the funds and the brokers' ultimate owners. To identify mergers of brokerage firms that occurred in our sample period (1996-2018), we start from the list provided by Han et al. (2019). They create the list using SDC Platinum Mergers and Acquisition database. From this list, we exclude three mergers because the acquiring broker is a foreign company: Societe Generale (1998-06-30), ABN-AMRO (2001-04-30), and Macquarie Group (2009-10-02).

Each of the remaining 23 mergers constitutes a shock to the connections between funds and their brokers' parent stocks. For example, when UBS completed the stock merger with Paine Webber on November 3, 2000, all funds that were clients of Paine Webber brokerage arm became connected with UBS. It is difficult to imagine that Paine Webber client funds would have a say in the merger. The resulting connection is a by-product of the merger and, hence, unlikely to be choice on the part of the funds.

To exploit this natural experiment, we repeat the analysis of section III.A using only those connections that are due to broker mergers and acquisitions. Specifically, we limit the sample of brokers' parent stocks to the list of acquiring brokers in Table A4 and we only consider funds that employed one of the acquired brokers from the list. Thus, the variable *Connected Fund*$_{ijt}$ takes value one after a merger for a fund i that is a client of the acquired brokers in the merger, and that becomes connected to the stock j of the acquiring broker after the deal is completed. Using the aforementioned example, for funds that were clients of Paine Webber, the variable *Connected Fund*$_{ijt}$, which reflects the connection between a fund and the UBS stock, takes value 0 before November 3, 2000 and value 1 after that date.

In Table 12, we find that when a connection between a fund and a broker's parent company arises due to a merger, funds hold a significantly larger fraction of stock's shares outstanding after the merger than before the merger, as compared to other similar funds. In Table A5 in the Appendix, we also see that there is about 10% higher probability that a fund invests in brokers' new owners. Finally, in Table A6 we note that, following the merger, funds also engage in liquidity provision during distress times.

Overall, results in this section are in line with those in the main body of the paper. Even when we limit the sample of business relationships only to those that are the result of exogenous brokerage mergers, we still observe that a connection between a fund and a broker's parent stock leads to a higher probability that the fund holds the stock, as well as a larger fund's ownership of the stock.

[Insert Table 12 here]

V Conclusion

We show that mutual funds are important investors in financial companies that are ultimate owners of their brokers, and they act as buyers of last resort by systematically

increasing stock holdings in their brokers' companies in distress times. This suggests that the relationship between mutual funds and brokers is more involved than perceived by the existing literature, as we uncover an important new channel through which funds lure brokers to provide them with valuable investment information. The documented relation has real consequences for both fund performance and financial stability of financial conglomerates. This also suggests that business networks between the financial institutions and their clients can have an important impact on the systemic risk of the financial sector.

References

Acharya, V. V., Pedersen, L. H., Philippon, T., and Richardson, M. Measuring systemic risk. *The Review of Financial Studies*, 30(1):2–47, 2017.

Barbon, A., Di Maggio, M., Franzoni, F., and Landier, A. Brokers and order flow leakage: Evidence from fire sales. *The Journal of Finance*, 74(6):2707–2749, 2019.

Boot, A. W. and Ratnovski, L. Banking and trading. *Review of Finance*, 20(6):2219–2246, 2016.

Brunnermeier, M. K., Dong, G. N., and Palia, D. Banks' non-interest income and systemic risk. *Available at SSRN 3328890*, 2019.

Chung, J.-W. and Kang, B. U. Prime broker-level comovement in hedge fund returns: information or contagion? *The Review of Financial Studies*, 29(12):3321–3353, 2016.

Cohen, L. and Schmidt, B. Attracting flows by attracting big clients. *The Journal of Finance*, 64(5):2125–2151, 2009.

Di Maggio, M., Franzoni, F., Kermani, A., and Sommavilla, C. The relevance of broker networks for information diffusion in the stock market. *Journal of Financial Economics*, 134(2):419–446, 2019.

Edelen, R. M., Evans, R. B., and Kadlec, G. B. Disclosure and agency conflict: Evidence from mutual fund commission bundling. *Journal of Financial Economics*, 103(2):308–326, 2012.

Ferreira, M. A., Matos, P., and Pires, P. Asset management within commercial banking groups: International evidence. *The Journal of Finance*, 73(5):2181–2227, 2018.

Gil-Bazo, J., Hoffmann, P., and Mayordomo, S. Mutual funding. *Review of Financial Studies, forthcoming*, 2020.

Gokkaya, S., Liu, X., Pool, V. K., Xie, F., and Zhang, J. Is there investment value in the soft-dollar arrangement? evidence from mutual funds. *Working Paper*, 2019.

Goldstein, M. A., Irvine, P., Kandel, E., and Wiener, Z. Brokerage commissions and institutional trading patterns. *The Review of Financial Studies*, 22(12):5175–5212, 2009.

Golez, B. and Marin, J. M. Price support by bank-affiliated mutual funds. *Journal of Financial Economics*, 115(3):614–638, 2015.

Han, M., Kim, S. H., and Nanda, V. K. Institutional brokerage networks: Facilitating liquidity provision. *Working Paper*, 2019.

Ibragimov, R., Jaffee, D., and Walden, J. Diversification disasters. *Journal of financial economics*, 99(2):333–348, 2011.

Kumar, N., Mullally, K., Ray, S., and Tang, Y. Prime (information) brokerage. *Journal of Financial Economics*, 2020.

Qian, H. and Zhong, Z. Do hedge funds possess private information about ipo stocks? evidence from post-ipo holdings. *The Review of Asset Pricing Studies*, 8(1):117–152, 2018.

Wagner, W. Diversification at financial institutions and systemic crises. *Journal of Financial Intermediation*, 19(3):373–386, 2010.

Table 1: Summary Statistics

Panel A presents time-series averages for the total number of funds, number of funds holding shares of at least one of their brokers, and % of fund TNA invested in their brokers' shares. Panel B reports time-series averages for the total number of publicly-traded brokers, number of brokers with shares held by at least one client fund, and % of brokers' shares held by client funds. Panel C presents number of observations, mean, standard deviation, 25th percentile, median, and 75th percentile for fund-level variables. Panel D presents the same statistics for stock-level variables. Panel E reports the probability that a broker's share is held by the connected and unconnected funds and the actual ownership of the broker by the connected and unconnected funds. A mutual fund is connected to a broker if its fund family is a broker's client. The sample consists of actively managed US domestic equity mutual funds over the 1996 to 2018 period.

Panel A: Mutual Fund Sample

	Total Funds	Funds holding their brokers' shares	% Fund TNA invested in their brokers' shares
Time-series Average	2,498	1,491	5.72

Panel B: Broker Sample

	Total brokers	Brokers with shares held by client funds	% Brokers' shares held by client funds
Time-series Average	174	144	7.74

Panel C: Mutual Fund Variables

	Obs.	Mean	Std. Dev.	25%	50%	75%
Fund Size ($b)	455,730	1.25	4.93	0.05	0.21	0.82
Fund Age (months)	455,730	97.12	100.33	32.00	69.00	130.00
Expense Ratio (%)	455,730	1.01	0.61	0.70	1.07	1.39
Loads (%)	455,730	2.94	4.09	0.00	0.00	6.75
Turnover (annualized)	455,730	0.27	6.78	0.18	0.47	0.92
Fund Flows (%)	455,730	1.00	0.10	0.96	1.00	1.05
Fund Risk (annualized)	455,730	0.13	0.09	0.08	0.13	0.18
Flow Volatility (annualized)	455,730	0.26	0.14	0.17	0.23	0.33
Raw Return (%)	455,730	0.58	4.20	−1.11	0.21	2.85
Family Size ($B)	455,730	158.27	461.59	1.50	13.68	75.72
Family Funds (#)	455,730	53.55	78.96	7.00	26.00	68.00

Panel D: Broker Variables

	Obs.	Mean	Std. Dev.	25%	50%	75%
Size (log)	86,155	5.37	1.99	3.92	5.12	6.67
Book-to-Market	86,155	0.59	3.19	0.36	0.57	0.87
Lag 12-month Return	86,155	0.13	0.49	−0.10	0.09	0.30
Return Volatility (annualized)	86,155	0.42	0.40	0.22	0.31	0.48
Profitability	86,155	0.03	0.14	0.02	0.03	0.05

Panel E: Mutual Fund-Broker Variables

	Connected Funds	Unconnected Funds	Difference (1) - (2)
Holding Probability	0.226	0.036	0.190***
Ownership (%)	0.023	0.006	0.02***

Table 2: Broker's Ownership by Connected Funds

This table presents estimates of the following model $Ownership\ (\%)_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 X_{ijt} + \epsilon_{ijt}$. The dependent variable $Ownership(\%)_{ijt}$ measures the percentage of broker j shares outstanding held by fund i at quarter t. The main independent variable $Connected\ Fund_{ijt}$ is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. X is a vector of control variables defined in Table A1 of the Appendix. The sample includes US actively managed, domestic equity mutual funds and publicly-traded brokers. Our sample period runs from 1996 to 2018. Coefficients are multiplied by 100. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Connected Fund	1.955***	1.658***	1.652***	1.621***	1.625***
	(10.40)	(8.61)	(8.02)	(7.98)	(8.04)
Fund Size		0.420***	0.452***	0.259***	0.279***
		(15.82)	(15.59)	(9.94)	(8.87)
Expense Ratio		-0.011	0.004	-0.005***	-0.000
		(-1.33)	(0.38)	(-6.15)	(-0.05)
Loads		-5.696***	-6.413***	-5.436***	-5.541***
		(-6.52)	(-6.62)	(-5.94)	(-5.26)
Fund Turnover		0.001	0.001	0.001	0.002
		(0.77)	(0.88)	(1.00)	(1.17)
Fund Flows		-0.780***	-0.880***	-0.415***	-0.525***
		(-5.14)	(-5.00)	(-6.58)	(-7.61)
Fund Age (log)		-0.021	-0.033	-0.034	-0.013
		(-0.77)	(-1.09)	(-1.39)	(-0.51)
Family Size		0.041***	0.047***	0.003	-0.070**
		(3.65)	(3.81)	(0.21)	(-2.34)
Market Cap.			-0.008	-0.008	-0.008
			(-0.17)	(-0.16)	(-0.17)
Book-to-Market			-0.056	-0.056	-0.057
			(-0.94)	(-0.93)	(-0.95)
Lag 12-month Return			0.050	0.050	0.050
			(1.40)	(1.39)	(1.39)
Return Volatility			-0.107*	-0.106*	-0.106*
			(-1.98)	(-1.97)	(-1.97)
Profitability			-0.607**	-0.607**	-0.607**
			(-2.49)	(-2.49)	(-2.49)
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	17,605,606	17,605,606	17,605,606	17,605,606	17,605,606
Adjusted r^2	0.002	0.005	0.005	0.015	0.016

Table 3: Trading Activity following Selling Pressure Shocks

Panel B presents estimates of the following model $\Delta Shares_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 Distress_{ijt} + \beta_3 Connected\ Fund \times Distress_{ijt} + \beta_4 X_{ijt} + \epsilon_{ijt}$. The dependent variable is the logarithm of the ratio ($\text{Shares}_{(t)}/\text{Shares}_{(t-1)}$) held by fund i between quarter *t-1* and quarter t. *Connected Fund* is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. *Distress* is an indicator variable equal to one if the underlying stock is in the top quintile by number of shares sold by funds in quarter t. Control variables at the fund and stock level as in Table 2 are also included, but not reported. Panel A reports the average portfolio change in broker's shares held by client funds when other funds are selling those shares. Our sample period runs from 1996 to 2018. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Univariate Results

	Connected Fund Trades on Distressed Brokers	Average Fund Trades on Distressed Stocks	Difference (1)-(2)
$\Delta Shares$	0.133***	-0.168***	0.302***
	(9.84)	(-32.27)	(21.63)

Panel B: Multivariate Results

	$\Delta Shares$				
	(1)	(2)	(3)	(4)	(5)
Connected Fund	0.303***	0.332***	0.280***	0.283***	0.243***
	(24.24)	(26.33)	(22.43)	(23.19)	(23.67)
Distress	-0.476***	-0.481***	-0.358***	-0.354***	-0.474***
	(-47.02)	(-46.26)	(-45.43)	(-45.23)	(-46.42)
Connected Fund × Distress	0.243***	0.259***	0.238***	0.239***	0.282***
	(13.17)	(13.93)	(13.18)	(13.20)	(15.51)
Controls Fund		X	X	X	X
Controls Stock			X	X	X
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	24,494,991	24,49,4991	24,494,991	24,494,991	24,494,991
Adjusted r^2	0.073	0.079	0.036	0.041	0.053

Table 4: Trading Activity following Analysts' Downgrades

Panel B presents estimates of the following model $\Delta Shares_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 Distress_{ijt} + \beta_3 Connected\ Fund \times Distress_{ijt} + \beta_4 X_{ijt} + \epsilon_{ijt}$. The dependent variable is the logarithm of the ratio ($\text{Shares}_{(t)}/\text{Shares}_{(t-1)}$) held by fund i between quarter *t-1* and quarter t. *Connected Fund* is an indicator variable equal to one if the family of the fund is a client of the broker in quarter t. *Distress* is an indicator variable equal to one in the quarter after the median analyst recommendation for a firm declines. Control variables at the fund and stock level as in Table 2 are also included, but not reported. Panel A reports the average portfolio change in broker's shares held by client funds following analysts' downgrades. Our sample period runs from 1996 to 2018. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Univariate Results

	Connected Fund Trades on Distressed Brokers	Average Fund Trades on Distressed Stocks	Difference (1)-(2)
$\Delta Shares$	0.199***	-0.050***	0.249***
	(16.63)	(-10.25)	(19.85)

Panel B: Multivariate Results

	$\Delta Shares$				
	(1)	(2)	(3)	(4)	(5)
Connected Fund	0.340***	0.374***	0.322***	0.324***	0.291***
	(27.73)	(30.16)	(25.93)	(27.00)	(28.45)
Distress	-0.173***	-0.174***	-0.104***	-0.104***	-0.173***
	(-37.60)	(-37.54)	(-31.95)	(-31.89)	(-37.79)
Connected Fund × Distress	0.160***	0.152***	0.114***	0.115***	0.153***
	(11.40)	(11.06)	(8.18)	(8.26)	(11.37)
Controls Fund		X	X	X	X
Controls Stock			X	X	X
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	24,494,991	24,494,991	24,494,991	24,494,991	24,494,991
Adjusted r^2	0.070	0.076	0.034	0.040	0.050

Table 5: Profitability of Trading Distressed Stocks - Selling Pressure Shocks

This table presents results from regressions of trade profitability on connected funds, distress stocks, and other fund and stock characteristics. The dependent variable *Trade Profitability* is measured as $\Delta DollarInvestment \times Return$, that is, the product of the change in the dollar value of a fund investment in a stock between quarter *t-1* and quarter t and the subsequent quarter stock return. The main independent variables are *Connected Fund*, an indicator variable equal to one if the family of the fund is a client of the broker in quarter t, and *Distress*, an indicator variable equal to one if the underlying stock is in the top quintile by number of shares sold by funds in quarter t. Control variables at the fund and stock level as in Table 2 are also included but not reported. Our sample period runs from 1996 to 2018. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Trade Profitability				
	(1)	(2)	(3)	(4)	(5)
Connected Fund	156.164***	160.981***	141.708***	139.329***	136.104***
	(4.99)	(4.73)	(3.99)	(3.99)	(3.88)
Distress	-16.173***	-15.590***	-10.728***	-10.889***	-9.350***
	(-6.69)	(-6.50)	(-4.77)	(-4.95)	(-4.31)
Connected Fund × Distress	-962.771***	-997.489***	-1032.779***	-1028.469***	-1025.043***
	(-4.81)	(-4.63)	(-4.56)	(-4.57)	(-4.59)
Controls Fund		X	X	X	X
Controls Stock			X	X	X
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	21,575,915	21,575,915	21,575,915	21,575,915	21,575,915
Adjusted r^2	0.003	0.003	0.002	0.003	0.009

Table 6: Profitability of Trading Distressed Stocks - Analysts' Downgrades

This table presents results from regressions of trade profitability on connected funds, distress stocks, and other fund and stock characteristics. The dependent variable *Trade Profitability* is measured as $\Delta DollarInvestment \times Return$, that is, the product of the change in the dollar value of a fund investment in a stock between quarter *t-1* and quarter t and the subsequent quarter stock return. The main independent variables are *Connected Fund*, an indicator variable equal to one if the family of the fund is a client of the broker in quarter t, and *Distress*, an indicator variable equal to one in the quarter after the median analyst recommendation for a firm declines. Control variables at the fund and stock level as in Table 2 are also included but not reported. Our sample period runs from 1996 to 2018. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Trade Profitability				
	(1)	(2)	(3)	(4)	(5)
Connected Fund	88.542***	91.034***	68.695***	66.849***	64.533***
	(4.63)	(4.37)	(3.23)	(3.19)	(3.04)
Distress	-0.365	0.006	2.131	2.265	2.470
	(-0.23)	(0.00)	(1.19)	(1.26)	(1.44)
Connected Fund × Distress	-799.859***	-814.915***	-880.335***	-881.534***	-887.113***
	(-5.04)	(-4.93)	(-4.91)	(-4.93)	(-4.97)
Controls Fund		X	X	X	X
Controls Stock			X	X	X
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	21,575,915	21,575,915	21,575,915	21,575,915	21,575,915
Adjusted r^2	0.003	0.003	0.002	0.003	0.009

Table 7: The Financial Stability provided by Connected Funds

Panel A presents results of panel regressions of stock-level risk variables on ownership by connected funds and other firm characteristics. The dependent variables are measures of risk including stock return volatility, idiosyncratic volatility, market beta, expected shortfall, and the marginal expected shortfall of Acharya et al. (2017). The main independent variable *Ownership by Connected Funds* measures the broker's fraction of shares held by their client funds. We control for market capitalization, book to market ratio, previous 12-month stock return, and profitability. Panel B presents results of panel regressions of financial sector-level risk variables on the fraction of mutual funds assets invested in connected brokers. The dependent variables are measures of financial sector risk including average return volatility, average idiosyncratic volatility, average market beta, sector expected shortfall, and the sector marginal expected shortfall of Acharya et al. (2017). The main independent variable *Portfolio Holdings in Connected Brokers* measures the aggregate fraction of total assets managed by mutual funds in quarter t that are invested in their funds' connected brokers. We control for real GDP, short-term interest rates, CPI, VIX, NBER crisis dummy, average growth in P/E ratio in the financial sector, average book-to-market ratio, average capitalization ratio, and average debt/equity ratio. The definition of these variables are in Table A1 of the Appendix. Our sample period runs from 1996 to 2018 and is limited to the financial sector as defined in Acharya et al. (2017). Robust t-statistics clustered at the firm level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Stock-Level Analysis

	Return Volatility		Idiosyncratic Volatility		Market Beta		Expected Shortfall		Marginal Expected Shortfall	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ownership by Connected Fund	-0.224***	-0.234***	-0.212***	-0.219***	-0.754***	-0.813***	0.020***	0.021***	0.015***	0.016***
	(-3.95)	(-4.00)	(-4.19)	(-4.38)	(-5.24)	(-5.43)	(3.13)	(3.22)	(3.29)	(3.48)
Market Cap.		-0.120***		-0.130***		0.146***		0.011***		-0.003***
		(-14.81)		(-15.76)		(15.07)		(14.53)		(-7.64)
Book-to-Market		0.007		0.003		0.075***		-0.001		-0.001**
		(0.97)		(0.46)		(5.20)		(-0.90)		(-2.12)
Lag 12-month Return		-0.066***		-0.067***		0.041**		0.006***		-0.001*
		(-6.49)		(-6.73)		(2.62)		(5.06)		(-1.79)
Profitability		-0.045		-0.047*		-0.004		0.005**		0.001
		(-1.60)		(-1.77)		(-0.10)		(2.40)		(0.68)
Time FE	X	X	X	X	X	X	X	X	X	X
Firm FE	X	X	X	X	X	X	X	X	X	X
Observations	86,155	86,155	86,155	86,155	86,155	86,155	86,155	86,155	86,155	86,155
Adjusted r^2	0.514	0.548	0.507	0.547	0.375	0.382	0.558	0.584	0.355	0.359

Panel B: Financial Sector-Level Analysis

	Return Volatility		Idiosyncratic Volatility		Market Beta		Expected Shortfall		Marginal Expected Shortfall	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Portfolio Holdings in Connected Brokers	-0.386***	-0.210***	-0.341***	-0.171***	1.016	-3.752***	1.072***	0.579***	0.120**	0.070*
	(-10.83)	(-8.76)	(-14.38)	(-10.20)	(1.07)	(-4.32)	(12.30)	(9.93)	(2.28)	(1.80)
T.Bond Rate		0.101***		0.141***		-2.646**		-0.338***		0.005
		(3.07)		(5.22)		(-2.18)		(-3.73)		(0.08)
Real GDP		-0.000		-0.000***		0.000***		0.000		-0.000***
		(-1.31)		(-2.88)		(4.18)		(0.56)		(-2.96)
CPI		-0.061**		-0.069***		0.551		0.025		-0.024
		(-2.47)		(-4.04)		(0.80)		(0.34)		(-0.52)
NBER Crisis		0.006***		0.004***		0.064*		-0.012***		-0.005**
		(4.32)		(4.57)		(1.88)		(-3.91)		(-2.47)
VIX		0.001***		0.000***		-0.000		-0.002***		-0.001***
		(9.55)		(8.97)		(-0.01)		(-12.52)		(-9.05)
Trailing P/E to Growth		0.000		0.000		0.050***		-0.000		-0.001***
		(1.11)		(0.37)		(6.68)		(-0.34)		(-2.77)
Book/Market		-0.000		-0.000		0.030		0.000		-0.000
		(-0.37)		(-1.57)		(1.08)		(0.28)		(-0.16)
Capitalization Ratio		-0.000		0.004		-0.085		0.007		0.022**
		(-0.04)		(0.71)		(-0.47)		(0.44)		(2.07)
Total Debt/Equity		0.000		0.000		0.001***		-0.000***		-0.000**
		(0.57)		(0.35)		(3.47)		(-3.33)		(-2.56)
Observations	286	286	286	286	286	286	286	286	286	286
Adjusted r^2	0.031	0.777	0.167	0.818	0.351	0.576	0.043	0.800	0.150	0.609

Table 8: Performance of Connected Funds

This table shows estimates of monthly fund return regressed on fund characteristics lagged 1 period, and a set of different fixed effects. The dependent variable is the fund returns before (gross) deducting fees and expenses. The main independent variable *Connected Holdings* measures the percentage of fund total net assets invested in their brokers' shares. Control variables are defined in Table A1 of the Appendix. The sample includes US domestic equity mutual funds from 1996 to 2018. Robust t-statistics clustered at the fund level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Fund Performance		
	(1)	(2)	(3)
Connected Holdings	0.231**	0.267***	0.320***
	(2.51)	(2.85)	(2.88)
Size (log TNA)		-0.047	-0.041
		(-0.67)	(-0.55)
Expense Ratio		-149.116**	-156.796**
		(-2.25)	(-2.25)
Load Fee		-14.059***	-15.448***
		(-2.65)	(-2.64)
Turnover		0.000	0.000
		(0.22)	(0.03)
Fund Flows		0.218	0.203
		(1.25)	(1.17)
Fund Age (log)		-0.015	-0.012
		(-0.41)	(-0.33)
Family Size (log TNA)		0.014	0.011
		(0.38)	(0.31)
Flows Volatility		18.117***	18.413***
		(4.34)	(4.31)
Family Funds		-0.001	-0.001
		(-0.78)	(-0.53)
Fund Style x Time FE	X	X	X
Fund FE	X	X	X
Fund Family FE			X
Observations	455,730	455,730	455,730
Adjusted r^2	0.747	0.748	0.748

Table 9: Information Channels

This table shows estimates of monthly fund return regressed on fund characteristics lagged 1 period, and a set of different fixed effects. The dependent variable is the fund returns before (gross) deducting fees and expenses. The main independent variable *Connected Holdings* measures the percentage of fund total net assets invested in their brokers' shares. We interact *Connected Holdings* with three different variables reflecting different types of brokers' connections: i) *Hedge Funds* is the number of brokers connected to a fund that are also prime brokers of a hedge fund; ii) *Financial Analyst* is the number of brokers connected to a fund that are part of a conglomerate issuing sell-side equity recommendations; iii) *Lending Division* is the number of brokers connected to a fund that are part of a conglomerate with a lending division. Control variables are defined in Table A1 of the Appendix. The sample includes US domestic equity mutual funds from 1996 to 2018. Robust t-statistics clustered at the fund level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Fund Performance		
	(1)	(2)	(3)
Connected Holdings	0.032	0.017	-0.002
	(1.30)	(0.95)	(-0.10)
Hedge Funds	0.400***		
	(2.72)		
Connected Holdings × Hedge Funds	0.012*		
	(1.83)		
Financial Analyst		-0.021	
		(-1.18)	
Connected Holdings × Financial Analyst		0.003**	
		(2.44)	
Lending Division			-0.030
			(-0.75)
Connected Holdings × Lending Division			0.011***
			(3.59)
Size (log TNA)	-0.323***	-0.317***	-0.316***
	(-4.44)	(-4.37)	(-4.32)
Expense Ratio	-184.575***	-181.934***	-182.182***
	(-2.69)	(-2.67)	(-2.67)
Load Fee	-14.782**	-14.584**	-14.826**
	(-2.53)	(-2.37)	(-2.44)
Turnover	-0.000	-0.001	-0.001
	(-0.52)	(-0.66)	(-0.63)
Fund Flows	0.550***	0.543***	0.541***
	(4.16)	(4.04)	(4.20)
Fund Age (log)	0.011	0.015	0.014
	(0.28)	(0.39)	(0.35)
Family Size (log TNA)	0.000***	0.000***	0.000***
	(3.30)	(3.23)	(3.35)
Flows Volatility	10.397***	10.393***	10.384***
	(2.59)	(2.61)	(2.61)
Family Funds	-0.001	-0.002	-0.002
	(-0.96)	(-1.27)	(-1.32)
Fund Style x Time FE	X	X	X
Fund FE	X	X	X
Fund Family FE	X	X	X
Observations	455,730	455,730	455,730
Adjusted r^2	0.640	0.640	0.640

Table 10: Determinants of Holding Broker's Shares

This table present estimates on the determinants of holding brokers' shares. The dependent variable *Connected Holding* measures the percentage of fund total net assets invested in their brokers' shares. Cash Holdings is the amount of fund TNA invested in cash. Brokerage Commission is the ratio of total brokerage commissions paid by the family, divided by the family TNA. Soft Dollar is an indicator variable equal to 1 if the fund reports paying soft dollars to its brokers. Additional variables at the fund level as in Table 2 are defined in Table A1 of the Appendix. The sample includes US domestic equity mutual funds from 1996 to 2018. Robust t-statistics clustered at the fund level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Connected Holdings		
	(1)	(2)	(3)
Cash Holdings	-0.002***	0.000	-0.001***
	(-4.86)	(1.53)	(-2.88)
Brokerage Commissions	0.141***	0.089***	0.142***
	(95.69)	(43.58)	(68.22)
Soft Dollar			0.037**
			(2.43)
Fund Size	0.008**	-0.007	-0.004
	(2.28)	(-1.54)	(-0.86)
Expense Ratio	11.975***	-1.000	10.543***
	(7.61)	(-0.55)	(7.65)
Load Fee	0.609***	-0.068	1.811***
	(3.97)	(-0.34)	(6.68)
Turnover	0.002***	0.000	0.001
	(3.79)	(0.99)	(1.35)
Fund Flows	-0.135***	-0.022**	-0.071**
	(-6.48)	(-2.06)	(-2.13)
Flow Volatility	0.093	0.060	0.341*
	(0.70)	(0.59)	(1.84)
Fund Age	0.026***	0.006**	0.027***
	(5.85)	(2.21)	(4.46)
Family Size	-0.009**	0.036***	-0.030***
	(-2.43)	(5.72)	(-7.52)
Fund Style x Time FE	X	X	X
Fund FE		X	
Observations	411,352	411,352	182,142
Adjusted r^2	0.743	0.922	0.756

Table 11: Broker's Ownership by Connected Funds - Client Relationship

This table presents estimates of the following model $Ownership\ (\%) = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 Relationship_{ijt} + \beta_3 Connected\ Fund_{ijt} \times Relationship_{ijt} + \beta_4 X_{ijt} + \epsilon_{ijt}$. The dependent variable $Ownership(\%)_{ijt}$ measures the percentage of broker j shares outstanding held by fund i at quarter t, and 0 if it is not holding any shares. $Connected\ Fund_{ijt}$ is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. $Relationship_{ijt}$ measures the difference in quarters between the first date in which we observe broker j working for the family of fund i and the current date t. X is a vector of control variables defined in Table A1 of the Appendix. The sample includes US actively managed, domestic equity mutual funds and publicly-traded brokers. Our sample period runs from 1996 to 2018. Coefficients are multiplied by 100. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Relationship	-2.293*	-2.320*	-2.636*	-3.087*	-3.137*
	(-1.92)	(-1.88)	(-1.72)	(-1.96)	(-1.98)
Connected Fund	1.064***	0.844***	0.910***	1.256***	1.299***
	(5.57)	(4.17)	(4.22)	(5.64)	(5.76)
Relationship × Connected Fund	7.799***	6.995***	7.089***	5.424***	5.251***
	(5.89)	(5.26)	(4.45)	(3.61)	(3.56)
Fund Size		0.418***	0.450***	0.257***	0.278***
		(16.17)	(16.05)	(9.85)	(8.82)
Expense Ratio		-0.011	0.003	-0.005***	-0.000
		(-1.32)	(0.27)	(-6.42)	(-0.21)
Loads		-5.606***	-6.298***	-5.316***	-5.516***
		(-6.50)	(-6.62)	(-5.82)	(-5.24)
Fund Turnover		0.001	0.001	0.001	0.002
		(0.72)	(0.84)	(1.01)	(1.16)
Fund Flows		-0.752***	-0.854***	-0.410***	-0.519***
		(-4.97)	(-4.82)	(-6.45)	(-7.49)
Fund Age (log)		-0.020	-0.031	-0.034	-0.013
		(-0.73)	(-1.04)	(-1.44)	(-0.53)
Family Size		0.039***	0.044***	0.005	-0.070**
		(3.50)	(3.57)	(0.32)	(-2.34)
Market Cap.			0.002	0.002	0.001
			(0.04)	(0.03)	(0.02)
Book-to-Market			-0.046	-0.043	-0.044
			(-0.78)	(-0.73)	(-0.75)
Lag 12-month Return			0.048	0.047	0.047
			(1.31)	(1.28)	(1.28)
Return Volatility			-0.097*	-0.100*	-0.101*
			(-1.79)	(-1.85)	(-1.86)
Profitability			-0.617**	-0.636**	-0.638**
			(-2.53)	(-2.59)	(-2.59)
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	17,605,606	17,605,606	17,605,606	17,605,606	17,605,606
Adjusted r^2	0.002	0.005	0.005	0.015	0.016

Table 12: Broker's Ownership by Connected Funds - Brokers Acquisitions

This table presents estimates of the following model $Ownership\ (\%)_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 X_{ijt} + \epsilon_{ijt}$. The dependent variable $Ownership(\%)_{ijt}$ measures the percentage of broker j shares outstanding held by fund i at quarter t, and 0 if it is not holding any shares. The main independent variable $Connected\ Fund_{ijt}$ is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. X is a vector of control variables defined in Table A1 of the Appendix. The sample includes US actively managed, domestic equity mutual funds and acquired brokerage firms, as detailed in Table A4. Our sample period runs from 1996 to 2018. Coefficients are multiplied by 100. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Connected Fund	1.245***	0.704***	0.691***	0.672***	0.605***
	(6.48)	(5.18)	(4.74)	(5.11)	(5.89)
Fund Size		0.622***	0.639***	0.264***	0.316***
		(9.26)	(9.08)	(5.85)	(3.51)
Expense Ratio		-0.038	-0.004	-0.003**	0.003
		(-1.04)	(-0.46)	(-2.18)	(0.47)
Loads		-9.901***	-10.176***	-2.677	0.795
		(-3.96)	(-3.94)	(-1.18)	(0.16)
Fund Turnover		0.003	0.003	0.000	-0.000
		(1.06)	(1.08)	(0.14)	(-0.10)
Fund Flows		-1.301***	-1.431***	-0.476***	-0.285*
		(-4.29)	(-4.51)	(-2.66)	(-1.96)
Fund Age (log)		0.006	-0.004	-0.173**	-0.168*
		(0.08)	(-0.05)	(-2.06)	(-1.84)
Family Size		0.121***	0.125***	-0.034	-0.111*
		(3.67)	(3.62)	(-1.09)	(-1.85)
Market Cap.			0.367***	0.364***	0.360***
			(2.95)	(2.90)	(2.86)
Book-to-Market			-0.050	-0.054	-0.062
			(-0.40)	(-0.43)	(-0.48)
Lag 12-month Return			0.001	0.001	0.002
			(0.01)	(0.01)	(0.03)
Return Volatility			-0.643***	-0.639***	-0.623***
			(-5.25)	(-5.91)	(-5.76)
Profitability			-1.129	-1.063	-1.024
			(-0.46)	(-0.44)	(-0.42)
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	2,008,997	2,008,997	2,008,997	2,008,997	2,008,997
Adjusted r^2	0.003	0.011	0.011	0.073	0.079

Internet Appendix for "Asset Managers as Buyers of Last Resort"

Benjamin Golez, Emanuele Rizzo, and Rafael Zambrana

This Internet Appendix reports the supplementary results as described below:

- Table A1: Variable Description
- Table A2: Broker's Ownership by Connected Funds (II)
- Table A3: Broker's Ownership by Connected Funds - Client Relationship (II)
- Table A4: List of Brokerage Mergers
- Table A5: Broker's Ownership by Connected Funds - Brokers Acquisitions (II)
- Table A6: Trading Activity following Negative Shocks - Brokers Acquisitions

Table A1: Variable Description

Variable	Definition
Main Independent Variables	
Connected Fund	Indicator variable equal to one if the family of the fund is a client of broker in a given quarter.
Distress - Selling Pressure	Indicator variable equal to one if the underlying stock is in the top quintile by number of shares sold by funds in a given period.
Distress - Analyst	Indicator variable equal to one in the quarter after the median analyst recommendation for a firm declines.
Ownership by Connected Funds	The broker's fraction of shares held by their client funds.
Connected Holdings	The percentage of fund total net assets invested in their brokers' shares.
Fund-Level Control Variables	
Fund Size	Natural logarithm of TNA (total net assets) under management (in US $m). Source: CRSP.
Expense Ratio	Total annual expenses and fees divided by year-end TNA (in %). Source: CRSP.
Loads	Total front-end, deferred, and rear-end charges divided by year-end TNA (in %). Source: CRSP.
Fund Turnover	Minimum of aggregate purchases and sales of securities divided by average TNA over the calendar year. Source: CRSP.
Fund Flows	The net growth in fund assets beyond reinvested dividends (Sirri and Tufano (1998)) over the past one year. Source: CRSP.
Fund Age (log)	Natural logarithm of the number of years since the fund inception date. Source: CRSP.
Family Size (log TNA)	Natural logarithm of TNA of all funds in the family, excluding the fund itself. Source: CRSP.
Brokerage Commission	Ratio of total brokerage commissions paid by the family, divided by the family TNA. Source: NSAR reports.
Soft Dollar	Indicator variable with value 1 if a fund reports paying soft dollars to its brokers. Source: NSAR reports.
Cash Holdings	Amount of fund TNA invested in cash. Source: CRSP.
Dependent Variables Table 7 Panel A	
Return Volatility	The standard deviation of daily stock returns over quarter t. A minimum number of 10 daily returns is required for the calculation. Source: CRSP.
Idiosyncratic Volatility	The standard deviation of residuals from a regression of daily stock returns on the CAPM model. Computed using daily returns over quarter t. A minimum number of 10 daily returns is required for the calculation. Source: CRSP.
Market Beta	CAPM Beta, computed using daily returns over quarter t. A minimum number of 10 daily returns is required for the calculation. Source: CRSP.
Expected Shortfall	Average daily stock return computed using returns in the bottom 5% of the distribution of daily stock returns in quarter t. Source: CRSP.
Marginal Expected Shortfall	Average daily stock return computed using the 5% worst days for the market returns in quarter t. Source: CRSP.
Dependent Variables Table 7 Panel B	
Return Volatility	Value-weighted average of stock-level Return Volatility across firms in the financial sector, as defined by Acharya et al. (2017). Source: CRSP.
Idiosyncratic Volatility	Value-weighted average of stock-level Idiosyncratic Volatility across firms in the financial sector, as defined by Acharya et al. (2017). Source: CRSP.
Market Beta	Value-weighted average of stock-level Market Beta across firms in the financial sector, as defined by Acharya et al. (2017). Source: CRSP.
Expected Shortfall	Average daily return of the financial sector computed using returns in the bottom 5% of the distribution of daily financial sector returns in quarter t. Source: CRSP.
Marginal Expected Shortfall	Average daily financial sector return computed using the 5% worst days for the market returns in quarter t. Source: CRSP.
Stock-Level Control Variables	
Market Capitalization	Natural logarithm of price times shares outstanding. Source: CRSP.
Book-to-Market	The natural log of the ratio of the book value of equity to the market value of equity. Book equity is total book value of assets, minus total liabilities, plus balance sheet deferred taxes and investment tax credit if available, minus preferred stock liquidating value if available, or redemption value if available, or carrying value. Market equity is price times shares outstanding from CRSP.
Lag 12-month return	Cumulative annual stock return over the 12 months going from $t-12$ to $t-1$. Source: CRSP.
Return Volatility	The standard deviation of monthly stock returns over the prior 12 months. A minimum number of 9 monthly returns is required for the calculation. Source: CRSP.
Profitability	Ratio of operating income before depreciation (OIBDP) minus interest expenses (TIE) and income taxes (TXC), divided by total assets (AT). Source: Compustat.

Table A2: Broker's Ownership by Connected Funds (II)

This table presents estimates of the following linear probability model $Y_{ijt} = \beta_0 + \beta_1 \textit{Connected Fund}_{ijt} + \beta_2 X_{ijt} + \epsilon_{ijt}$. The dependent variable Y_{ijt} is an indicator variable that takes value one if fund i holds shares of broker j at quarter t. The main independent variable $\textit{Connected Fund}_{ijt}$ is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. X is a vector of control variables defined in Table A1 of the Appendix. The sample includes US actively managed, domestic equity mutual funds and publicly-traded brokers. Our sample period runs from 1996 to 2018. Coefficients are multiplied by 100. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Connected Fund	14.267***	13.456***	12.661***	12.410***	12.409***
	(22.55)	(19.23)	(20.98)	(21.51)	(21.33)
Fund Size		0.328***	0.353***	0.232***	0.271***
		(6.36)	(6.27)	(7.12)	(7.54)
Expense Ratio		0.033***	-0.029	-0.008***	-0.004
		(2.63)	(-1.17)	(-6.03)	(-0.36)
Loads		-12.239***	-13.198***	-2.351	-6.012***
		(-5.54)	(-5.46)	(-1.37)	(-2.67)
Fund Turnover		0.025	0.027	0.006**	0.006*
		(1.33)	(1.34)	(2.14)	(1.98)
Fund Flows		-1.307***	-1.400***	-0.490***	-0.620***
		(-3.58)	(-3.51)	(-3.75)	(-4.33)
Fund Age (log)		0.101*	0.105*	0.074**	0.151***
		(1.81)	(1.70)	(2.37)	(4.09)
Family Size		0.512***	0.577***	-0.052	-0.060
		(13.28)	(13.57)	(-1.51)	(-1.05)
Market Cap.			1.382***	1.383***	1.383***
			(20.78)	(20.83)	(20.82)
Book-to-Market			0.408***	0.411***	0.409***
			(3.48)	(3.50)	(3.48)
Lag 12-month Return			0.037	0.034	0.035
			(0.61)	(0.57)	(0.58)
Return Volatility			0.089	0.090	0.089
			(1.03)	(1.04)	(1.03)
Profitability			-0.318	-0.346	-0.346
			(-0.79)	(-0.86)	(-0.86)
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	17,605,606	17,605,606	17,605,606	17,605,606	17,605,606
Adjusted r^2	0.150	0.159	0.164	0.219	0.222

Table A3: Broker's Ownership by Connected Funds - Client Relationship (II)

This table presents estimates of the following linear probability model $Y_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 Relationship_{ijt} + \beta_3 Connected\ Fund_{ijt} \times Relationship_{ijt} + \beta_4 X_{ijt} + \epsilon_{ijt}$. The dependent variable Y_{ijt} is an indicator variable that takes value one if fund i holds shares of broker j at quarter t. $Connected\ Fund_{ijt}$ is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. $Relationship_{ijt}$ measures the difference in quarters between the first date in which we observe a connection between fund i and broker j and the current date t. X is a vector of control variables defined in Table A1 of the Appendix. The sample includes US actively managed, domestic equity mutual funds and publicly-traded brokers. Our sample period runs from 1996 to 2018. Coefficients are multiplied by 100. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Relationship	-12.136***	-13.001***	-12.642***	-11.707***	-11.814***
	(-12.05)	(-11.34)	(-9.54)	(-9.36)	(-9.37)
Connected Fund	8.404***	7.907***	7.715***	7.535***	7.580***
	(18.84)	(15.89)	(15.81)	(16.65)	(16.59)
Relationship × Connected Fund	48.332***	44.917***	41.983***	40.833***	40.624***
	(22.85)	(20.81)	(20.12)	(20.74)	(20.40)
Fund Size		0.315***	0.339***	0.217***	0.263***
		(6.41)	(6.32)	(6.66)	(7.34)
Expense Ratio		0.032**	-0.038	-0.010***	-0.004
		(2.33)	(-1.37)	(-7.77)	(-0.45)
Loads		-11.667***	-12.539***	-0.745	-5.804**
		(-5.32)	(-5.22)	(-0.43)	(-2.59)
Fund Turnover		0.024	0.027	0.006**	0.006*
		(1.31)	(1.32)	(2.22)	(1.94)
Fund Flows		-1.096***	-1.182***	-0.465***	-0.578***
		(-3.03)	(-3.00)	(-3.59)	(-4.04)
Fund Age (log)		0.106*	0.112*	0.088***	0.149***
		(1.91)	(1.80)	(2.83)	(4.05)
Family Size		0.501***	0.557***	-0.030	-0.060
		(13.40)	(13.39)	(-0.89)	(-1.05)
Market Cap.			1.436***	1.434***	1.434***
			(22.54)	(22.57)	(22.57)
Book-to-Market			0.456***	0.454***	0.453***
			(4.26)	(4.23)	(4.22)
Lag 12-month Return			0.025	0.024	0.024
			(0.42)	(0.40)	(0.41)
Return Volatility			0.149*	0.148*	0.147
			(1.67)	(1.67)	(1.66)
Profitability			-0.323	-0.338	-0.341
			(-0.79)	(-0.83)	(-0.84)
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	17,605,606	17,605,606	17,605,606	17,605,606	17,605,606
Adjusted r^2	0.154	0.163	0.168	0.222	0.225

Table A4: List of Brokerage Mergers

This table reports a list of twenty six brokerage mergers during our sample period. We include the names of brokers involved in the merger, and the effective date of the event.

Effective Date	Acquiring Broker	Acquired Broker
1997-05-31	Morgan Stanley	Dean Witter Reynolds
1997-09-02	BT New York (Successor: Deutsche)	Alex Brown
1997-11-28	Smith Barney (Travelers)	Salomon Brothers
1998-06-30	Societe Generale Securities	Cowen
2000-02-24	Instinet	Lynch Jones Ryan
2000-11-02	Goldman Sachs Group	Spear Leeds Kellogg
2000-11-03	UBS Warburg Dillon Read	Paine Webber
2000-11-03	Credit Suisse First Boston	Donaldson Lufkin Jenrette
2001-04-30	ABN-AMRO	ING Baring-US
2001-09-04	Wachovia	First Union Capital Markets
2002-02-04	Bank of New York	Autranet
2003-07-01	Wachovia	Prudential
2003-10-31	Lehman Brothers	Neuberger Berman
2003-12-08	UBS AG	ABN-AMRO
2005-03-31	Instinet	Bridge Trading
2007-02-02	Nomura Holdings	Instinet
2007-10-01	Wachovia	A.G. Edwards Sons
2008-05-30	JPMorgan Chase	Bear Sterns
2008-09-22	Barclays	Lehman Brothers
2008-12-31	Bank of America	Merrill Lynch
2009-10-02	Macquarie Group	Fox Pitt Kelton
2009-12-31	Wells Fargo Securities	Wachovia
2010-07-01	Stifel	Thomas Weisel Partners
2012-04-02	Raymond James Financial	Morgan Keegan
2013-02-15	Stifel	Keefe Bruyette Woods
2014-09-03	Keybank	Pacific Crest Securities

Table A5: Broker's Ownership by Connected Funds - Brokers Acquisitions (II)

This table presents estimates of the following linear probability model $Y_{ijt} = \beta_0 + \beta_1 \textit{Connected Fund}_{ijt} + \beta_2 X_{ijt} + \epsilon_{ijt}$. The dependent variable Y_{ijt} is an indicator variable that takes value one if fund i holds shares of broker j at quarter t. $\textit{Connected Fund}_{ijt}$ is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. X is a vector of control variables defined in Table A1 of the Appendix. The sample includes US actively managed, domestic equity mutual funds and acquired brokerage firms, as detailed in Table A4. Our sample period runs from 1996 to 2018. Coefficients are multiplied by 100. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Connected Fund	13.764***	11.898***	11.344***	10.573***	10.561***
	(25.74)	(20.31)	(22.79)	(22.30)	(21.71)
Fund Size		0.820***	0.839***	0.859***	0.805***
		(6.83)	(6.71)	(8.88)	(7.51)
Expense Ratio		0.067	-0.069**	-0.009**	-0.036*
		(0.43)	(-2.60)	(-2.00)	(-1.77)
Loads		-3.789	-3.874	-5.758	-16.161***
		(-0.75)	(-0.76)	(-1.11)	(-2.64)
Fund Turnover		0.081**	0.085**	0.019**	0.027***
		(2.06)	(2.10)	(2.50)	(3.64)
Fund Flows		-6.979***	-7.486***	-2.306***	-1.824***
		(-6.12)	(-6.25)	(-5.67)	(-4.25)
Fund Age (log)		0.277*	0.309*	0.393***	0.564***
		(1.83)	(1.96)	(4.24)	(5.91)
Family Size		0.911***	0.980***	-0.335***	-0.346*
		(9.24)	(9.93)	(-3.30)	(-1.98)
Market Cap.			0.774**	0.719*	0.728*
			(1.99)	(1.84)	(1.85)
Book-to-Market			-3.131***	-3.208***	-3.204***
			(-4.73)	(-4.82)	(-4.81)
Lag 12-month Return			-1.429*	-1.337*	-1.325*
			(-1.91)	(-1.79)	(-1.78)
Return Volatility			-3.157**	-2.970**	-2.978**
			(-2.56)	(-2.41)	(-2.41)
Profitability			-7.587	-7.239	-7.422
			(-0.49)	(-0.47)	(-0.49)
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	2,008,997	2,008,997	2,008,997	2,008,997	2,008,997
Adjusted r^2	0.273	0.288	0.291	0.394	0.403

Table A6: Trading Activity following Negative Shocks - Brokers Acquisitions

This table presents estimates of the following model $\Delta Shares_{ijt} = \beta_0 + \beta_1 Connected\ Fund_{ijt} + \beta_2 Distress_{ijt} + \beta_3 Connected\ Fund \times Distress_{ijt} + \beta_4 X_{ijt} + \epsilon_{ijt}$. The dependent variable is the logarithm of the ratio ($\text{Shares}_{(t)}/\text{Shares}_{(t-1)}$) held by fund i between quarter *t-1* and quarter t. *Connected Fund* is an indicator variable equal to one if the family of the fund i is a client of broker j in quarter t. We measure stock-level *Distress* using 2 different variables: in panel A, we define *Distress* as an indicator variable equal to one if the underlying stock is in the top quintile by number of shares sold by funds in quarter t; in panel B, we define *Distress* as an indicator variable equal to one in the quarter after the median analyst recommendation for a firm declines. X is a vector of control variables defined in Table A1 of the Appendix. The sample includes US actively managed, domestic equity mutual funds and acquired brokerage firms, as detailed in Table A4. Our sample period runs from 1996 to 2018. Robust t-statistics clustered at the fund and quarter level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Distress Measured Using Funds' Selling Pressure

	$\Delta Shares$				
	(1)	(2)	(3)	(4)	(5)
Connected Fund	0.232***	0.270***	0.286***	0.291***	0.150***
	(8.90)	(10.17)	(10.38)	(10.62)	(6.78)
Distress	-0.479***	-0.484***	-0.359***	-0.356***	-0.477***
	(-46.91)	(-46.16)	(-45.29)	(-45.09)	(-46.32)
Connected Fund × Distress	0.221***	0.221***	0.225***	0.241***	0.210***
	(4.25)	(4.30)	(4.43)	(4.74)	(4.12)
Controls Fund		X	X	X	X
Controls Stock			X	X	X
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	23,823,024	23,823,024	23,823,024	23,823,024	23,823,024
Adjusted r^2	0.073	0.079	0.036	0.041	0.053

Panel B: Distress Measured Using Analyst Recommendations

	$\Delta Shares$				
	(1)	(2)	(3)	(4)	(5)
Connected Fund	0.248***	0.289***	0.305***	0.312***	0.170***
	(9.39)	(10.73)	(10.94)	(11.26)	(7.55)
Distress	-0.175***	-0.177***	-0.106***	-0.105***	-0.175***
	(-37.67)	(-37.59)	(-31.99)	(-31.93)	(-37.84)
Connected Fund × Distress	0.087***	0.083***	0.072**	0.075**	0.072**
	(2.94)	(2.82)	(2.44)	(2.54)	(2.46)
Controls Fund		X	X	X	X
Controls Stock			X	X	X
Fund Style x Time FE	X	X	X	X	X
Stock FE	X	X	X	X	X
Fund FE				X	X
Fund Family x Time FE					X
Observations	23,823,024	23,823,024	23,823,024	23,823,024	23,823,024
Adjusted r^2	0.071	0.077	0.035	0.040	0.050