The Granular Nature of Large Institutional Investors

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Abstract

Over last 35 years institutional ownership became concentrated at unprecedented levels; e.g., the stock holdings by the largest ten asset management firms quadrupled from 5.6% to 23.1%. Due to their sheer size, institution-level shocks cannot be diversified away and can spill over to the underlying securities. We document that stock ownership by the largest institutional investors leads to an increase in the volatility of the assets that they hold. Furthermore, stocks held by the largest institutional investors exhibit patterns of price inefficiency. We show that these effects are triggered by institution-level idiosyncratic news and channeled through large trades.

Keywords: Financial institutions, institutional investors, granularity
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1. Introduction

The U.S. asset management industry has become increasingly concentrated in recent years. Over the last 35 years, the largest institutional investors quadrupled their holdings in the equity market. As of December 2014, the largest asset manager oversaw 4.4% of the total equity assets in SEC 13F filings, and the largest ten managers managed 23.1% of these assets.[1] One issue that arises in a market with high concentration of ownership is that idiosyncratic shocks to the largest individual players are hardly diversifiable (Gabaix, Gopikrishnan, Plerou, and Stanley 2006, and Gabaix 2011).

The asset management space has experienced many examples of idiosyncratic events at the institutional investor level that led to significant shocks to the financial system. At the peak of the Global Financial Crisis of 2008-2009, stocks held by hedge funds that had brokerage relations with the now-bankrupt Lehman Brothers experienced a drop in liquidity (Aragon and Strahan 2012). In early 2012, JP Morgan's trader Bruno Iksil (the "London Whale") built a large short position in credit default swaps that led to trading losses exceeding $6 billion within weeks and distorted market prices of credit-linked securities.[2] Moreover, on August 1, 2012, a glitch in an untested trading program at Knight Capital led to 4 million order executions in 148 stocks within 45 minutes. These orders created losses of $440 million to Knight Capital due to the significant intraday price impact on many stocks.[3] Lastly, the sudden departure of co-founder Bill Gross from Pimco on September 26, 2014 caused unprecedented large withdrawals from the fund ("Bill Gross Effect"). To fund the withdrawals, Pimco engaged in massive fire sales. For example, it closed more than 860,000 Eurodollar futures contracts (each with a notional value of $1m).[4,5] It is important to note that these idiosyncratic events need not be extreme to have an

[1] These numbers are computed using the SEC 13F reports, which only contain equity-like securities. They are, however, consistent with the report by the Office of Financial Research (2013), which calculates that as of December 2012 the largest asset manager (Blackrock) oversaw 7.2% of the total assets under management (AUM) in the U.S., and the largest ten and twenty managers managed 35.2% and 49.4%, respectively.

[2] See Ruhle, Stephanie, Bradley Keoun, Mary Childs, 2012, JP Morgan Trader's Positions Said to Distort Credit Indexes, Bloomberg Business http://www.bloomberg.com/news/articles/2012-04-05/jpmorgan-trader-iksil-s-heft-is-said-to-distort-credit-indexes. Zuckerman, Gregory, and Katy Burne, 2012, London Whale Rattles Debt Market, Wall Street Journal http://www.wsj.com/articles/SB10001424052702303299604577326031119412436. Hurtado, Patricia, 2015, The London Whale, Bloomberg QuickTake http://www.bloombergview.com/quicktake/the-london-whale.

[3] Securities and Exchange Commission, Order Instituting Administrative and Cease-to-Desist Proceedings (Knight Capital Americas LLC), October 16, 2013 https://www.sec.gov/litigation/admin/2013/34-70694.pdf.

[4] See Ablan, Jennifer, 2014, 'Bill Gross effect' sparks flows into BlackRock, Legg Mason: KBW, Reuters http://www.reuters.com/article/2014/10/08/us-pimco-allianz-gross-idUSKCN0HX1Y820141008, Goldstein,

impact on asset prices. A large institution that initiates trades due to a new investment policy, portfolio rebalancing, or new risk management practices may engage in trades that lead to price distortions.

Regulators have expressed concerns about systemic risks that could result from the high concentration of assets under a single large manager: "The failure of a large asset management firm could be a source of risk, depending on its size, complexity, and the interaction among its various investment management strategies and activities" (Office of Financial Research 2013). The Financial Stability Board (FSB 2013) has voiced additional concerns about whether non-bank, non-insurance financial institutions are systemically important or "too-big-to-fail." Furthermore, a recent FSB directive (2015), focusing on systemic risks originating from non-bank, non-insurer institutions, voiced the concern that while abundant research studies on market contagion, there is a lacuna in the research about individual organizations.[6]

Given that the evidence on the effect of large firms is so far anecdotal, the purpose of this paper is to provide a large-sample study on the impact of large institutional investors on price stability. Using 35 years of ownership data, we measure the effect of large institutional ownership on stock volatility. Our results show that the presence of large institutions lead to noisier stock prices. These results introduce new evidence into the debate on the risk created by large institutional investors.

Matthew, 2014, Bill Gross, King of Bonds, Abruptly Leaves Mutual Fund Giant Pimco, New York Times Dealbook http://dealbook.nytimes.com/2014/09/26/william-gross-leaves-pimco-to-join-janus/, and Mackenzie, Michael, and Gregory Meyer, 2014, Gross Triggers Sell-Off in Interest Rate Derivative Positions, Financial Times, October 5, 2014. Grind, Kirsten, and Gregory Zuckerman, 2014, Amid Crisis Pimco Steadies Itself, The Wall Street Journal, December 15, 2014 http://www.wsj.com/articles/amid-crisis-caused-by-bill-grosss-exit-pimco-steadies-itself-1418614371. This anecdotal evidence illustrates the magnitude of the sell-off and the threat of a liquidity crunch that Pimco faced in the months following Gross' departure, as well as the ensuing price drops that spread to many securities in Pimco's portfolio. In the immediate aftermath, the performance ranking of Pimco's Total Return Fund dropped to the 23rd percentile, before rebounding to the 99th percentile after price reversals on the bonds with the most price pressures when Pimco's outflows steadied in the following months.

[5] In spite of these adverse developments, some argue that Pimco was able to avoid a large-scale fire sale through holding the fund's clearance in-house. For example, in its response to the Secretariat of the Financial Stability Board, Blackrock Inc. used Bill Gross's departure as an example of a large-firm-idiosyncratic event that did not cause havoc in financial markets (http://www.blackrock.com/corporate/en-gb/literature/publication/2nd-nbni-gsifi-fsb-iosco-052915.pdf.). See also Weiss, Miles, 2015, Pimco May Have Averted Fire Sale After Gross's Exit http://www.bloomberg.com/news/articles/2015-06-11/pimco-may-have-averted-fire-sale-after-gross-s-exit.

[6] Some of the largest U.S. funds responded to the FSB's allegations that they are systemically important. Fidelity, for example, claimed that the FSB's approach is "irredeemably flawed" and its claims "would be counterproductive and destructive." See Jopson, Barney, 2015, Top US fund managers attack regulators, Financial Times http://www.ft.com/intl/cms/s/0/6fbde67a-061b-11e5-89c1-00144feabdc0.html.

Our base analysis tests the impact of large asset managers on the volatility of the securities that they hold. We use 13F quarterly data to identify the stock holdings of the largest institutional investors each quarter. We show that larger stock ownership by the top institutions is associated with significantly higher volatility. These effects have higher magnitude during crises and are particularly strong (double in size) around the Global Financial Crisis of 2008.

We use two distinct identification strategies to address potential endogeneity concerns (e.g., the fact that large institutions may endogenously prefer stocks with higher volatility). The first relies on "local bias," that is, the prior finding that asset managers overweight firms located close to their headquarters (Coval and Moskowitz 1999). We use an indicator for whether a company is headquartered in the same state as the large asset managers (Baik, Kang, and Kim 2010). Consistent with a local bias, we show that institutional investors hold significantly larger stakes in firms that are headquartered in the same state. This variable is a valid instrument since it is not likely to have a direct effect on stock volatility. The second stage in the analysis shows that instrumented ownership by large institutions leads to significantly higher stock volatility. Using this identification technique, we find that a one percent increase in stock ownership causes an increase in stock volatility of 28 basis points, relative to a daily average of 3.5%. The economic magnitude is, therefore, large. The caveat is that these estimates possibly measure a local average treatment effect (LATE) (Imbens and Angrist, 1994), that is, the impact of ownership on stocks that enter the institutional portfolio only because of their geographical location, which are likely to be small and illiquid. For this reason, we interpret the instrumental variable (IV) coefficients as an upper bound for the effect of interest.

Our second identification strategy relies on a mega-merger between two large institutional investors that took place at the end of 2009. The granularity theory in this context suggests that the shocks of one large consolidated organization (the merged entity) have a greater impact than the combined individual shocks (pre-merger organizations). Consistent with this hypothesis, we find that stocks owned by the combined entity have higher volatility than stocks owned by the pre-merger firms and that this effect is permanent. Our estimates show that the asset manager consolidation resulted in an increase in the sensitivity of stock volatility to ownership by the combined entity relative to the ownership of the two separate managers. A 1% increase in ownership by the combined institution increases stock volatility by 3 to 4.8 basis points more than the effect of a comparable increase in ownership by the two separate

institutions (relative to a daily average volatility of 3.2% during the merger period). As the merger event is arguably exogenous relative to the portfolio stocks' characteristics (including volatility), we can interpret this effect as the causal impact of a large institutional owner on volatility. We see this magnitude as a lower bound for the effect of interest as it identifies the incremental effect of the merger relative to the baseline effect of large institutional ownership.

After establishing causality, we turn to exploring the nature of the increase in stock volatility. It may be the case that the increase in volatility is a desirable outcome of institutional ownership, e.g., if large institutions encourage information production and faster price discovery. We test whether large institutions contribute to or detract from market efficiency in two ways. First, we document that ownership by large institutions is associated with stronger daily return autocorrelation, indicating reduced price efficiency. Second, we show that the returns of stocks that are owned by large institutional investors co-move with the returns of the rest of their portfolios, controlling for standard factors and industry effects. This evidence suggests that the underlying securities are exposed to the same shocks, presumably spilling over from the large institutional investor. This effect becomes larger as institution size increases. This finding, therefore, is an extension of prior evidence on abnormal co-movement in institutional portfolios (Greenwood and Thesmar 2011, Anton and Polk 2014).

The last part of the study delves deeper into the origin of these effects and the channels through which they play out. First, we show that stock volatility increases with contemporaneous idiosyncratic news of the large institutional investors. In an attempt to capture the effects of idiosyncratic events like the "London Whale" or the departure of Pimco's CEO, we document that an increase in an institution's credit default swap (CDS) spreads (i.e., increase in the market's perception of the probability of default) is associated with a concurrent increase in the volatility of stocks owned by the institution.

Second, we show that large institutional investors engage in especially large trades, which impound non-diversifiable shocks into prices. This analysis intends to highlight the difference between a large institutional investor and a collection of smaller institutions. The granularity theory suggests that while small institutional investors may suffer idiosyncratic shocks, their trades will cancel out one another. In contrast, idiosyncratic shocks to a large institutional investor will translate into large trades, which have a substantial impact on prices.

Large institutions are generally composed of dozens of semi-independent divisions like exchange-traded funds (ETFs), mutual funds, proprietary trading desks, etc. Hence, a priori, one could conceive that large institutions behave as a collection of separate entities. However, the different divisions within a large firm may trade in a correlated way if, for example, fund managers use the same source of security research, if there is a centralized risk-management function, or, more generally, if there is an investment philosophy that characterizes the whole institution. We examine this issue by comparing the absolute size of trades of large institutions to the absolute size of net trades of a collection of randomly drawn institutions whose collective assets under management equal those of the large institution ("synthetic large institutional investor"). Our results show that the trades of large institutional investors are more concentrated than those of the synthetic large institutional investors. For example, 17.0% of the trades of large institutional investors are larger than the 90th percentile of the trades of the synthetic large institutions, and 3.9% of the trades of large institutional investors are larger than the 99th percentile of the trades of the synthetic large institutions. We show that over time trades by large institutional investors became less concentrated. However, even at the end of the sample period, they are more concentrated than those of the synthetic large investors.

Finally, we link the concentration of trades to the effect that large institutions have on volatility. We construct a trade granularity score as the stock-quarter percentile rank of large institutions' trades relative to the trades of the synthetic large investors. Then, we run a horse race between the institutional ownership variable and the trade granularity score in explaining stock volatility. Our results show that the trade granularity score has significantly higher explanatory power for stock-level volatility than ownership. This effect remains strong in sub-periods of the sample, including the very recent period.

Overall, our study shows that ownership by large institutional investors increases the volatility in prices of the portfolio securities. Furthermore, the increase in volatility appears to originate from institutional shocks. These shocks lead to large trades, which translate into substantial price pressure, transmitted through concentrated trades by these large institutional investors.

The idea that idiosyncratic shocks to institutions are granular and cannot be diversified away (Gabaix 2011) has been explored in several contexts in financial markets. Gabaix,

Gopikrishnan, Plerou, and Stanley (2006) look at the effect of large institutional investors on securities markets, positing that due to the size of their trades, large institutional investors increase market volatility. Koijen and Yogo (2015) reach the opposite conclusion based on the estimation of an equilibrium model in which large institutional investors smooth their price impact and therefore have a muted effect on market volatility. They also present aggregate statistics to support their claim. In contrast, we provide disaggregated evidence on the effect of the ownership structure (large vs. small investors) on stock-level volatility. The granularity idea also appears in other economic contexts: Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012) study the effects on supply chains, and Blank, Buch, and Neugebauer (2009) and Bremus, Buch, Russ, and Schnitzer (2013) study the effects of granularly large banks on the banking industry. Corsetti, Dasgupta, Morris, and Shin (2004) develop a model that explains the impact of one large trader on the behavior of small traders.

Beyond applying the granularity theory to the institutional investment space, this paper contributes to the literature on the effect of institutions on asset prices, risk spillovers, and financial stability. A substantial body of work shows the impact of institutional investors on asset prices, including Shleifer (1986), Barberis, Shleifer, and Wurgler (2005), Greenwood (2005), Coval and Stafford (2007), and Wurgler (2011). Moreover, other papers establish that institutions can affect the correlations of asset returns (Anton and Polk (2014), Greenwood and Thesmar (2011), Lou (2011), Jotikasthira, Lundblad, and Ramadorai (2012), and Chang, Hong, and Liskovich (2015)). In addition, Basak and Pavlova (2013a, 2013b) show theoretically that an asset included in an index tracked by institutional investors increases the non-fundamental volatility in that asset's prices. Ben-David, Franzoni, and Moussawi (2014) provide empirical evidence that ETFs increase stock volatility. Allen and Gale (2000) and Boyson, Stahel, and Stulz (2010), among others, show that shocks within one part of the financial system may propagate throughout the rest of the system, causing a large-scale stress event.

The paper proceeds as follows. Section 2 describes the data. Section 3 presents the main evidence of the effect of large institutional ownership on stock volatility. Section 4 investigates the nature of the volatility increase, and Section 5 examines the channels by which risk may transfer from large institutions to stocks. Section 6 concludes.

2. Data

We construct our sample of asset managers using institutional ownership data from the first quarter of 1980 until the first quarter of 2014 that was compiled by Thomson-Reuters from U.S. Securities and Exchange Commission (SEC) 13F filings.[7]

We examine the largest asset management firms in each quarter based on a rolling four-quarter average of the rankings of their aggregate equity holdings, as disclosed in institutional 13F filings. The 13F filings require all institutions with investment discretion over $100 million or more of equity assets at the end of the year to provide detailed quarterly reports of their long holdings in these qualified securities in the next year.[8]

In our tests, we include all stocks in the CRSP universe, regardless of whether they are held by the largest asset managers. We use data from CRSP and Compustat to construct other stock-level variables. Given that the main variables from the 13F filings are at the quarterly frequency, we construct all other variables at a quarterly frequency.

The variables of interest are the *Ownership* of each stock by the largest institutional investors. The main dependent variable that captures firm risk is *Daily volatility (%)*, which is measured for each stock in each quarter as the standard deviation of daily log returns. Panel A of Table 1 provides summary statistics for our sample of stocks. The mean *Daily volatility* over the entire sample is 3.6%, and the median *Daily volatility* is 2.8%. Moreover, we observe that for the average stock in our sample, 36.4% of its shares are owned by institutional investors. We also provide some sample statistics specific to the mega-merger we study. During this event period, the average stock's *Daily volatility* is 3.3%, which is very close to the mean of our overall sample. Appendix A provides a detailed description of the variables we use in the study.

We measure large institutional ownership at several levels: the ownership by each of the largest institutions (Top 1 to Top 10), and the aggregated ownership by subsets of large institutions, specifically: the top 3, top 5, top 7, and top 10 institutions. Table 1, Panel B provides summary statistics for our sample of asset managers. The largest institutional investor (Top 1)

[7] See Ben-David, Franzoni, and Moussawi (2012) for institutional details regarding 13F data and an overview of the Thomson-Reuters Institutional Ownership database.

[8] On a quarterly basis, the SEC publishes the official list of Section 13F securities on the following page: https://www.sec.gov/divisions/investment/13flists.htm. The list contains mainly equity and equity-like securities such as publicly traded common stocks, convertible bonds, ETFs, and options on equity securities.

holds 1.7% of the outstanding shares of the average stock in our sample with a standard deviation of ownership of 2.5%. Average holdings follow a nearly monotonic decrease from the largest institution to the tenth largest institution. As a group, we observe that the largest three institutions hold a combined 3.7% of the average stock in our sample, while the aggregate ownership of the top ten institutions is on average 7.3%. Ownership of the average stock decreases for the combined top 11 through top 20 institutions and beyond. The top 30 through top 50 institutions together hold 2.7% of the shares outstanding of the average stock in our sample.

We also provide summary statistics for other key variables. *Same State* is a dummy that captures whether a firm's headquarters is in the same state as the headquarters of the institutional investor. ΔCDS captures the change in the CDS price for the largest institutions in our sample (the units are such that a 1% change is recorded as 0.01). This variable reflects changes in the idiosyncratic risk of the asset manager. Lastly, *Beta with Top X* estimates the sensitivity of the firm's daily returns to the returns of the rest of the portfolio of the Top X institutional investors.

Figure 1 plots the time series of the percentage of holdings of large institutions over our sample period. We include the holdings of the largest institutional investor as well as of the groups of the top 3, 5, 7, and 10 largest investors. We observe that the percentage of total shares outstanding held by large institutions in the average stock is increasing over time. For example, the largest institution in the economy quadruples its holdings from 1.1% of the equity market at the beginning of the sample (1980) to 4.4% at the end of the sample (2014). Similarly, the largest ten institutions own 5.5% at the beginning of the sample and 21.7% at the end.

Table 1, Panel C provides summary statistics for the ownership by asset managers, calculated by index, of the underlying stocks. We observe that the largest institutions hold a greater proportion of the largest stocks, defined by the stocks' inclusion in the S&P 500. While the largest institution holds an unconditional average of 1.7% of the shares outstanding of all companies in our sample, it holds 2.9% of the shares outstanding of the S&P 500 members and 2.7% of the shares of the Russell 1000 members. This trend persists for all institutions in the top ten.

Finally, Appendix B reports statistics on the large investment firms that make up our sample. We compile the length of time that each firm stays in our sample, its average long equity

holdings, its average quarterly turnover, and the average rank of the firm while in the sample. The firm with the highest average ranking is in our sample from the second quarter of 1990 until the third quarter of 2013. In recent years, this large institution had average equity assets of $710 billion and a quarterly turnover of 3.8%. In all, our sample comprises 39 unique institutions that fell within the top ten institutions at some point during our sample period, and they hold an average of $172 billion (inflation adjusted to the end of 2014) in assets in a given quarter of our sample.

3. The Effect of Large Institutions on Stock Volatility

We begin our analysis by using ordinary least squares (OLS) regressions to explore the relation between ownership by large institutional investors and stock-level volatility. We lag ownership by one quarter to reduce the concern that it is endogenous with respect to volatility. For the same reason, in some specifications we control for lagged volatility or, alternatively, for stock fixed effects. We address the remaining endogeneity concerns in Section 3.3 through an instrumental variable approach as well as a natural experiment.

3.1 Base regressions

Our main OLS specification takes the following form:

$$Volatility_{iq} = TopXOwnership_{i,q-1} + Controls_{i,q-1} + Time\ FE_q + Stock\ FE_i + \varepsilon_{iq} \quad (1)$$

The sample frequency is quarterly, and variables are measured at the stock level. The dependent variable is the stock's daily return volatility measured over the calendar quarter. Institutional ownership is the fraction of shares outstanding collectively held by the top X institutions, with X = 3, 5, 7, and 10 (*Top X ownership*). We include the following controls: lagged *volatility* (when stock fixed effects are not included), lagged *log(market cap)*, lagged *book-to-market* ratio, *past 6-month returns*, lagged inverse price ratio (*1/price*), lagged *Amihud illiquidity* measure (Amihud 2002), and lagged *total ownership by all institutions*. We also add in a variable that measures the lagged total *ownership by bottom institutions* whose aggregate

equity holdings sum up to that of the largest ten institutions. Lastly, our specifications include calendar quarter fixed effects and, in some cases, stock fixed effects. Standard errors are clustered at the stock level throughout our analyses.

The estimates are presented in Table 2, Panels A and B. Panel A does not include stock fixed effects, while Panel B does. We note that up to the 20th largest institution, the positive relation between ownership by large institutions and stock volatility is statistically significant. Column 4 of Panel B shows that a 1% increase in the top 10 institutions' stock ownership coincides with a 0.78 basis point increase in daily stock volatility. The economic magnitude of these OLS estimates is therefore not large. Beyond the 20th largest institution, the magnitude halves for institutional investors ranked 21 to 30, and it is indistinguishable from zero for institutional investors ranked 31 to 50. Furthermore, for the bottom institutional investors, the association between stock volatility and ownership is negative and statistically different from zero.

To explore whether these effects are relegated to small and illiquid stocks, we focus on the subsample of S&P 500 firms in Table 2, Panel C. The results again show that the holdings by the top ten institutions are associated with higher stock-level volatility. The effect is more concentrated, though, as ownership by institutions 11 to 30 is not significantly associated with a change in stock volatility, but institutions 31 to 50 are associated with lower volatility. We conclude that the relation between ownership by large investors and stock-level volatility is not merely a small-stock phenomenon.

3.2 Financial Crises

Financial crises are of particular interest, since asset managers often face withdrawals by their investors and therefore may engage in liquidations and rebalancing. For example, Ben-David, Franzoni, and Moussawi (2012) report that hedge funds liquidated equity positions during the 2008-2009 financial crisis as a response to capital outflows. The effects that we identify are therefore potentially larger in crisis periods. Koijen and Yogo (2015) argue that the trades of large institutions were responsible for only a small fraction of aggregate volatility during 2008-2009 financial crisis. Within their general equilibrium model, the trades of the top 25 institutions

account for up to 6.8% of stock volatility. Our focus is different, however. We ask whether the distribution of institutional ownership makes a difference for stock-level volatility.

To test whether the effect of interest is stronger during crisis periods, we limit our sample to the quarters that are defined as financial or banking crises in Berger and Bouwman (2012).[9] Table 2, Panel D presents the results of this analysis. The first four columns show the relation between holdings of the top 3, 5, 7, and 10 institutions and stock volatility, respectively. Columns (5) to (8) use a sample that is restricted to the eight quarters in the 2008–2009 crisis period. We note that the association between ownership by large institutions and stock volatility is higher during crises and especially higher during the financial crisis of 2008. The magnitude of the coefficients during the 2008–2009 period is approximately double that presented in Panel A.

3.3 Identification

Stock ownership by large institutional investors may be endogenous with respect to volatility. In such a case, the association between large institutional investors and volatility may not reflect a causal relation. For example, one possible explanation for this correlation is that large institutional investors might prefer holding popular stocks, which exhibit large trading volume and volatility.

To identify a causal relation in which ownership by large institutional investors leads to an increase in stock volatility, we provide evidence from two distinct identification strategies. We first use an instrumental variable (IV) to exploit the result that institutional investors have a local bias and therefore have greater holdings in firms that are headquartered nearby (Coval and Moskowitz 1999, and Baik, Kang, and Kim 2010). Our second identification strategy relies on the mega-merger of two large institutions at the end of 2009, which led to the creation of an even-larger entity.

[9] These periods include: the stock market crash in the fourth quarter of 1987; the credit crunch from the first quarter of 1990 until the fourth quarter of 1992; the Russian debt and Long-Term Capital Management (LTCM) crisis in the third and fourth quarters of 1998; the dot-com bubble and the September 11 crisis, from the second quarter of 2000 until the third quarter of 2002; and the subprime lending crisis from the third quarter of 2007 until the fourth quarter of 2009.

3.3.1 Identification Strategy I: Local Bias

In our first identification strategy, we exploit the local bias of institutional investors. Coval and Moskowitz (1999) show that mutual funds overweight firms that are located closer to their headquarters. Confirming the local bias, Giannetti and Laeven (2015) find that during times of crisis, institutions are more likely to sell stocks of firms that are located far away. In particular, we follow Baik, Kang, and Kim (2010), who document that institutional investors hold larger stakes in firms that are headquartered in the same state. Large investors may tend to hold greater stakes in firms from the same state for several reasons. For example, it is possible that the clients of the institutional investors prefer local firms (e.g., due to political reasons). Other reasons could involve informational advantages, or governance and legal reasons. Irrespective of the motivation for the local bias, the common location of the top institution and the company's headquarters seems to drive the stock's volatility, especially in light of the fact that our top institutions are spread all over the country (see Appendix B).

We use a two-stage least squares (2SLS) framework for our test. The potentially endogenous regressor is the aggregate ownership by the Top X institutions. For each of these institutions, we construct an indicator for whether the institution and the firm are headquartered in the same state. Then, our instrument is the sum of this indicator across all the institutions among the Top X institutions (we label it "Same State Score"). The instrument can range between 0 and X. Except for the case of the top 3 institutions, it never occurs in our sample that all Top X managers have headquarters in the same state.

In the first stage, we regress the aggregate Top X institutions' holdings in stock *i* in quarter *q* on the instrument and controls, including time fixed effects:

$$TopXOwnership_{iq} = Same\ State\ Score_{i,q} + Controls_{i,q-1} + Time\ FE_q + \varepsilon_{iq} \quad (2)$$

The estimates of Equation (2) are reported in Table 3, Panel A. The coefficient on the instrument shows that, consistent with a local bias, institutional investors hold larger stakes in firms that are headquartered in the same state. The instrument is statistically significant with t-statistics ranging from 3.2 to 4.6. We also use an F-statistic, with degrees of freedom adjusted for clustering as in Kleibergen and Paap (2006), to test whether the instrument is weak. Staiger and Stock's (1997) rule of thumb suggests that instruments with values of F-statistic below 10 are

considered weak. The F-statistics, reported at the bottom of Panel A, range from 9.9 to 19.6; hence, most specifications pass the rule-of-thumb test. More formally, Stock and Yogo (2005) provide critical values for a weak instrument test based on maximum size distortion, using the same F-statistic. In the case of one endogenous regressor and one instrument, the critical values are 16.38, 8.96, 6.66, and 5.53, for maximum acceptable rejection rates of the null hypothesis of irrelevant instruments of 10%, 15%, 20%, and 25%, respectively. While in Columns (1) and (2), there may be a suspicion of weak instruments, in Columns (3) and (4), we are able to reject the null hypothesis at all critical values.

The second stage is a regression of stock volatility on the predicted holdings of the large institutions using the same controls as in the first stage:[10]

$$Volatility_{iq} = Instrumented\ TopXOwnership_{i,q-1} + Controls_{i,q-1} + Time\ FE_q + \varepsilon_{iq} \quad (3)$$

In all four specifications, the two-stage least-square coefficient on ownership by the top institutions is statistically significant. Under the assumption of a valid instrument, the coefficients measure the causal impact of ownership by top institutions on stock-level volatility. The IV estimates are larger than the OLS coefficients in Table 2 by almost two orders of magnitude. While the larger IV estimates can in general stem from a weak instrument, this concern seems less relevant for the specifications in Columns (3) and (4), for which the hypothesis of weak instruments is unambiguously rejected. Based on the slope in Column (4) of Panel B, Table 3, we infer that a 1 percentage point increase in ownership by the top ten institutions leads to an increase in daily volatility of about 28 basis points. Considering that average daily volatility is about 3.5%, the effect seems economically important.

The comparison between the OLS and IV estimates suggests a negative bias in the former. This bias can originate from the fact that the large institutions in our sample are sponsors of passive funds and ETFs that are benchmarked to major stock indexes. Index stocks, being larger, are on average less volatile. This channel introduces a negative correlation between

[10] The two-stage least-square estimates are obtained using Stata's ivreg2 command. Therefore, the standard errors are adjusted to take into account the generated regressor from the first stage. Also, as in the rest of our analysis, we cluster standard errors at the stock level.

ownership by large institutions and stock volatility. By exploiting exogenous variation in ownership induced by the local bias, we are able to filter out this negative correlation.

To be conservative in our inference on the magnitude of the effect of interest, we should allow for the possibility that the IV estimates measure a local average treatment effect (LATE, Imbens and Angrist 1994). Specifically, the estimated coefficient represents the average effect of an increase in top institutional ownership on the stocks that are held only because they are in the same state as the top institutions. These firms would not otherwise appear on the managers' radar screens. Hence, they are likely to be small stocks, for which the effect of interest is larger due to their illiquidity. If this argument is correct, the IV coefficients represent an upper bound for the effect of interest.

3.3.2 Identification Strategy II: Evidence from the 2009 Mega-Merger

Another way to test the idea that large institutional investors increase volatility is to compare the relation between institutional ownership and stock-level volatility before and after a major merger of institutional investors. If the size of the institutional investors affects the volatility of the stocks in their portfolios, holdings by the combined institution resulting from the merger should have a larger impact on volatility than holdings by the two separate institutions before the merger. The identifying assumption is that the merger is an exogenous event relative to the volatility of the stocks in the portfolios of the two original institutions.

If the large size of institutional investors is the cause of higher stock volatility, then breaking up large institutions into smaller units may lead to lower noise in stock prices. The analysis of this policy implication may be of particular interest to regulators. While a break-up of a large institution into smaller units is not present in our sample period, the causal interpretation of the merger event allows us to reverse the logic and address regulators' question.

We focus on the merger between two large institutional investors in December 2009. In the quarter preceding the merger, one firm held equities worth about $596bn (Top 1) while the other held equities worth about $156bn (Top 12). In December 2009, the combined entity was the largest institutional investor in the equity market, overseeing approximately $815bn worth of

equities. The merger caused the largest institutional investor to increase its asset holdings by 37% overnight.

Our specification resembles a difference-in-differences approach because we examine the effect on volatility of the combined stock-level ownership by the two institutions before and after the merger; after the merger, ownership is measured for the resulting institution. The main distinction from a difference-in-differences analysis is that we focus on the effect of a continuous variable (ownership by the merging institutions), as opposed to having treatment and control groups. We restrict our sample to windows of varying length, from one quarter through 8 quarters, after the merger event. The pre-merger window is set between 2009/Q1 and 2009/Q4 to avoid the confounding effect of the financial crisis. We use the following empirical specification:

$$Volatility_{iq} = CombinedOwnership_{i,q-1} \times PostMerger + CombinedOwnership_{i,q-1} + Controls_{i,q-1} + Time\ FE_q + Stock\ FE_i + \varepsilon_{iq}, \quad (4)$$

where *Combined Ownership* is the combined holdings of the merging firms in each stock-quarter before the merger, and the ownership of the resulting entity after the merger. The *Post-Merger dummy* is an indicator of whether the quarter is the first quarter of 2010 or later. The variable of interest, the interaction between *Combined Ownership* and *Post-Merger dummy*, captures the impact on volatility of ownership by the combined institution following the merger relative to the pre-merger effect of the two separate institutions. Under the assumption that the merger is exogenous with respect to stock-level volatility, the slope on the interaction measures the causal effect of the increase in institutional size on the slope for the combined ownership variable.

The results are reported in Table 4. As usual, standard errors are clustered at the stock level. The samples in Columns (1) through (8) include post-merger periods ranging from one to 8 quarters, respectively. The estimates show that the impact of ownership on volatility increases significantly following the merger. The coefficient on the interaction, which ranges from 3.0 to 4.8, can be interpreted as follows: a 1 percent increase in the ownership of the largest institution leads to an increase in daily volatility of 3 to 4.8 basis points for the combined entity (to be assessed against an average daily volatility of 3.3% during the period).

While the IV estimates in previous subsection are likely an upper bound for the effect of interest, due to the LATE interpretation, the results from the merger experiment possibly provide

a lower bound. The advantage of this experiment is that it allows us to compare the same stocks that are held by large institutions before and after an exogenous event (the merger). Hence, the estimates that we obtain are not specific to the stocks that are held merely because of the variation in the instrument. Rather, these estimates give the average effect across all the stocks in the portfolio of the merging institutions. On the other hand, the present analysis provides a lower bound for the effect of large institutional ownership because the slope on the interaction is net of the baseline coefficient, the slope on the *Combined Ownership* variable. The latter is potentially an endogenous variable in the regression. Hence, we cannot legitimately include it in the computation of the causal effect of large institutional ownership on volatility.

Finally, the persistence and stability of the effect across specifications allows us to rule out alternative explanations. In particular, there could be a concern that the event of the merger *per se* increases stock volatility, irrespective of the 'large-firm' effect that we aim to identify. For example, trading related to portfolio restructuring in the aftermath of the merger could lead to higher turnover and volatility. However, this alternative story would lead to a temporary effect that wears out as we extend the window. The estimates in Table 4, instead, suggest that the effect persists unabated for at least two years after the merger.

4. Good or Bad Volatility?

After showing that large institutional investors cause higher volatility in stocks, we next explore the nature of the increase in volatility. In particular, higher volatility may reflect greater informational content in returns, which is a desirable effect, or it may indicate that stock returns are noisier, which is a negative consequence of large institutions' ownership. We provide two sets of results showing that at least part of the increase in volatility is related to greater noise in prices. First, we show that the autocorrelation of returns is higher for stocks that are held by large institutional investors. Second, we present evidence that stocks with common ownership by large institutions display abnormal co-movement.

4.1 Daily Return Autocorrelation

The first test looks at the relation between daily return autocorrelation and ownership by large institutional investors. In an efficient market, returns are unpredictable on short horizons and, importantly, are not autocorrelated. Thus, a finding that autocorrelation increases with ownership of large institutional investors will constitute evidence of heightened price inefficiency.

Our test repeats the base specification. However, instead of using volatility as the dependent variable, we compute a measure of return autocorrelation. Specifically, we use DGTW-adjusted returns (Daniel, Grinblatt, Titman, and Wermers, 1997) to calculate daily autocorrelation of a stock within the quarter. Then, we take the absolute value of each autocorrelation coefficient and use it as the dependent variable.

Table 5 shows the results, which indicate that stocks owned by the largest institutions have significantly higher absolute return autocorrelation. The effect is statistically significant for the top ten institutions (Columns (1) to (4)), halved in magnitude for institutions ranked 11 to 20 (Column (5)), and not distinguishable from zero for institutions ranked 21 to 50 (Columns (6) and (7)). A one standard deviation increase in the ownership by the top three institutions is associated with an increase of 9.1% of a standard deviation of the autocorrelation coefficient.[11]

Overall, the results suggest that stocks with higher ownership by top institutions exhibit more noise in their prices than other stocks, controlling for ownership by all institutions. This evidence motivates us to interpret the positive impact of large institutions' ownership on volatility as due to noise, at least in part.

4.2 Co-movement with Large Institutions' Portfolios

Another way to detect noise in prices induced by large institutions is to look at the co-movement of individual stocks with the other stocks in the portfolios of the top institutions. If large institutions impound non-diversifiable shocks into prices, stocks in the same institutional portfolio should co-move beyond the correlation arising from standard factors. The literature has shown convincingly that common institutional ownership modifies the correlation structure of

[11] From Table 1, Panel A: 0.101 * 0.265 / 0.294 = 0.091.

returns (Greenwood and Thesmar 2011, Anton and Polk 2014). Here, we ask whether this effect extends to ownership by large institutions.

For each stock-quarter, we compute the beta of the daily returns of the stock with respect to the returns of the top institution's portfolio (excluding the stock itself) within the quarter. Then, we regress this beta on ownership by the large institution while controlling for the factor loadings on the Fama and French (1993) factors and the Carhart (1997) momentum factor, also estimated within the quarter from daily returns. Besides time effects, we also include stock fixed effects in the regression. This choice allows us to control for the possibility that institutions prefer stocks with similar characteristics that load on the same industry factors (Daniel and Titman 1997)

In Table 6, the results show unambiguously that the co-movement of stocks with the institutional portfolio increases with the institution's ownership in the stock. This finding is consistent with prior evidence in the literature. However, we further note that the effect is larger for larger institutions (compare Top 1 through Top 5 with Top 6 through Top 10). This fact suggests that large institutions impound noise into prices at a greater rate than other institutions, consistent with the hypothesis that the shocks originating from large investors are less diversifiable than other idiosyncratic shocks. In this sense, our findings extend the prior literature. For the purposes of the main question in the paper, the evidence corroborates the view that idiosyncratic shocks spill over from large institutions to asset prices.

5 Exploring the Granularity of Large Institutions

The main thesis of this study is that idiosyncratic events at large institutions lead to trades in the portfolio securities, which, because of their sheer size, cannot be diversified away. In this section, we explore the necessary components of this proposed mechanism. We present three main tests. First, we show that institution-level news (proxied for by changes in CDS prices) magnify the impact of large institutions' ownership on stock volatility. Second, we show that large institutions make trades that are on average larger than those of a randomly drawn collection of small institutions with a similar total size. Finally, we show that the extent of concentration of large institutions' trades, relative to other institutions' trades, is able to explain a significant part the effect of large institutions' ownership on stock volatility.

5.1 Institution-Specific News

Our first test examines the effect of institution-level news on the volatility of the underlying securities. In this analysis, we obtain 5-year CDS spreads from Markit for the years 2001–2014.[12] Markit provides good quality CDS pricing data on approximately 3,000 individual entities dating back to 2001. A CDS contract represents insurance against the default of an entity. The annual payment of such a contract represents the CDS spread and is expressed as a percentage of the value of the contract. Therefore, CDS spreads provide a direct measure of the credit risk for the underlying entity. Additionally, recent empirical evidence suggest that CDS spreads are a superior and more timely measure of credit risk than the bond or stock market indicators, and that they lead the bond market in terms of price discovery (Jorion and Zhang 2007, Blanco, Brennan, and Marsh 2005, and Zhu 2006).

We manually match large institutions to the database and compute the change in CDS prices within each quarter. We keep only CDS quotes for US dollar denominated senior unsecured debt with a modified restructuring (MR) clause. The matched dataset is limited to institutional investors with publicly traded bond issues that have CDS contracts written on their debt securities. An increase in the CDS spread of a particular institution reflects an increase in the perceived risk of default by market participants. Hence, we can examine the effects of a negative credit risk event on the underlying stocks held by a large institution.

The regression specification is

$$Volatility_{it} = TopXOwnership_{i,t-1} \times \Delta CDS_{i,t} + TopXOwnership_{i,t-1} + \Delta CDS_{i,t} + Controls_{i,t-1} + Time\ FE_t + Stock\ FE_i + \varepsilon_{it}. \quad (4)$$

The variable of interest is the interaction between the holdings of the large institutional investors and the contemporaneous change in CDS spread. We take the average change in the CDS spread across the Top X institutions, with X equal to 3, 5, 7, and 10.

[12] Markit receives contributed CDS data from market makers' official books and records, which undergo rigorous data cleaning to ensure that only the highest quality data is used in forming composite prices. We use the 5-year CDS spreads as, according to Jorion and Zhang (2007), they are the most liquid contracts and "constitute over 85% of the entire CDS market."

Table 7 reports the results of this test for the groupings of the top 3, 5, 7, and 10 large institutions. In all columns, the interaction is positive and statistically different from zero. As for the magnitude, from Column (4), a 1% increase in the CDS spread doubles the main effect of ownership on volatility (i.e., 0.01 * 73.313 = 0.733, which is in the same ballpark as 0.690, the baseline effect). In unreported analysis, we estimated specifications that include interactions of the *Top X ownership* variable with time dummies, and the effects of interest survive. The goal of these alternative specifications is to address the concern that the changes in the CDS spread correlate with crisis periods, when the effect of interest is more pronounced (see Table 2, Panel D).

Overall, we take this evidence as a corroboration of the view that institution specific events, here proxied by the change in the CDS spread, are the trigger of the effect of large institutional ownership on stock-level volatility.

5.2 The Distribution of Trade Size

The second direction in which we explore the granularity hypothesis is meant to shed light on the channel of propagation of idiosyncratic institutional shocks to asset prices. Like other investors, large institutions trade in response to a variety of events: investors' flows, portfolio rebalancing, changes in investment strategies, computer glitches, etc. However, due to their larger portfolios, large institutions are likely to place orders that have a bigger price impact. We recognize that a large institution is a collection of different units, which operate autonomously. If these divisions traded completely independently, the effect of their trades on prices would be as likely to be diversified as that of the trades from separate institutions. The granularity hypothesis, therefore, amounts to the assumption that there is some positive correlation in the way the units within a large institution trade. This correlation can arise either because there are institution-level investment directives (e.g., a centralized risk management policy), or because the trades are triggered by institution-wide shocks (e.g., the departure of the CEO).

To test this conjecture, we conduct an analysis that compares the large institutional investors to synthetic institutions made up of independent smaller organizations. We focus on the ten largest institutions in each quarter. For each large institution in a given quarter (called here

the "original institution"), we generate a sample of 99 synthetic institutions. Each synthetic institution results from pooling together institutions that rank below the 10th institution. These component institutions are randomly drawn without replacement until the dollar value of the equity holdings of the original institution is matched.[13] The purpose of constructing a synthetic institution of similar size as the original institution is to filter out the scale effect originating from the large portfolio, while testing whether the trades of the different units that compose a large institution are more correlated among them than the trades of separate institutions (i.e., the granularity hypothesis).

For each stock-quarter, a synthetic institution's trade results from the sum of the trades of the component institutions. A quarterly trade for a given institution in a given stock is the change in the number of split-adjusted shares reported in the 13F filings of two consecutive quarters. It can happen that the component institutions' trades are in opposite directions, so that the resulting synthetic trade is close to zero. If granularity is present, we should expect the large institutions' trades to rank systematically higher than the trades of the synthetic institutions. In comparing the size of trades across institutions, we focus on the absolute value of the trades, because both buys and sells can cause price pressure and volatility.

We construct a stock-quarter indicator for whether the original institution's trade is above a given percentile of the distribution of the synthetic institutions' trades. For each top-ten institution, Table 8, Panel A, reports the average across stocks and quarters of this indicator for the 50th, 90th, 95th, and 99th percentiles. In case there is no granularity, we should not observe a disproportionate fraction of large institutions' trades above the cutoff. Instead, the panel shows that the distribution of the original institution's trades has fatter tails than the synthetic institutions' trades. On average, 58.1% of trades by the original institution are larger than the trades placed by 50% of the synthetic institutions. Moreover, 17.0% of the trades are larger than 90% of the synthetic institutions' trades; 9.9% of trades are larger than the 95th percentile; and 3.9% of trades are larger than the 99th percentile. All results are statistically different from the percentages expected if the distributions were the same for the original and synthetic institutions (i.e., we would expect 50% of trades above the 50th percentile, 10% above the 90th percentile,

[13] We add a fraction of the last institution drawn to make sure that we match exactly the total dollar value of the equity holdings of the random sample to that of the large institution.

and so on). The evidence is strongly consistent with the conjecture that large institutions trade in a more correlated way than a collection of random institutions of similar size.

To assess the relevance of this result in recent periods, it is important to study the behavior of large institutional investors over time. To do this, we average the indicator of relative trade size across top institutions in a given year, and plot the time series in Figure 2. Each solid line in the figure describes the percentage of trades of large institutions that are above a certain cutoff. The dashed lines with colors corresponding to the solid lines provide the value that is expected if the distribution of the original institutions' trades is the same as the distribution of the synthetic trades (i.e., if there is no granularity). For example, the red solid line describes the percentage of trades by large institutions that are above the 99th percentile, while the red dashed line gives marks the 0.01 level. The scale of the graph is logarithmic to improve legibility. As the chart shows, at the beginning of the sample (1980), trades by large institutions were highly granular: 13% of large institutions' trades were larger than that the 99th percentile of synthetic institutions. Over time, large institutions reduced their granularity: in 2014, only 41% of large institutions' trades are larger than the trades in the 50th percentile of synthetic institutions. Possibly, over time large institutions have learnt to internalize their price impact, as suggested by Koijen and Yogo (2015). Yet, if we focus on the extreme percentiles, we still find significant evidence of trade granularity even at the end of the sample.

5.3 The Impact of Large Trades on Stock Volatility

Finally, we link the evidence of granularity of large institutions' trades to the effect of large institutions on volatility that we present in the prior sections. To this purpose, we construct a score of trade granularity as the rank of the original institutions' trade in the distribution of synthetic institutions' trades for each stock-quarter, and average it across the top X institutions (the rank ranges from 0 to 1). Then, we modify the base regression in Equation (1) by adding the stock-quarter score of trade granularity:

$$Volatility_{iq} = TopXOwnership_{i,q-1} + TradeGranularityScore_{t,i}$$
$$+Controls_{i,q-1} + Time\ FE_q + Stock\ FE_i + \varepsilon_{iq} \quad (5)$$

Note that, because the score is a relative ranking measure within a given stock-quarter, it is not contaminated by time-variation in the size of the trades or the liquidity of the stocks.

The regression results are presented in Table 8, Panel B. Columns (1) through (4) show the base regressions for the sample of stocks that are included in our analysis, that is, those with non-zero trades in a given quarter by at least one institution (the results should be compared to Panel B, Table 2, for which the sample includes all stocks). The variable of interest is *Top X ownership*. Stock volatility increases with ownership by large institutions and the magnitude of the coefficients is very close to those in Table 2, Panel B. The notable results are in Columns (5) to (8), where we add the trade granularity score. The coefficient on *Top X ownership* declines by about 40%. This evidence provides a strong indication that trade granularity is the channel through which large institutions affect volatility.

Because the landscape of the asset management world is constantly changing, and given the debate about the need to regulate large non-bank, non-insurer financial institutions, it is important to repeat this test in different sample periods. In Table 8, Panel C, we examine three recent sub-periods (2000–2007, 2008–2009, and 2010–2014). The results echo the same message: granular trades by large institutions are an important driver of stock volatility. The effect persists even in the most recent sample (2010–2014).

6 Conclusion

In this study, we provide novel evidence that large asset managers have a positive causal impact on the volatility of the securities in which they invest. The result is economically significant and robust in different specifications and subsamples, including the more recent ones. This finding is not exclusively the desirable outcome of greater information production or faster price discovery. Indeed, the presence of large institutions correlates with lower price efficiency, as the stocks in which they trade have higher return autocorrelation. Similarly, the stocks in the portfolios of large institutions display abnormal return co-movement.

In studying the origins of this effect, we show that the impact of large institutions on volatility occurs in combination with institution-specific shocks, as measured by changes in CDS prices. This finding suggests that institution-specific shocks spill over to the prices of the

securities in the large managers' portfolios. Moreover, we identify a channel for the transmission of these shocks in the granular nature of large asset managers' trades (Gabaix 2011). Specifically, we find that large institutions' trades are on average less diversified than the trades of a control group of smaller institutions, so that they are likely to cause larger price pressure. While large firms' trades have become less granular over time, the effect of interest remains significant even in the latest years of the sample.

We believe that these results are informative for regulators. From a microprudential perspective, large institutional investors create adverse spillovers on other institutions' balance sheets through the volatility created by the granular nature of their trades. From a macroprudential perspective, large institutional investors are more likely to destabilize financial markets than a set of small institutions that trade in a less correlated way. This conclusion is especially relevant at times of financial crisis, when the effect that we document doubles, as in the case of the 2008–2009 crisis. Any policy prescription cannot, however, overlook the broader role played by large institutions in terms of savings due to economies of scale, information production, corporate governance, and liquidity provision. These other dimensions deserve further investigation before a verdict can be reached on the impact of large financial institutions on financial markets.

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Appendix A. Variable Definitions

Variable	Description	Source
Daily volatility	Standard deviation of daily stock log returns within the quarter month.	CRSP
log(market cap)	The logged market capitalization of the stock (in $ millions) at the end of the month.	CRSP
1/Price	The inverse of the nominal share price at the end of the month.	CRSP
Amihud ratio	Absolute return scaled by daily dollar volume in $million, average within the quarter. Based on Amihud (2002).	CRSP
Top X ownership	The % ownership of the large institution. Computed the number of shares owned at the end of the quarter divided by the number of share outstanding.	13F, CRSP
Ownership by all institutions	The % ownership by all institutions. Computed the total number of shares owned by all 13F institutional managers at the end of the quarter divided by the number of share outstanding.	13F, CRSP
Past 6-month return (q-3 to q-1)	The stock's 6-month momentum return over the two quarters prior to analysis	CRSP
Book-to-market (q-1)	The stock's book value of equity relative to market value of equity	CRSP, Compustat
Ownership by bottom institutions	Institutional ownership of the set of smallest institutions that have equal aggregate equity holdings to the Top 10 institutions	13F
Same state dummy	An indicator to whether the headquarters of the firm and the headquarters of the institutional investor are in the same state within the U.S.	Compustat, 13F
Combined ownership	Ownership of the large institution which was the result of the 2009 Mega-merger	13F
Post-merger dummy	An indicator to whether the quarter in consideration is in 2010/Q1 or later.	-
ABS(ρ(DGTW-adjusted returns(t, t-1)))	The absolute value of the daily autocorrelation in stock benchmark-adjusted returns (adjusted to DGTW portfolio returns).	CRSP
Beta of daily returns with those of Top X portfolio	Sensitivity of the stock's daily returns to the portfolio of the Top X large institutional investors, net of the holdings of the stock.	CRSP, 13F
$Beta_{MKT}$	Sensitivity of the stock's daily returns to the Fama-French (1993) market factor.	CRSP, French's website
$Beta_{SMB}$	Sensitivity of the stock's daily returns to the Fama-French (1993) SMB factor.	CRSP, French's website
$Beta_{HML}$	Sensitivity of the stock's daily returns to the Fama-French (1993) HML factor.	CRSP, French's website
$Beta_{UMD}$	Sensitivity of the stock's daily returns to the Carhart (1997) Momentum factor.	CRSP, French's website
ΔCDS	Quarter-over-quarter change in the 5-year CDS spread of large institutional investors.	Markit
Trade granularity score	For each large institutional investor, in each calendar quarter, we created 99 synthetic institutional investors made up from institutions that are not in the top ten largest institutions. Each of the synthetic institution has the same equity holdings at the end of the previous quarter as the original institution. Then, we sort the absolute net trades 100 institutions for each stock (99 synthetic institutions and one original institution), and record the percentile in which the original institution is within the group. Stock-quarter-institutions in which there was no trade by the institution are excluded; thus, the analysis is conditioned on the large institution trading. We perform this exercise for the largest ten institutions for each quarter.	13F

Appendix B. Top Institutional Investors

This table presents a listing of all of the institutional investors that comprise our sample. *First Quarter* and *Last Quarter* define the first and last quarter in which the firm is part of the sample, respectively. *Average Long Equity Assets* is the average assets managed by the institution over the time that the institution is in our sample, defined in 2014 dollars. *Average Quarterly Turnover* measures the percentage of assets under management that are bought and sold within the average quarter. Lastly, *Top Rank* is the average ranking of the firm's size relative to all other institutional investors while it is a member of our sample.

13F Institution Name	13F Institution Number	Zip Code	State	Number of Quarters	First Quarter	Last Quarter	Avg Long Equity Assets ($m)	Avg Quarterly Turnover	Top Rank
Bzw Barclays Glbl Invts	92040	94105	CA	24	6-1990	3-1996	$72,401.27	2.94%	1.3
Blackrock Inc	9385	94105	CA	11	12-2010	9-2013	$710,435.63	3.78%	1.4
Barclays Bank Plc	7900	94104	CA	50	3-1997	9-2009	$461,530.10	5.26%	1.6
Fidelity Mgmt & Research Co	27800	02109	MA	91	12-1991	6-2014	$397,565.19	13.29%	2
Fmr Corp	26590	02109	MA	20	3-1986	12-1990	$24,808.76	21.02%	3.6
Bankers Tr N Y Corp (Deutsche Bk	7800	10017	NY	93	3-1980	6-2005	$71,431.35	6.00%	3.8
State Str Corporation	81540	02111	MA	97	6-1988	6-2014	$313,848.92	4.21%	4.1
Vanguard Group, Inc.	90457	19482	PA	62	3-1999	6-2014	$425,072.42	2.49%	4.5
Prudential Ins Co/Amer	72280	07102	NJ	15	3-1980	9-1983	$6,322.04	11.11%	4.7
College Retire Equities	18265	10017	NY	74	3-1980	6-1998	$30,415.48	4.76%	4.7
Wells Fargo Bank N.A.	92035	94104	CA	35	6-1980	3-1990	$20,328.29	4.21%	4.7
Capital Research & Mgmt Co	12740	90071	CA	69	9-1990	9-2007	$186,198.48	8.83%	5
Manufacturers Natl	53690	48226	MI	1	3-1980	3-1980	$3,931.77	.	5
Batterymarch Finl Mgmt	8190	02116	MA	13	12-1981	12-1985	$8,415.31	10.85%	5.5
Capital World Investors	11836	90071	CA	27	12-2007	6-2014	$277,070.53	8.17%	5.6
Equitable Companies Inc (Axa)	25610	10014	NY	63	6-1994	3-2010	$188,741.35	13.08%	6.1
Citicorp	16260	10022	NY	28	3-1980	3-1988	$8,089.42	13.43%	6.3
Jpmorgan Chase & Company	58835	10017	NY	72	3-1980	3-2014	$47,718.42	11.56%	6.3
Donaldson Lufkin & Jen	23375	10172	NY	13	12-1982	12-1985	$9,400.29	21.26%	6.4
Alliance Capital Mgmt	1250	10105	NY	27	12-1986	6-1993	$20,505.82	14.40%	6.5
T. Rowe Price Associates, Inc.	71110	21202	MD	40	3-1980	6-2014	$191,393.98	9.23%	6.6
Mellon National Corp (Mellon Bank)	55390	15219	PA	118	3-1980	12-2013	$117,863.82	7.74%	6.7
Putnam Investment Mgmt, L.L.C.	72400	02266	MA	40	9-1980	9-2003	$121,156.99	16.27%	7.3
First Interstate Bancorp	29800	90017	CA	17	6-1981	3-1987	$10,284.75	8.63%	7.5
Sarofim Fayez	76045	77010	TX	10	12-1980	3-1983	$5,331.44	5.54%	7.7
State Street Resr & Mgmt	81575	02111	MA	12	6-1982	3-1985	$6,947.09	8.97%	7.9
New York St Common Ret.	63850	10038	NY	27	12-1986	3-1994	$18,887.11	3.98%	8.1
Capital Research Gbl Investors	11835	90071	CA	22	12-2007	6-2014	$219,362.06	8.81%	8.2
Calif Public Emp. Ret.	12000	95811	CA	4	12-1988	9-1989	$15,360.45	8.44%	8.3
Wellington Management Co, Llp	91910	02210	MA	93	6-1985	6-2014	$143,576.97	11.71%	8.3
Harris Trust & Sav Bank	43680	60640	IL	3	3-1980	9-1980	$4,188.83	9.35%	8.7
Janus Capital Corporation	48170	80206	CO	5	3-2000	3-2001	$185,674.99	16.64%	8.8
Msdw & Company	58950	10036	NY	20	12-1997	3-2011	$167,649.99	10.54%	9.3
Travelers (Citigroup Inc)	84900	55102 (10022)	MN (NY)	17	6-1996	9-2005	$136,146.07	10.60%	9.4
Legg Mason Inc	50160	21202	MD	4	9-2006	6-2007	$197,726.63	7.90%	9.5
Northern Trust Corp	65260	60603	IL	18	12-2003	6-2014	$200,789.09	3.08%	9.7
Calif Public Empl Retirm	12090	95811	CA	1	9-1986	9-1986	$10,598.98	5.40%	10
Chase Manhattan Corp	15230	10017	NY	2	3-1980	6-1980	$3,849.58	5.79%	10
Goldman Sachs & Company	41260	10282	NY	1	9-2007	9-2007	$228,626.59	18.64%	10

Table 1. Summary Statistics

This table presents summary statistics for key variables used in the analysis. Panel A presents the characteristics of the stocks we study. Panel B presents the mean and standard deviations of institution-level characteristics for the top one through top ten largest institutions in each quarter as well as for various groups of large institutions collectively. Finally, Panel C presents, by index, the proportion of stocks held by large institutions for the top one through top ten institutions individually as well as for various groups of large institutions collectively. The sample period is 1980/Q1–2014/Q1. Data are reported quarterly.

Panel A: Summary Statistics of Regression Variables

	N	Mean	Std Dev	Min	p25	Median	p75	Max
Daily volatility (%)	624,296	3.556	2.563	0.208	1.865	2.831	4.399	24.523
ABS(ρ(DGTW-adj ret(t, t-1)))	562,013	0.338	0.274	0.000	0.124	0.270	0.485	1.461
Ownership by all institutions (q-1)	624,296	0.364	0.294	0.000	0.103	0.302	0.588	1.285
1 / price (q-1)	624,296	0.249	0.613	0.006	0.039	0.077	0.199	10.442
Amihud illiquidity (q-1)	624,296	0.375	0.595	0.000	0.007	0.086	0.502	4.330
log(market cap) (q-1)	624,296	5.128	2.052	0.424	3.595	4.967	6.528	11.236
Past 6-month return (q-3 to q-1)	624,296	0.068	0.426	-0.939	-0.162	0.029	0.227	8.143
Book-to-market (q-1)	624,296	0.756	0.661	-0.029	0.338	0.599	0.968	10.313
Ownership by bottom institutions	624,296	0.016	0.031	0.000	0.000	0.005	0.017	0.284
2009 Mega-Merger								
Daily volatility (%)	44,322	3.297	1.965	0.208	1.993	2.842	4.021	16.062
Combined ownership (q-1)	44,322	0.036	0.026	0.000	0.010	0.039	0.054	0.675

Panel B: Characteristics of Large Institutions

	TopX ownership		Same state		ΔCDS		Beta		Trade granularity	
	N = 624,296		N = 600,649		N = 225,505		N = 617,884		N = 596,378	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Top 1	0.017	0.025					0.640	0.714		
Top 2	0.013	0.022					0.627	0.721		
Top 3	0.007	0.014					0.625	0.730		
Top 4	0.007	0.017					0.602	0.724		
Top 5	0.006	0.013					0.591	0.715		
Top 6	0.005	0.012					0.581	0.716		
Top 7	0.005	0.014					0.573	0.719		
Top 8	0.004	0.011					0.571	0.723		
Top 9	0.005	0.012					0.570	0.729		
Top 10	0.005	0.012					0.565	0.730		
Top 3 insts	0.037	0.045	0.286	0.581	0.000	0.003			0.272	0.227
Top 5 insts	0.050	0.060	0.450	0.800	0.000	0.002			0.249	0.191
Top 7 insts	0.060	0.070	0.612	1.030	0.000	0.002			0.231	0.171
Top 10 insts	0.073	0.082	0.845	1.340	0.000	0.002			0.226	0.161
Top 11-Top 20	0.032	0.045								
Top 21-Top 30	0.020	0.032								
Top 30-Top 50	0.027	0.039								

Table 1. Summary Statistics (Cont.)

Panel C: Stock Ownership by Large Institutions, by Index

	All stocks		S&P 500		Russell 1000		Russell 2000		Russell 3000	
	Top X ownership (%)	Top X (0/1)	Top X ownership (%)	Top X (0/1)	Top X ownership (%)	Top X (0/1)	Top X ownership (%)	Top X (0/1)	Top X ownership (%)	Top X (0/1)
Top 1	0.017	0.615	0.029	0.969	0.027	0.935	0.022	0.736	0.024	0.805
Top 2	0.013	0.649	0.025	0.971	0.022	0.941	0.018	0.757	0.019	0.821
Top 3	0.007	0.479	0.021	0.908	0.016	0.854	0.009	0.668	0.011	0.733
Top 4	0.007	0.474	0.017	0.883	0.015	0.814	0.009	0.590	0.011	0.669
Top 5	0.006	0.388	0.015	0.847	0.013	0.769	0.007	0.457	0.009	0.567
Top 6	0.005	0.390	0.012	0.845	0.010	0.766	0.005	0.448	0.007	0.560
Top 7	0.005	0.347	0.011	0.838	0.010	0.741	0.006	0.377	0.007	0.505
Top 8	0.004	0.402	0.010	0.855	0.009	0.770	0.005	0.464	0.006	0.572
Top 9	0.005	0.416	0.010	0.830	0.008	0.760	0.006	0.500	0.007	0.591
Top 10	0.005	0.414	0.009	0.836	0.008	0.764	0.006	0.497	0.006	0.590
Top 3 insts	0.037	0.803	0.075	0.991	0.065	0.985	0.049	0.904	0.055	0.932
Top 5 insts	0.050	0.835	0.107	0.995	0.092	0.991	0.065	0.927	0.074	0.949
Top 7 insts	0.060	0.858	0.130	0.996	0.112	0.994	0.076	0.938	0.089	0.958
Top 10 insts	0.073	0.883	0.159	0.998	0.137	0.996	0.093	0.951	0.108	0.967

Table 2. Ownership of Large Asset Managers and Stock Volatility

This table presents Ordinary Least Squares (OLS) regression results. In Panels A–E, the dependent variable is the stock's *Daily volatility*. *Daily volatility* is computed from daily returns during quarter q. All independent variables are measured during quarter q-1. Panel A uses the *Ownership* of the largest institutional investors in a given stock as the key independent variable. Panel B replicates the analysis and adds stock fixed effects. Panel C replaces the Ownership of large institutions with a dummy variable indicating whether the large institution holds a given stock. Lastly, Panel D restricts the sample to only S&P 500 stocks, and Panel E focuses on financial crises. The sample period is 1980/Q1–2014/Q1. Appendix A provides variable description. t-statistics based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Ownership by Large Asset Managers and Daily Volatility

Dependent variable:	Daily volatility (q) (%)						
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts	Top 11-Top 20	Top 21-Top 30	Top 30-Top 50
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Top X ownership (q-1)	0.422***	0.586***	0.609***	0.550***	0.563***	0.229***	0.201***
	(6.25)	(10.55)	(12.30)	(12.39)	(8.81)	(3.17)	(3.29)
Daily volatility (q-1)	0.689***	0.689***	0.689***	0.689***	0.689***	0.689***	0.689***
	(282.78)	(282.67)	(282.68)	(282.70)	(282.72)	(282.73)	(282.72)
Ownership by all institutions (q-1)	0.152***	0.119***	0.101***	0.090***	0.137***	0.177***	0.176***
	(10.66)	(8.17)	(6.80)	(5.80)	(9.83)	(13.22)	(12.90)
1 / price (q-1)	0.295***	0.294***	0.294***	0.294***	0.294***	0.295***	0.295***
	(26.50)	(26.44)	(26.38)	(26.38)	(26.44)	(26.52)	(26.52)
Amihud illiquidity (q-1)	0.364***	0.362***	0.361***	0.360***	0.361***	0.363***	0.363***
	(40.72)	(40.54)	(40.36)	(40.25)	(40.35)	(40.66)	(40.64)
log(market cap) (q-1)	-0.120***	-0.122***	-0.123***	-0.123***	-0.121***	-0.119***	-0.119***
	(-50.61)	(-51.01)	(-51.32)	(-51.53)	(-50.54)	(-50.17)	(-50.10)
Past 6-month return (q-3 to q-1)	-0.255***	-0.254***	-0.254***	-0.253***	-0.253***	-0.255***	-0.255***
	(-36.27)	(-36.20)	(-36.13)	(-36.06)	(-36.05)	(-36.28)	(-36.24)
Book-to-market (q-1)	-0.175***	-0.175***	-0.175***	-0.175***	-0.175***	-0.175***	-0.175***
	(-29.18)	(-29.17)	(-29.14)	(-29.08)	(-29.11)	(-29.20)	(-29.21)
Ownership by bottom institutions	-0.509***	-0.439***	-0.409***	-0.394***	-0.496***	-0.562***	-0.560***
	(-6.07)	(-5.22)	(-4.87)	(-4.67)	(-5.96)	(-6.77)	(-6.75)
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	624,295	624,295	624,295	624,295	624,295	624,295	624,295
Adj R^2	0.683	0.684	0.684	0.684	0.683	0.683	0.683

Table 2. Ownership of Large Asset Managers and Stock Volatility (Cont.)

Panel B: Ownership by Large Asset Managers and Daily Volatility, with Stock Fixed Effects

Dependent variable:	Daily volatility (q) (%)						
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts	Top 11-Top 20	Top 21-Top 30	Top 30-Top 50
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Top X ownership (q-1)	0.755***	0.842***	0.897***	0.785***	0.993***	0.523***	-0.018
	(5.06)	(6.58)	(7.86)	(7.53)	(8.10)	(3.80)	(-0.16)
Ownership by all institutions (q-1)	0.154***	0.124***	0.096**	0.085**	0.128***	0.189***	0.221***
	(3.71)	(2.98)	(2.28)	(1.99)	(3.00)	(4.53)	(5.24)
1 / price (q-1)	0.597***	0.596***	0.596***	0.596***	0.596***	0.596***	0.597***
	(21.27)	(21.26)	(21.23)	(21.24)	(21.26)	(21.28)	(21.29)
Amihud illiquidity (q-1)	1.499***	1.497***	1.496***	1.495***	1.496***	1.499***	1.499***
	(66.70)	(66.58)	(66.51)	(66.43)	(66.55)	(66.70)	(66.71)
log(market cap) (q-1)	-0.284***	-0.287***	-0.289***	-0.289***	-0.284***	-0.282***	-0.281***
	(-26.86)	(-27.01)	(-27.17)	(-27.21)	(-26.98)	(-26.72)	(-26.69)
Past 6-month return (q-3 to q-1)	-0.108***	-0.107***	-0.106***	-0.105***	-0.106***	-0.109***	-0.109***
	(-12.08)	(-11.97)	(-11.88)	(-11.79)	(-11.88)	(-12.15)	(-12.17)
Book-to-market (q-1)	0.002	0.001	0.002	0.002	0.003	0.002	0.003
	(0.14)	(0.10)	(0.12)	(0.14)	(0.22)	(0.15)	(0.19)
Ownership by bottom institutions	-1.637***	-1.575***	-1.533***	-1.521***	-1.615***	-1.708***	-1.738***
	(-8.68)	(-8.34)	(-8.12)	(-8.06)	(-8.54)	(-9.04)	(-9.19)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	624,296	624,296	624,296	624,296	624,296	624,296	624,296
Adj R^2	0.672	0.672	0.672	0.672	0.672	0.672	0.672

Table 2. Ownership of Large Asset Managers and Stock Volatility (Cont.)

Panel C: Ownership by Large Asset Managers and Daily Volatility, S&P 500 Stocks

Dependent variable:	Daily volatility (q) (%)						
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts	Top 11-Top 20	Top 21-Top 30	Top 30-Top 50
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Top X ownership (q-1)	0.910***	0.973***	1.042***	0.823***	0.216	-0.113	-0.718***
	(3.55)	(4.58)	(5.40)	(4.55)	(1.22)	(-0.52)	(-4.13)
Ownership by all institutions (q-1)	-0.065	-0.112	-0.157*	-0.154*	-0.009	0.027	0.094
	(-0.74)	(-1.25)	(-1.76)	(-1.69)	(-0.10)	(0.31)	(1.10)
1 / price (q-1)	5.476***	5.473***	5.472***	5.486***	5.508***	5.511***	5.508***
	(11.31)	(11.36)	(11.39)	(11.40)	(11.33)	(11.32)	(11.32)
Amihud illiquidity (q-1)	0.263	0.254	0.236	0.229	0.247	0.251	0.253
	(0.92)	(0.89)	(0.83)	(0.80)	(0.87)	(0.88)	(0.89)
log(market cap) (q-1)	-0.074***	-0.076***	-0.078***	-0.078***	-0.073***	-0.073***	-0.072***
	(-3.00)	(-3.09)	(-3.18)	(-3.18)	(-2.99)	(-2.96)	(-2.93)
Past 6-month return (q-3 to q-1)	-0.140***	-0.140***	-0.139***	-0.135***	-0.131***	-0.132***	-0.137***
	(-4.78)	(-4.81)	(-4.77)	(-4.65)	(-4.49)	(-4.55)	(-4.74)
Book-to-market (q-1)	0.052	0.051	0.053	0.053	0.051	0.052	0.054
	(1.45)	(1.44)	(1.48)	(1.49)	(1.44)	(1.44)	(1.53)
Ownership by bottom institutions	-0.967	-0.793	-0.627	-0.661	-1.031	-1.126	-1.263
	(-0.76)	(-0.63)	(-0.49)	(-0.52)	(-0.81)	(-0.89)	(-1.00)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	65,405	65,405	65,405	65,405	65,405	65,405	65,405
Adj R^2	0.624	0.624	0.624	0.624	0.623	0.623	0.624

Table 2. Ownership of Large Asset Managers and Stock Volatility (Cont.)

Panel D: Ownership by Large Asset Managers and Daily Volatility, during Crises

Dependent variable:	Daily volatility (q) (%)							
Sample:	All Crises				2008-2009			
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top X ownership (q-1)	0.943***	1.207***	1.365***	1.134***	2.032***	1.798***	1.856***	0.640*
	(2.78)	(4.11)	(5.25)	(5.05)	(4.13)	(4.11)	(5.03)	(1.85)
Ownership by all institutions (q-1)	0.396***	0.340***	0.291***	0.279***	0.729***	0.689***	0.628***	0.803***
	(4.36)	(3.72)	(3.17)	(3.00)	(3.84)	(3.56)	(3.22)	(4.01)
1 / price (q-1)	0.462***	0.462***	0.462***	0.462***	0.091	0.091	0.091	0.090
	(11.99)	(11.98)	(11.97)	(11.97)	(1.56)	(1.55)	(1.55)	(1.53)
Amihud illiquidity (q-1)	1.401***	1.400***	1.398***	1.397***	0.989***	0.988***	0.989***	0.982***
	(42.29)	(42.23)	(42.14)	(42.09)	(16.24)	(16.21)	(16.26)	(16.12)
log(market cap) (q-1)	-0.391***	-0.394***	-0.397***	-0.397***	-1.042***	-1.040***	-1.043***	-1.040***
	(-18.98)	(-19.10)	(-19.20)	(-19.23)	(-21.61)	(-21.56)	(-21.63)	(-21.55)
Past 6-month return (q-3 to q-1)	-0.486***	-0.485***	-0.483***	-0.482***	-0.177***	-0.176***	-0.176***	-0.175***
	(-26.83)	(-26.77)	(-26.69)	(-26.61)	(-7.01)	(-6.98)	(-6.96)	(-6.96)
Book-to-market (q-1)	-0.010	-0.011	-0.011	-0.010	-0.145***	-0.145***	-0.144***	-0.144***
	(-0.54)	(-0.57)	(-0.57)	(-0.53)	(-6.66)	(-6.65)	(-6.63)	(-6.63)
Ownership by bottom institutions	-1.953***	-1.852***	-1.775***	-1.766***	-1.058*	-1.029*	-0.955	-1.114*
	(-5.26)	(-4.99)	(-4.78)	(-4.76)	(-1.76)	(-1.71)	(-1.58)	(-1.83)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	171,479	171,479	171,479	171,479	34,998	34,998	34,998	34,998
Adj R^2	0.690	0.690	0.690	0.690	0.790	0.790	0.790	0.790

Table 3. Instrumenting Large Institutional Ownership with Local Bias

This table presents two-stage least square (2SLS) regression results. The dependent variable is stock-level *Daily volatility*. *Daily volatility* is computed from daily returns during quarter q. The explanatory variable of interest is the stock-level ownership by the top X institutions (with X= 3, 5, 7, and 10). The instrument is the *Same State Score*. This score is the sum of X indicator variables, each of them denoting whether the stock's headquarters are located in the same state as one of the top X institutions. Panel A reports the first stage, and Panel B has the second stage. At the bottom of table, we report the F-statistic for the Stock and Yogo (2005) test for the null hypothesis of weak instruments. The critical values for this test are 16.38, 8.96, 6.66, and 5.53, for maximum acceptable rejection rates of the null hypothesis of irrelevant instruments of 10%, 15%, 20%, and 25%, respectively. The sample period is 1980/Q1–2014/Q1. Appendix A provides variable description. t-statistics based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: First Stage: Ownership by Large Institutional Investors and Local Bias

Dependent variable:	Top X ownership (q-1)			
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts
	(1)	(2)	(3)	(4)
Same state dummy	0.001***	0.001***	0.001***	0.001***
	(2.88)	(3.58)	(4.45)	(4.37)
Daily volatility (q-1) (%)	0.000***	0.001***	0.001***	0.001***
	(8.35)	(10.59)	(9.46)	(10.05)
Ownership by all institutions (q-1)	0.088***	0.117***	0.140***	0.177***
	(90.54)	(96.07)	(102.30)	(111.94)
1 / price (q-1)	0.001***	0.002***	0.002***	0.002***
	(6.07)	(10.59)	(14.23)	(12.39)
Amihud illiquidity (q-1)	-0.000	0.002***	0.004***	0.006***
	(-0.94)	(6.67)	(11.99)	(15.09)
log(market cap) (q-1)	0.003***	0.006***	0.008***	0.009***
	(23.80)	(34.57)	(38.63)	(39.37)
Past 6-month return (q-3 to q-1)	-0.001***	-0.002***	-0.002***	-0.004***
	(-6.20)	(-11.33)	(-14.47)	(-20.11)
Book-to-market (q-1)	0.000**	0.000	0.000	-0.000
	(1.99)	(1.58)	(0.57)	(-1.59)
Ownership by bottom institutions	-0.169***	-0.243***	-0.282***	-0.340***
	(-39.91)	(-43.77)	(-46.39)	(-50.24)
Calendar quarter FE	Yes	Yes	Yes	Yes
Observations	590,414	590,414	590,414	590,414
Adj R^2	0.588	0.654	0.684	0.713
Stock and Yogo (2005) F-stat	8.3	12.8	19.8	19.1

Table 3. Instrumenting Large Institutional Ownership (Cont.)

Panel B: Second Stage: Instrumented Ownership by Large Institutional Investors and Stock Volatility

Dependent variable:	Daily volatility (q) (%)			
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts
	(1)	(2)	(3)	(4)
Top X ownership (IV) (q-1)	98.105***	58.750***	40.196***	28.914***
	(2.85)	(3.51)	(4.27)	(4.09)
Daily volatility (q-1) (%)	0.645***	0.648***	0.662***	0.666***
	(39.23)	(51.93)	(87.64)	(97.78)
Ownership by all institutions (q-1)	-8.396***	-6.638***	-5.423***	-4.882***
	(-2.78)	(-3.40)	(-4.10)	(-3.91)
1 / price (q-1)	0.226***	0.204***	0.200***	0.224***
	(7.68)	(6.84)	(7.59)	(10.11)
Amihud illiquidity (q-1)	0.396***	0.243***	0.193***	0.182***
	(13.76)	(6.00)	(4.39)	(3.87)
log(market cap) (q-1)	-0.439***	-0.480***	-0.440***	-0.391***
	(-3.93)	(-4.68)	(-5.85)	(-5.89)
Past 6-month return (q-3 to q-1)	-0.176***	-0.154***	-0.158***	-0.147***
	(-5.89)	(-5.17)	(-6.63)	(-5.47)
Book-to-market (q-1)	-0.216***	-0.200***	-0.184***	-0.165***
	(-8.84)	(-11.74)	(-14.57)	(-14.70)
Ownership by bottom institutions	16.025***	13.702***	10.753***	9.273***
	(2.75)	(3.37)	(4.04)	(3.85)
Calendar quarter FE	Yes	Yes	Yes	Yes
Observations	590,414	590,414	590,414	590,414

Table 4. 2009 Mega-Merger

This table presents ordinary least squares (OLS) regression results. The dependent variable is the *Daily volatility* of the stocks held by large institutional investors. *Daily volatility* is computed from daily returns during quarter q. This test uses the exogenous event of a mega merger between two large institutional investors in 2009 to test the relation between volatility and ownership by large institutions. The key independent variables are *Combined Ownership* and *Combined Ownership Dummy,* which represent the combined ownership of the two institutional investors before and after the merger, and their respective interactions with the *Post-merger dummy*. The sample in each column includes the pre-merger period (2009/Q1–2009/Q4) and several months after the merger, as specified. Appendix A provides variable description. t-statistics based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Daily volatility (q) (%)							
Window after merger	+1 qtr	+2 qtrs	+3 qtrs	+4 qtrs	+5 qtrs	+6 qtrs	+7 qtrs	+8 qtrs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Combined ownership (q-1)	3.912***	3.342***	2.026**	1.501*	0.842	1.242	1.309*	0.936
	(2.92)	(2.95)	(2.06)	(1.71)	(1.02)	(1.59)	(1.69)	(1.24)
× Post-merger dummy	4.828***	3.771***	3.073***	3.040***	3.005***	3.890***	4.596***	4.513***
	(6.53)	(6.08)	(5.57)	(5.70)	(5.77)	(7.44)	(8.80)	(8.77)
Ownership by all institutions (q-1)	0.353	0.498**	0.372*	0.300	0.218	0.237*	0.284**	0.286**
	(1.17)	(2.04)	(1.71)	(1.64)	(1.37)	(1.66)	(2.13)	(2.31)
1 / price (q-1)	0.501***	0.525***	0.547***	0.537***	0.555***	0.574***	0.589***	0.592***
	(5.53)	(6.49)	(7.53)	(8.04)	(8.70)	(9.38)	(9.78)	(10.35)
Amihud illiquidity (q-1)	0.728***	0.758***	0.773***	0.780***	0.769***	0.823***	0.811***	0.792***
	(8.74)	(10.05)	(11.18)	(11.85)	(12.34)	(13.88)	(14.24)	(14.82)
log(market cap) (q-1)	-0.974***	-0.895***	-0.822***	-0.764***	-0.682***	-0.575***	-0.619***	-0.618***
	(-13.29)	(-13.95)	(-14.04)	(-14.80)	(-14.57)	(-13.52)	(-15.38)	(-16.64)
Past 6-month return (q-3 to q-1)	-0.008	0.008	0.026	0.054***	0.068***	0.056***	0.054***	0.058***
	(-0.33)	(0.34)	(1.23)	(2.76)	(3.58)	(3.02)	(2.93)	(3.25)
Book-to-market (q-1)	0.013	0.047**	0.069***	0.087***	0.107***	0.114***	0.102***	0.095***
	(0.56)	(2.14)	(3.23)	(4.22)	(5.40)	(5.91)	(5.32)	(5.03)
Ownership by bottom institutions	-1.917***	-2.200***	-2.128***	-2.115***	-1.939***	-2.016***	-2.041***	-1.989***
	(-2.66)	(-3.41)	(-3.88)	(-4.35)	(-4.53)	(-5.04)	(-5.35)	(-5.67)
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,150	22,848	26,512	30,141	33,736	37,271	40,815	44,321
Adj R^2	0.826	0.809	0.800	0.789	0.782	0.768	0.759	0.756

Table 5. Large Institutional Ownership and Stock Autocorrelation

This table presents ordinary least squares (OLS) regression results. The dependent variable is the *Autocorrelation* of the stocks held by large institutional investors. The key independent variable is the *Ownership* of the top institutions in the previous quarter. The sample period is 1980/Q1–2014/Q1. Appendix A provides variable description. t-statistics based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	ABS(ρ(DGTW-adjusted returns(t, t-1))) (q)						
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts	Top11-Top20	Top21-Top30	Top30-Top50
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Top X ownership (q-1)	0.109***	0.103***	0.085***	0.107***	0.054***	-0.005	0.012
	(6.69)	(7.61)	(7.00)	(9.30)	(4.00)	(-0.31)	(0.89)
Ownership by all institutions (q-1)	-0.038***	-0.040***	-0.040***	-0.047***	-0.034***	-0.028***	-0.029***
	(-8.27)	(-8.64)	(-8.57)	(-9.78)	(-7.23)	(-6.28)	(-6.44)
1 / price (q-1)	-0.022***	-0.022***	-0.022***	-0.022***	-0.022***	-0.022***	-0.022***
	(-14.02)	(-14.05)	(-14.08)	(-14.11)	(-14.05)	(-14.02)	(-14.03)
Amihud illiquidity (q-1)	0.144***	0.143***	0.143***	0.143***	0.143***	0.144***	0.144***
	(71.35)	(71.29)	(71.23)	(71.23)	(71.23)	(71.26)	(71.27)
log(market cap) (q-1)	-0.010***	-0.010***	-0.010***	-0.011***	-0.010***	-0.010***	-0.010***
	(-10.64)	(-10.94)	(-10.92)	(-11.32)	(-10.34)	(-10.18)	(-10.19)
Past 6-month return (q-3 to q-1)	-0.011***	-0.011***	-0.011***	-0.011***	-0.011***	-0.011***	-0.011***
	(-12.12)	(-11.99)	(-11.97)	(-11.70)	(-12.11)	(-12.28)	(-12.26)
Book-to-market (q-1)	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***
	(-5.49)	(-5.54)	(-5.49)	(-5.49)	(-5.37)	(-5.39)	(-5.41)
Ownership by bottom institutions	0.000	0.006	0.005	0.015	-0.008	-0.015	-0.014
	(0.01)	(0.29)	(0.26)	(0.80)	(-0.41)	(-0.77)	(-0.71)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	562,013	562,013	562,013	562,013	562,013	562,013	562,013
Adj R^2	0.296	0.296	0.296	0.296	0.296	0.296	0.296

Table 6. Large Institutional Ownership and Stock Co-movement with Institutions' Portfolios

This table presents ordinary least squares (OLS) regression results. The dependent variable is the correlation of each stock-quarter with the portfolio (excluding the stock itself) of the large institution. The correlation is computed using daily returns in the current quarter. The key independent variable is *Ownership* by the top institutions in the previous quarter. The sample period is 1980/Q1–2014/Q1. Appendix A provides variable description. t-statistics based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Beta of daily returns with those of TopX portfolio (q) (%)									
Institution:	Top 1	Top 2	Top 3	Top 4	Top 5	Top 6	Top 7	Top 8	Top 9	Top 10
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Top X ownership (q-1)	1.632***	1.562***	2.071***	0.773***	1.443***	0.249**	0.059	0.482***	0.809***	0.439***
	(20.14)	(18.24)	(16.98)	(9.01)	(14.05)	(2.36)	(0.61)	(5.00)	(8.43)	(5.04)
$Beta_{MKT}$	0.082***	0.080***	0.080***	0.078***	0.077***	0.075***	0.074***	0.074***	0.074***	0.073***
	(56.65)	(54.74)	(54.17)	(53.06)	(53.56)	(52.16)	(51.72)	(51.97)	(51.32)	(49.65)
$Beta_{SMB}$	0.025***	0.025***	0.027***	0.027***	0.027***	0.028***	0.028***	0.029***	0.029***	0.030***
	(24.17)	(23.74)	(25.67)	(25.32)	(26.17)	(26.88)	(27.21)	(28.10)	(27.88)	(28.75)
$Beta_{HML}$	-0.031***	-0.029***	-0.029***	-0.028***	-0.028***	-0.028***	-0.027***	-0.028***	-0.027***	-0.027***
	(-41.36)	(-38.85)	(-38.93)	(-37.82)	(-38.11)	(-37.49)	(-36.08)	(-37.14)	(-35.89)	(-35.69)
$Beta_{UMD}$	0.003***	0.003***	0.002***	0.001	0.001	0.001**	0.002**	0.001	0.000	0.000
	(3.71)	(3.95)	(2.99)	(1.47)	(1.61)	(2.00)	(2.35)	(1.57)	(0.65)	(0.50)
Ownership by all institutions (q-1)	0.279***	0.299***	0.353***	0.365***	0.365***	0.390***	0.395***	0.405***	0.402***	0.415***
	(22.69)	(24.31)	(28.43)	(30.61)	(30.80)	(32.81)	(33.50)	(34.05)	(33.88)	(34.95)
1 / price (q-1)	0.029***	0.024***	0.020***	0.012***	0.013***	0.012***	0.009***	0.007**	0.004	0.001
	(9.02)	(7.39)	(6.15)	(3.83)	(4.12)	(3.65)	(2.94)	(2.17)	(1.22)	(0.47)
Amihud illiquidity (q-1)	-0.162***	-0.173***	-0.185***	-0.192***	-0.193***	-0.201***	-0.200***	-0.208***	-0.219***	-0.219***
	(-35.74)	(-36.83)	(-38.11)	(-40.18)	(-40.19)	(-41.86)	(-41.85)	(-43.12)	(-44.75)	(-44.75)
log(market cap) (q-1)	0.002	-0.009***	-0.024***	-0.030***	-0.034***	-0.042***	-0.045***	-0.051***	-0.057***	-0.060***
	(0.70)	(-2.94)	(-7.61)	(-9.67)	(-11.01)	(-13.87)	(-14.98)	(-16.96)	(-18.48)	(-19.62)
Past 6-month return (q-3 to q-1)	0.082***	0.077***	0.075***	0.079***	0.081***	0.079***	0.077***	0.078***	0.077***	0.074***
	(29.09)	(26.54)	(25.74)	(27.29)	(28.93)	(27.39)	(26.13)	(27.16)	(26.31)	(27.01)
Book-to-market (q-1)	-0.027***	-0.027***	-0.028***	-0.029***	-0.028***	-0.032***	-0.034***	-0.033***	-0.030***	-0.032***
	(-9.26)	(-9.08)	(-9.35)	(-9.71)	(-9.51)	(-10.61)	(-11.40)	(-10.85)	(-9.87)	(-10.54)
Ownership by bottom institutions	-0.682***	-0.724***	-0.861***	-0.887***	-0.866***	-0.914***	-0.921***	-0.966***	-0.961***	-0.969***
	(-12.35)	(-13.01)	(-14.96)	(-15.83)	(-15.44)	(-16.18)	(-16.32)	(-16.83)	(-16.76)	(-16.81)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	610,672	610,458	610,466	610,453	610,368	610,473	610,529	610,383	610,445	610,398
Adj R^2	0.209	0.199	0.202	0.193	0.199	0.198	0.204	0.208	0.202	0.199

Table 7. Idiosyncratic News of Large Institutional Ownership

This table presents ordinary least squares (OLS) regression results. The dependent variable is the stock's *Daily volatility*, computed using daily returns in quarter q. The key independent variables are the changes in the *CDS spreads* of the top 3, 5, 7, and 10 largest institutional investors and the *interaction* terms between the changes in CDS prices and the institution's Ownership. The sample period is 1980/Q1–2014/Q1. Appendix A provides variable description. t-statistics based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Daily volatility (q) (%)			
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts
	(1)	(2)	(3)	(4)
Top X ownership (q-1)	0.842***	0.785***	0.822***	0.690***
	(4.92)	(5.40)	(6.43)	(5.71)
ΔCDS (q)	412.102***	407.134***	677.308***	-1,224.293***
	(7.67)	(7.58)	(7.69)	(-7.83)
TopX ownership (q-1) × ΔCDS (q)	103.578***	107.082***	82.991***	73.313***
	(3.53)	(4.62)	(3.95)	(5.51)
Ownership by all institutions (q-1)	0.232***	0.210***	0.180***	0.151**
	(4.10)	(3.65)	(3.09)	(2.56)
1 / price (q-1)	0.767***	0.764***	0.764***	0.761***
	(26.42)	(26.30)	(26.26)	(27.06)
Amihud illiquidity (q-1)	0.851***	0.847***	0.846***	0.839***
	(27.47)	(27.21)	(27.19)	(27.56)
log(market cap) (q-1)	-0.406***	-0.410***	-0.411***	-0.399***
	(-23.69)	(-23.80)	(-23.90)	(-23.12)
Past 6-month return (q-3 to q-1)	-0.069***	-0.068***	-0.068***	-0.115***
	(-5.55)	(-5.49)	(-5.45)	(-9.15)
Book-to-market (q-1)	0.106***	0.106***	0.106***	0.108***
	(6.81)	(6.77)	(6.77)	(7.17)
Ownership by bottom institutions	-1.407***	-1.367***	-1.335***	-1.366***
	(-7.05)	(-6.84)	(-6.68)	(-6.88)
Stock FE	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes
Observations	225,505	225,505	225,505	239,646
Adj R^2	0.697	0.697	0.697	0.694

Table 8. Large Institutional Investors' Large Trades

The table presents evidence on the trade sizes of large institutions. Panel A presents results from an analysis in which trades of large institutions were compared to 99 net trades of synthetic institutions, which are made up of smaller institutions and have equity holdings equal to that of the large investor. The panel shows the percentage of trades by large institutional investors that are above the 50th, 90th, 95th, and 99th percentiles of all synthetic institutions. Panels B and C present regressions in which the dependent variable is stock-quarter daily volatility and the explanatory variable of interest is the Trade granularity score. This variable is computed as following. For each large institutional investor, in each calendar quarter, we created 99 synthetic institutional investors made up from institutions that are not in the top ten largest institutions. Each of the synthetic institution has the same equity holdings at the end of the previous quarter as the original institution. Then, we sort the absolute net trades of the 100 institutions for each stock (99 synthetic institutions and one original institution), and record the percentile in which the original institution is within the group. We perform this exercise for the largest ten institutions for each quarter. The *Trade granularity score* is the average percentile ranking across all the top X institutions in the group, divided by 100, with X=3, 5, 7, 10. The sample period is 1980/Q1–2014/Q1. Stock-quarter-institutions in which there was no trade by the institution are excluded. Appendix A provides variable description. t-statistics based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Large Trades by Large Institutional Investors

	%Stock-quarter with abs(trade) of Top X			
	> 50th pctile	> 90th pctile	> 95th pctile	> 99th pctile
	(1)	(2)	(3)	(4)
Top 1	55.9%	16.4%	9.4%	4.6%
Top 2	55.5%	13.8%	7.6%	3.5%
Top 3	47.5%	13.4%	8.0%	3.5%
Top 4	59.0%	18.2%	10.4%	4.2%
Top 5	55.3%	16.5%	9.5%	3.6%
Top 6	59.0%	18.9%	11.0%	4.0%
Top 7	64.0%	21.8%	13.1%	4.9%
Top 8	61.2%	16.5%	9.4%	3.3%
Top 9	62.0%	17.6%	10.2%	3.6%
Top 10	61.5%	17.5%	10.1%	3.5%
Average	58.1%	17.0%	9.9%	3.9%

Table 8. Large Institutional Investors' Large Trades (Cont.)

Panel B: Large Trades by Large Institutional Investors and Stock Volatility

Dependent variable:	Daily volatility (q) (%)							
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top X ownership (q-1)	0.858***	0.918***	0.969***	0.848***	0.497***	0.635***	0.595***	0.407***
	(5.87)	(7.32)	(8.64)	(8.27)	(3.31)	(4.92)	(5.15)	(3.86)
Trade granularity score (q)					0.234***	0.291***	0.478***	0.737***
					(14.18)	(13.40)	(18.51)	(23.80)
Ownership by all institutions (q-1)	0.166***	0.136***	0.107***	0.095**	0.194***	0.166***	0.145***	0.134***
	(4.07)	(3.33)	(2.59)	(2.27)	(4.76)	(4.05)	(3.51)	(3.21)
1 / price (q-1)	0.777***	0.776***	0.776***	0.776***	0.778***	0.777***	0.776***	0.772***
	(25.73)	(25.71)	(25.69)	(25.71)	(25.86)	(25.82)	(25.81)	(25.75)
Amihud illiquidity (q-1)	1.397***	1.395***	1.394***	1.393***	1.414***	1.411***	1.416***	1.425***
	(61.76)	(61.62)	(61.54)	(61.45)	(62.37)	(62.14)	(62.32)	(62.67)
log(market cap) (q-1)	-0.275***	-0.278***	-0.280***	-0.280***	-0.279***	-0.285***	-0.293***	-0.302***
	(-26.25)	(-26.43)	(-26.60)	(-26.65)	(-26.68)	(-27.09)	(-27.76)	(-28.63)
Past 6-month return (q-3 to q-1)	-0.097***	-0.096***	-0.095***	-0.094***	-0.094***	-0.092***	-0.088***	-0.082***
	(-10.86)	(-10.74)	(-10.64)	(-10.54)	(-10.53)	(-10.31)	(-9.94)	(-9.26)
Book-to-market (q-1)	0.022*	0.021	0.021	0.022*	0.020	0.019	0.018	0.018
	(1.65)	(1.61)	(1.63)	(1.66)	(1.56)	(1.45)	(1.41)	(1.34)
Ownership by bottom institutions	-1.726***	-1.664***	-1.621***	-1.608***	-1.769***	-1.702***	-1.673***	-1.665***
	(-9.34)	(-9.00)	(-8.77)	(-8.70)	(-9.58)	(-9.20)	(-9.04)	(-9.03)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	596,378	596,378	596,378	596,378	596,378	596,378	596,378	596,378
Adj R^2	0.675	0.676	0.676	0.676	0.676	0.676	0.676	0.676

Table 8. Large Institutional Investors' Large Trades (Cont.)

Panel C: Large Trades by Large Institutional Investors and Stock Volatility, by Period

Dependent variable:	Daily volatility (q) (%)							
Institution:	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts	Top 3 insts	Top 5 insts	Top 7 insts	Top 10 insts
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2000-2007 Sample								
Top X ownership (q-1)	-0.294	0.321	0.654***	1.013***	-0.578**	-0.028	0.051	0.299*
	(-1.32)	(1.53)	(3.55)	(6.03)	(-2.53)	(-0.13)	(0.27)	(1.75)
Trade granularity score (q)					0.198***	0.337***	0.685***	0.976***
					(6.41)	(8.17)	(14.69)	(18.03)
Stock-quarter controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	161,501	161,501	161,501	161,501	161,501	161,501	161,501	161,501
Adj R^2	0.715	0.715	0.715	0.715	0.715	0.715	0.716	0.716
2008-2009 Sample								
Top X ownership (q-1)	2.052***	1.818***	1.880***	0.667*	1.690***	1.370***	1.480***	0.400
	(4.17)	(4.15)	(5.10)	(1.93)	(3.37)	(3.08)	(3.95)	(1.12)
Trade granularity score (q)					0.254***	0.477***	0.496***	0.445***
					(3.65)	(5.28)	(4.64)	(3.53)
Stock-quarter controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34,918	34,918	34,918	34,918	34,918	34,918	34,918	34,918
Adj R^2	0.790	0.790	0.790	0.790	0.790	0.791	0.791	0.790
2010-2014 Sample								
Top X ownership (q-1)	0.457*	1.125***	1.183***	1.061***	0.268	0.937***	0.983***	0.859***
	(1.74)	(6.44)	(6.79)	(6.36)	(1.01)	(5.23)	(5.56)	(5.08)
Trade granularity score (q)					0.134***	0.208***	0.284***	0.358***
					(4.22)	(5.29)	(5.90)	(6.28)
Stock-quarter controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	64,898	64,898	64,898	64,898	64,898	64,898	64,898	64,898
Adj R^2	0.695	0.695	0.695	0.695	0.695	0.695	0.696	0.696

Figure 1. Time Series of Large Institutions' Ownership

The chart shows the aggregate equity holdings by top institutions over time, as percentage of total market capitalization of the US equity market.

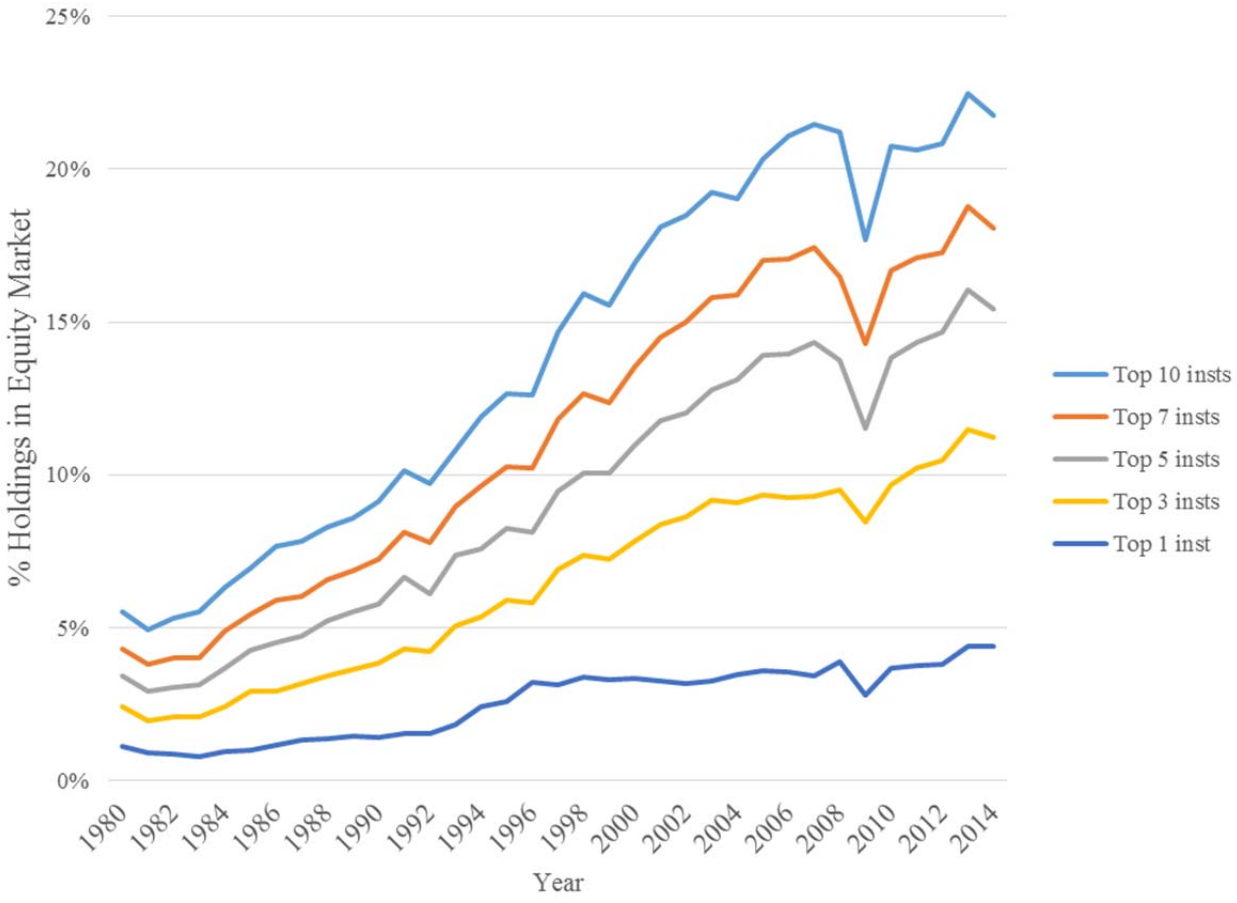


Figure 2. Evolution of Large Institutions' Relative Trade Size

The chart shows the relative size of trades of large institutions relative to synthetic institutions with the same total equity holdings. For each large institutional investor, in each calendar quarter, we created 99 synthetic institutional investors made up from institutions that are not in the top ten largest institutions. Each of the synthetic institution has the same equity holdings at the end of the previous quarter as the original institution. Then, we sort the absolute net trades 100 institutions for each stock (99 synthetic institutions and one original institution), and record the percentile in which the original institution is within the group. Stock-quarter-institutions in which there was no trade by the institution are excluded; thus, the analysis is conditioned on the large institution trading. We perform this exercise for the largest ten institutions for each quarter. The chart reports the average fraction of absolute trades that are larger than the 50th, 90th, 95th, and 99th percentile in each quarter. The dashed lines represent the null hypothesis, that the likelihood of having a trade larger than Xth percentile equals to (1-X), i.e., generated by a uniform distribution.

