# The Granular Nature of Large Institutional Investors

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**Abstract**

Over the last 35 years, the concentration of institutional assets in equity markets has increased dramatically. The stock ownership by the largest ten asset managers now accounts for 23.1% of total stock market capitalization, having quadrupled over this period. The paper asks whether idiosyncratic shocks to these institutions can spill over to their underlying holdings through their trading activity. The conjecture is that large institutions are granular, that is, they cannot be reduced to a diversified collection of smaller entities. We provide evidence of a causal effect of ownership by large institutions on the volatility of their stock holdings. Moreover, we show that these effects are driven by larger-than-expected trades as well as by concentrated investor flows. Finally, the stocks owned by large institutions exhibit stronger price inefficiency.

**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] According to some theories, idiosyncratic shocks to the largest individual players are hardly diversifiable (Gabaix, Gopikrishnan, Plerou, and Stanley 2006, and Gabaix 2011). In this vein, large institutions are not equivalent to a collection of smaller independent entities. Rather, they have an uncompressible institutional identity that leaves a large footprint in the market. They are 'granular'.

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. To fund the withdrawals, Pimco engaged in massive fire sales. For example, it closed more

[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.

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 impact on asset prices. A large institution that initiates trades to accommodate investor flows, for portfolio rebalancing or risk management reasons 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 leads to

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[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, 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, May 31, 2015, http://www.ft.com/intl/cms/s/0/6fbde67a-061b-11e5-89c1-00144feabdc0.html.

noisier stock prices. These results introduce new evidence into the debate on the risk created by large institutional investors.

Our base regressions study the link between stock volatility and ownership by large asset managers. 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) during the financial crisis of 2008-2009.

We use two distinct identification strategies to address potential endogeneity concerns (e.g., the fact that large institutions may prefer stocks with higher volatility). The first relies on "local bias," that is, the prior finding that asset managers overweight firms that are located closer 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 located 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 about 12 to 18 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 the merger between two large institutional investors (Blackrock and Barclays Global Investors (BGI)) that took place at the end of 2009. The granularity theory in this context suggests that the shocks to one large consolidated organization (the merged firm) have a greater impact than the shocks to separate entities (the pre-merger organizations). Consistent with this hypothesis, we find that stocks owned by the combined entity exhibit higher volatility than stocks owned by the pre-merger firms and that this effect persists well after the merger event. A 1% increase in ownership by the combined institution increases stock volatility by about 2 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 the increase in volatility as the causal effect of the increase in institutional size. 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.

the study delves deeper into the origin of these effects and the channels through which they play out. First, we explore the role of trades by large institutions in increasing stock volatility. We run a horse race between the effect of ownership by large institutions and their contemporaneous trades and find that trades by large institutions are those that increase volatility and drive out the coefficient on institutional ownership. We repeat this test where we instrument both ownership and current trades, and our results appear to remain qualitatively similar. This evidence is consistent with Ellul (2006) who identifies the price impact of large trades.

Second, we look for evidence of granularity by comparing the trades of large institutions to those of a random set of smaller institutions with the same total amount of portfolio holdings. The goal is to build a synthetic institution representing the counterfactual world in which large institutions are unbundled into smaller entities. 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. The underlying assumption is that 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.

Our results show that large investors trade in a more concentrated portfolio of stocks and in bigger sizes than the synthetic institution. For example, after 2000, the ten largest firms trade in just 47% of the available stocks, while the synthetic organization in 67% of the universe. Furthermore, the size of the trades of the large investors is substantially bigger, and therefore more conducive to price impact, than that of the synthetic institutions. For example, 17.6% of the trades of large institutional investors are above the 90$^{th}$ percentile of the distribution of trades of the synthetic institutions, and 4.4% of the trades of the large firms exceed the 99$^{th}$ percentile of the same distribution. While the distance has shrunk over time, the ranking persists through the end of the sample.

Finally, we explore the role of investor flows into large investors as potentially one of the causes for the large trades we document. We execute this test using a monthly mutual fund dataset, as fund flows are measured more accurately and on a relatively higher frequency. We document that the correlation between mutual fund flows is higher among funds that are affiliated with the same parent company than among independent funds by approximately 0.1 standard deviations of the correlation coefficient. Thus, investor flows could be one of the reasons that large institutional investors are forced to place large trades.

We close the study by 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 these institutions' 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. The effect becomes larger as institution size increases. This finding, therefore, extends prior evidence on abnormal co-movement in institutional portfolios (Greenwood and Thesmar 2011, Anton and Polk 2014) by showing that the size of the institutional investors also matters in determining co-movement.

Overall, our study shows that ownership by large institutional investors increases the volatility in prices of the portfolio securities. Our analysis shows that institutions initiate cause the increase in volatility through large trades, which translate into substantial price pressure. Large institutions have a 'granular' nature that leads them to trade in a less diversified way than a random collection of independent entities. Finally, our analysis suggests that the increase in volatility is associated, at least in part, with an increase in noise.

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. Sias (1996) and Bushee and Noe (2000) find further evidence that increases in institutional ownership are accompanied by a rise in stock 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. Additionally, Stambaugh (2014) presents an equilibrium model which suggests that increases in active management leads to a decline in individual stock ownership, which in turn reduces the amount of noise trading in the market. 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) and Kelly, Lustig, and Van Nieuwerburgh (2013) 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. Siriwardane (2015) shows that the CDS market is very concentrated (very few sellers) and that prices of CDS contracts are affected by the capital constraints of these sellers.

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, 2012, Jotikasthira, Lundblad, and Ramadorai (2012), and Chang, Hong, and Liskovich (2015), Bartram, et al. (2015)) or develop intermediary asset pricing models (Adrian, Moench, and Shin (2010), He and Krishnamurthy (2012), Adrian, Moench, and Shin (2013), and Muir (2014)). 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] 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.[8,9]

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. 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

[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.

[9] Asset managers report also holding that are managed for clients. For example, consider CalPERS, which uses Blackrock as one of their asset managers. According to CalPERS' investment statement (https://www.calpers.ca.gov/docs/forms-publications/facts-at-a-glance.pdf) they have about $160 billion in public equity, 82% of those are managed internally (http://www.pionline.com/article/20150909/ONLINE/150909854/calpers-to-consider-taking-activist-manager-portfolio-in-house). Since their 13F assets as of June end, account only for $67 billions: http://www.sec.gov/Archives/edgar/data/919079/000114036115032277/xslForm13F_X01/primary_doc.xml), CalPERS is likely to have a few billions reported by asset managers like Blackrock and other asset managers. Those assets will be reported under Blackrock 13F (for advising and executing on investment decisions). Hence, if there is a shock to Blackrock, it should be primarily be reflected on Blackrock's 13F assets (outflows and withdrawals of money managed by Blackrock) but should not affect the money internally managed by CalPERS.

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 (*Ownership by all institutions)*. We also provide some sample statistics specific to the Blackrock-BGI merger we study (Section 3.4.2) and for the mutual fund flows analysis (Section 5.4). 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) 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 (Table 1, Panel B). *Same State* is a dummy that captures whether a firm's headquarters is in the same state as the headquarters of the institutional investor. *Beta with Top Institutions* estimates the sensitivity of the firm's daily returns to the returns of the rest of the portfolio of the top 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.

Table 1, Panel D provides a correlation matrix for the key variables used in our analysis below. Most variables exhibit low correlation with each other, but there are some exceptions. Ownership by the top ten institutions is correlated with the ownership by all institutions at 60.2%. Moreover, the measure of large institutional ownership is correlated at 52.8% with Greenwood and Thesmar's (2011) measure of fragility, which measures the effective concentration of ownership of a financial asset, weighted by the volatility and correlation of the trading needs of its investors. Despite this high correlation, we include the fragility measure in the analysis below and find that institutional ownership has explanatory power for volatility, even when fragility is included in our regressions.

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 1996. This large institution had average equity assets of $72 million and a quarterly turnover of 2.94%. 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 3.4 through an instrumental variable approach as well as a natural experiment.

### 3.1 Base regressions

Our main OLS specification takes the following form:

$$Volatility_{iq} = TopInstOwnership_{i,q-1} + Controls_{i,q-1} + Time\ FE_q + Stock\ FE_i + \varepsilon_{iq} \tag{1}$$

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 3, 5, 7, and 10 institutions (*Top inst. 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.[10]

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.

[10] Results are robust to standard errors clustered by stock and time.

Column 4 of Panel B shows that a 1% increase in the top 10 institutions' stock ownership coincides with a 0.76 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, but not 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).[11]

[11] 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

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 Greenwood and Thesmar (2011)'s Measure of Fragility

We also examine the results of our base analysis with the inclusion of the measure of stock fragility (G) from Greenwood and Thesmar (2011). In their paper, the authors show a relation between stock volatility and fragility, which may be viewed as similar to the relation we show in this study. However, it is not the case that the predictions we make overlap with those of the Greenwood and Thesmar (2011) study. In our study, we posit that unique investors may create increases in volatility, while Greenwood and Thesmar (2011) show that the concentration and correlation of flows from multiple investors may contribute to increased stock volatility. It is not the case that these two hypotheses are the same. For example, one stock may have a sizable portion of its equity owned by a single large investor, but at the same time may have a low fragility (G) as the remainder of its shares is held by a large number of other investors. Even so, as seen in Table 1, Panel D, the correlation between G and the ownership of the top ten largest institutions is 52.81%.

Accordingly, we insert the measure of fragility in to our main regression model to see whether our measure of unique institutional ownership has explanatory power beyond that of Greenwood and Thesmar's (2011) measure of fragility. Table 2, Panel E presents the results of this analysis. We again find that the coefficient on large institutional ownership is positive and statistically significant. Meanwhile, the coefficient on Greenwood and Thesmar's fragility measure is also positive and statistically significant, with coefficients that are similar in magnitude to those found in the original study. Going forward, we restrict our usage of Greenwood and Thesmar's fragility measure as its inclusion depletes our sample size by nearly

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until the third quarter of 2002; and the subprime lending crisis from the third quarter of 2007 until the fourth quarter of 2009.

20%. In order to have the largest sample possible and to draw reliable conclusions, we omit this variable for most of the analysis below.

### 3.4 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).[12] Our second identification strategy relies on the merger of two large institutions (Blackrock and BGI) at the end of 2009, which led to the creation of an even-larger entity.

#### 3.4.1 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. Moreover, firms targeted by mutual funds tend to be of higher quality (Coval and Moskowitz (2001)). 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).

[12] See also Giroud (2013), who shows that proximity to plants makes it easier for firms to acquire information. By extension, we apply the same logic to large institutional investors and stocks.

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 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 institutions (we label it "Same State Score"). The instrument can range between 0 and the number of large institutions. Except for the case of the top 3 institutions, it never occurs in our sample that all top managers have headquarters in the same state.

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

$$TopInstOwnership_{iq} = Same\ State\ Score_{i,q} + Controls_{i,q-1} + Time\ FE_q + \varepsilon_{iq} \tag{2}$$

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 3.8 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 7.1 to 21.2; 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 exclusion restriction in this instrumental variables setup is that same-state residency affects stock volatility only through the ownership by top institutional investors. One violation of this restriction is the possibility that large institutional investors are encouraged or requested (e.g., by politicians) to hold local firms in financial distress in order to provide some support. At the same time, these firms have higher volatility. To control for this possibility, we include two types of controls. First, we include firm-level controls for financial distress: F-Score (Piotroski 2000), O-Score (Ohlson 1980), Z-Score (Altman 1968), CHS distress risk (Campbell, Hilscher, and Szilagyi 2008), and the fraction of quarters with negative income over the previous two years. As reflected in the first stage in Table 3, Panel A, large institutional investors are more likely to hold successful firms than firms in financial distress. Second, we control for annual state-level gross domestic product (GDP) of the institutional investors (averaged across investors) as well as two lags, to account for a change in the behavior of institutional investors during bad times (local patriotism). The regression shows that state-level economic conditions do not affect the behavior of top institutional investors.

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:[13]

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

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 Columns (3) and (4) of Panel B, Table 3, we infer that a 1 percentage point increase in ownership by the top

[13] 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.

institutions leads to an increase in daily volatility of about 12 to 18 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 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.

Finally, Table 3, Panel C, shows the second stage of an IV regression that includes Greenwood and Thesmar's (2011) measure of fragility. The coefficient on our measure of stock ownership by large institutions again is positive and statistically significant for the top 5, 7, and 10 largest managers.

### 3.4.2 Identification Strategy II: Evidence from the 2009 Blackrock-BGI 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, BGI held equities worth about \$596bn (Top 1) while Blackrock 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.

An important question is the motivation behind the merger. In particular, if the motivation behind the merger relates to the stock volatility, it is possible that the effects that we observe might be biased and do not reflect the effect due to the increase in the size of the institutional investor. For this matter we rely on the investigative work of Azar, Schmalz, and Tecu (2015) regarding the drivers of the merger. They report that the merger took place following the desire of Barclays to sell some of its divisions in order to strengthen its balance sheet following the financial crisis. Blackrock made a bid of \$13.5 billion, and the merger was announced on June 11, 2009, and was completed at the end of 2009. Hence, it appears that the reason for the merger was unrelated to the volatility of the underlying securities.

We use the following empirical specification. The pre-merger window is set to last quarter before the merger (2009/Q4) to minimize the confounding effect of the financial crisis of 2008-2009. The post-event windows takes varying lengths, from one quarter through 8 quarters, after the merger event. The regression analysis that we execute is:

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

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. We control for the usual stock characteristics (main effects and interactions with the merger indicator). In addition, we control for the absolute value of the trades (scaled by stocks' market capitalization). 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 1.5 to 2.2, can be interpreted as follows: a 1 percent increase in the ownership of the largest institution leads to an increase in daily volatility of 1.5 to 2.2 basis points for the combined entity (to be assessed against an average daily volatility of 3.0% during the period).

Another interesting fact to note is the effect of the absolute value of trades, and its interaction with the merger variable. While including these variable do not change materially the coefficients of other the variables, we observe that its coefficient is positive and almost always statistically significant, suggesting that the trades by BGI and Blackrock affect stock volatility. Furthermore, the coefficient on this interaction with the merger indicator is positive in most specifications and statistically significant in some, indicating that the effect of trades on stock volatility increase when the entities are combined. We discuss this issue further in Section 5.2.

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, which causes an omitted variable bias. When an omitted variable problem occurs, the OLS assumption that the error term is uncorrelated with the regressors is violated. This in turn may cause the OLS coefficients to be negatively biased.

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 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 four main sets of evidence. First, 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. Third, 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. Finally, we present evidence consistent with the hypothesis that investor flows into large institutions are correlated across units.

### 4.1 Trades as the Channel of the Impact of Large Institutions on Volatility

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, 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. If these divisions traded completely independently, they would be as likely to have a price impact as a group of 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). The alternative hypothesis is that trades of units within large institutions are uncorrelated, or even negatively correlated. For example, Gaspar, Matos, and Massa (2006) show that mutual funds within the same family tend to offset their trades to reduce price impact.

To test that the effect of large institutions' ownership on volatility is channeled through trading activity, we run a horse race between ownership and trades. We measure trades as the quarterly change in holdings of a given stock by a given institution. This quarterly measure of trading activity is an understatement of the actual volume generated by these institutions on a daily level, which is what matters for daily volatility (our dependent variable). However, the resulting bias raises the hurdle for finding an effect of trades on daily volatility. Further, we focus on the absolute value of trades because both buy and sell orders can have a price impact and, therefore, increase volatility. For the top 3, 5, 7, and 10 institutions, we compute the sum of the absolute trades (expressed fractions of market capitalization) in a given stock in the same quarter in which the dependent variable is measured. We exclude the stock-quarters in which no trade by the top institutions takes place, in order to focus on the actual trading activity.

Table 5, Panel A, reports the estimates from OLS regressions where the dependent variable is the daily stock-level volatility within the quarter. In addition to the usual controls, we include a variable measuring the sum of the absolute trades by all institutions below the top ten. The purpose of this variable is to provide a benchmark in terms of the effect of the trading activity by institutions that are not large. As usual, standard errors are clustered at the stock level. For each set of top institutions, we report three specifications: one that focuses on the trades by top institutions; one that focuses only on ownership by top institutions (replicating the specifications in Table 2, Panel A, for this sample of stocks); and one that carries out the horse race between trades and ownership.

Across all sets of top institutions, the coefficient on the trade variable is positive and strongly significant in isolation. Moreover, the slope on trading by top institutions by far exceeds that on trading by other institutions. This fact suggests that top institutions trade in a way that has a greater price impact than smaller institutions. Finally, while ownership has a positive and significant coefficient in isolation, its effect is driven out by top institutions' trades in all the specifications where both variables appear. This finding supports the view that the impact of top institutions on volatility is channeled to a large extent through their trading activity.

Trades, as well as ownership, can be endogenous with respect to volatility. To address this issue, in Panel B of Table 5, we modify the analysis of Panel A by instrumenting both explanatory variables. For ownership, we use the same-state indicator as an instrumental variable (see Section 3.3.1). For trades, we rely on the fact that there is persistence in institutional flows (see, e.g., Coval and Stafford, 2007). Hence, lagged trades are a predictor of current trades. Our identifying assumption is that lagged trades are exogenous with respect to the dependent variable (to current volatility) once we control for lagged volatility. In other words, while we allow for trades to be co-determined with volatility in the same quarter, we assume no correlation of current trades with the innovation in next quarter volatility.

The results in Panel B confirm the prior evidence. Instrumented trades have a positive and significant impact on volatility in isolation as well as in combination with ownership. In the horse race, the coefficient on ownership turns from positive to negative. The magnitude of the coefficients is less reliable in the horse race specification, as the two instruments are used to predict both endogenous variables. In particular, both endogenous variables load significantly on the two instruments in the first stage. As a result, the fitted variables in the second stage are highly collinear. Nevertheless, we find it reassuring that the patterns and signs of coefficients mirror those from the OLS specifications in Panel A.

Overall, the evidence lends support to the view that large institutions affect volatility through their trading activity. While large institutions are composed of multiple entities, the orders of these entities are not fully offsetting (i.e., there is a granular component to the institutional trades). The trades of large institutions, therefore, affect prices more than the trades of other institutions.

### 4.2 Large Trades by Large Institutions

So far, the evidence suggests that in the existing market configuration, large institutions' trades have a bigger impact on stock volatility than small institutions' trades. From a policy perspective, however, the relevant question is whether moving to a market populated by smaller firms would be beneficial from the point of view of volatility. The relevant comparison in addressing this question is the one between the existing distribution of institutions and a counterfactual world in which large institutions are replaced with a bunch of smaller ones, keeping the amount of total assets and flows constant. One could argue that, in this counterfactual world, the overall impact on prices of trades could be the same as in the actual world, because the same amount of investor flows would reach the market. The granularity hypothesis, however, holds that when flows are conveyed to a large institution, as opposed to a group of smaller ones, they trigger trades that are more concentrated and, therefore, more impactful for volatility.

To test this conjecture, we contrast large institutions' trades in the existing configuration of the market to the trades of small institutions in a synthetic counterfactual world. To construct the synthetic counterfactual, for each stock-quarter, we bootstrap the trades of small institutions (below the tenth) and cumulate the bootstrapped trades to obtain the trading activity of a synthetic institution that has total equity holdings of the same amount as a top institution.

In more detail, for each large institution among the top 10 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 10$^{th}$ institution. These component institutions are randomly drawn without replacement until the dollar value of the equity holdings of the original institution is matched.[14] 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).

The dramatic growth in the size of the largest institutional investors over time is reflected also in this exercise. Consider the largest institutional investor at any quarter, for example. In 1980, the size of the equity portfolio of this investor equals the aggregate size of about 25 random institutions. In contrast, by 2014, this number grows to 360.

To be a valid counterfactual, synthetic institutions are assumed to be similar in all aspects to the original institutional investors except for the fact that original institutions are governed by a centralized body. In particular, we need to assume that characteristics like investor composition and sensitivity of flows to market shocks are similar. Furthermore, we assume the actual trades of the firms that make up the synthetic institutions do not differ in a meaningful way from the trades that the small institutions would carry out in a market with no large institutions. If these assumptions hold, then the actual trades of small institutions can proxy for the trades that they would carry out in the counterfactual world.

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 two effects. First, the trades by large institutions are more concentrated (i.e., restricted to a smaller set of stocks), e.g., because each manager decides to focus on a limited set of stocks, which does not increase proportionally with the size of the institution. Second, we expect that large institutions place trades that are systematically larger than the trades placed by 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 increase volatility.

[14] 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.

First, we examine the evolution of trade concentration over time in Figure 2. The figure shows the time-series of the average fraction of stocks that are traded by the top ten institutional investors and the quantity for the synthetic institutions (each paired to an original institutional investor among the top 10). Until the mid-1990s the fraction of stocks traded by original and synthetic institutions is similar. Since the mid-1990s, however, there is a wedge between the two types of organizations. While synthetic organizations trade each quarter up to 77% of stocks, original institutional investors trade a smaller set of stocks, up to 56% of the stocks universe. Hence, trading by large institutional investors is more concentrated than their synthetic counterfactual.

Second, to address the relative size of trades by large institutions, 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 6 reports the average across stocks and quarters of this indicator for the $50^{th}$, $90^{th}$, $95^{th}$, and $99^{th}$ 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, 58.7% of trades by the original institution are larger than the trades placed by 50% of the synthetic institutions. Moreover, 17.6% of the trades are larger than 90% of the synthetic institutions' trades; 10.4% of trades are larger than the $95^{th}$ percentile; and 4.4% of trades are larger than the $99^{th}$ 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 $50^{th}$ percentile, 10% above the $90^{th}$ percentile, 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 3. 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 99$^{th}$ percentile, while the red dashed line 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 99$^{th}$ 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 50$^{th}$ percentile of synthetic institutions. Possibly, over time large institutions have learnt to internalize their price impact, as suggested by Goncalves-Pinto and Schmidt (2013) and 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.

### 4.3 Correlated Flows across Units within Institutional Investors

One potential factor that causes institutions to initiate large trades is investor flows that are potentially more correlated across units within large institutions. The hypothesis is, therefore, that the correlation between investor flows and units is higher within large institutions than within independent institutions. Unfortunately, this hypothesis is difficult to test using quarterly 13F filing data, since these data do not include investor flows, but only changes in long equity positions.[15]

To overcome this empirical hurdle, we resort to mutual fund data. Within this data, mutual fund flows are available on a monthly basis for the years 1980-2014. The test is therefore simple: we examine whether the correlation between mutual fund flows is higher for funds that are within the same family (i.e., have the same management company) than the correlation between funds that are in distinct families. The database does not have explicit mutual fund family assignment, but rather includes the name of the funds. Based on the name of the funds we classify them to over 100 families. We start with all 57,645 fund share classes in CRSP Mutual Fund Database with data after 1980 and group them into their family categories, using historical management company information in CRSP, after accounting for variations in management company names in CRSP over the time series. When such information is not available in CRSP, we try to derive the management company information using the first few words of the historical

[15] While some studies estimate flows as the difference across quarters in return-adjusted equity holdings, these estimates are inaccurate, since they cannot net out the effect of rebalancing across asset classes and changes in short positions.

fund name itself (e.g. Vanguard, State Street). We end up with 1,692 distinct classes. Groups linked to only one fund are those for funds without family association. There are 964 groups that are linked to 2 or more funds, with an average of 58 fund share classes linked to a fund family.

We then group all these fund share classes into their respective portfolios. This information is not available in CRSP for most of the period between 1980 and 2008. As such, we rely on WRDS MFLinks database that focuses on equity mutual fund portfolios. We end up with 27,105 fund share classes linked to 8,576 fund portfolios and associated with 550 fund families that have 2 funds or more during our sample period between 1980 and 2014.

We then compute the monthly flows for each share class using the monthly assets and net return figures in CRSP, scale them by lagged total assets, and then aggregate them at the fund level. The flow correlation measure is constructed between funds using rolling 12-month Pearson correlations in the percent month flows. To this end, we generate a dataset that includes all combinations of mutual fund pairs. For each pair-year, we compute the rolling Pearson correlation between the flows (scaled by lagged total net assets) of the two funds in the last 12 months. We restrict our sample to only those correlations that have non-missing flows in the last 12 months. Our flow correlation sample consists of 2,655,732,147 pairwise correlations on a monthly frequency between 1980 and 2014. Finally, we restrict to only one observation per fund pair–year. Since the number of fund-pair combination is large, we sampled 1% of the dataset for the purpose of the regressions, resulting in 2.2 million mutual fund pair-years. The summary statistics for variables used in this analysis are provided in Table 1, Panel A.

We test whether the correlation between mutual fund pairs is higher when funds belong to the same family. We thus regress the correlation coefficient on same family dummy. The results are presented in Table 7. The different specifications present different levels of fixed effects: from no fixed effects (Column (1)) to a specification that includes fixed effects for each fund i-year and fund j-year (Column (4)). The standard errors in these regressions are clustered three ways: by year, by fund i, and by fund j. Despite the different levels of fixed effects, the results are similar across specifications; they show that the correlation coefficient is higher by about 3.1% when funds are within the same family. Given that the standard deviation of the dependent variable is approximately 0.33, the effect is large. Funds that belong to the same family have a correlation that is higher by about 0.1 standard deviation relative to the entire population of funds. Note that since we control for fund i-year and fund j-year, this finding is "within fund-year," i.e., results from variation in the correlation of the same fund between and across fund families.

The result that funds within the same family exhibit higher correlation can be one of the reasons for why large institutional investors engage in large trades beyond the trades of a collection of small institutional investors.

## 5 The Nature of the Increase in 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 more negative and higher in absolute value 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.

### 5.1 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 should be unpredictable. Hence, the autocorrelation of returns should be zero. Thus, a finding that autocorrelation is related to the 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 filter out the contribution of standard factors in computing the autocorrelation.

In Table 8, Panel A, we report estimates from the regression of stock-return autocorrelation on Top Institutional ownership and controls, including stock and quarter fixed effects. Standard errors are clustered at the quarter and stock levels. The results suggest a significantly negative relation between return autocorrelation and ownership by large firms. The interpretation of these coefficients is ambiguous in terms of the implications for price efficiency. If the autocorrelation of returns is overall negative, the negative estimates imply that returns of stocks owned by top institutions are even more negatively autocorrelated and, therefore, more noisy. On the other hand, if the autocorrelation of returns is on average positive, the negative sign of the coefficients implies that the prices of stocks owned by large firms are closer to a random walk (zero autocorrelation of returns) and, therefore, more efficient.

We dispel this ambiguity in Panel B of Table 8, using the absolute value of the autocorrelation as dependent variable. The estimates suggest a significantly positive relation between the absolute value return autocorrelation and large firm ownership (up to the top 20th institution). In combination with Panel A, this finding allows us to conclude that the returns of stocks with more top institutions in their client base are more negatively autocorrelated than the returns of other stocks. In other words, the prices of stocks with higher ownership by larger firms are less efficient, on average. The economic magnitude seems non-negligible. From Column (4) of Panel A, we infer that a one standard deviation increase in the ownership by the top ten institutions is associated with a decrease of 0.5% in the return autocorrelation coefficient.[16]

Overall, the results suggest that stocks with higher ownership by top institutions exhibit more noise in their prices than other stocks, even controlling for ownership by all institutions. This evidence strengthens the case for interpreting the positive impact of large institutions' ownership on volatility as the result of noise.

## 5.2 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

[16] Using the statistics from Table 1, Panel B: -0.063 * 0.082 = -0.005.

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 from the rolling regression of the daily excess return of the stock with respect to the excess return 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, as well as various stock characteristics such as the logarithm of size, liquidity, book-to-market, and momentum. 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 9, the results show unambiguously that the co-movement of stocks with the institutional portfolio increases with the institution's ownership in the stock. A 1% increase in ownership by a large institution contributes 0.01 to 0.02 to the beta of the stock with that institution. 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.

## 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 because institutions place larger-than-expected trades. 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 beneficial role played by large institutions in terms of 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 inst 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 |
| Greenwood and Thesmar (2011) Fragility | The effective concentration of ownership of a financial asset, weighted by the volatility and correlation of the trading needs of its investors (Greenwood and Thesmar, 2011). | 13F, CRSP |
| Piotroski F-Score | A score to determine a firm's financial strength using Piotroski's (2000) F-Score methodology. | Compustat |
| Ohlson O-Score | A score to predict financial distress following Ohlson (1980). | Compustat |
| Altman's Z | Z-score following the formula by Altman (1968) to predict bankruptcy. | Compustat |
| CHS distress risk | A score developed by Campbell, Hilscher, and Szilagyi (2008) to measure distress risk. | Compustat, CRSP |
| Fraction of qtrs. with negative income | The fraction of quarters in the last two years in which the firm posted negative income. | Compustat |
| State-level dGDP | The change in the state-level Gross Domestic Product (GDP). | Bureau of Economic Analysis |
| Combined ownership | Ownership of the large institution which was the result of the 2009 Blackrock-BGI merger. | 13F |
| Post-merger dummy | An indicator to whether the quarter in consideration is in 2010/Q1 or later. | - |
| ρ(DGTW-adjusted returns(t, t-1)) | The daily autocorrelation in stock benchmark-adjusted returns (adjusted to DGTW portfolio returns). | CRSP |

## Appendix A. Variable Definitions (Cont.)

| Variable | Description | Source |
|---|---|---|
| Beta of daily returns with those of Top inst. portfolio | Sensitivity of the stock's daily returns to the portfolio of the largest 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 |
| Total absolute trades by institutions | The sum of absolute value of net trades of institutions during the quarter. Expressed as fraction of market capitalization (beginning of the quarter). | 13F, CRSP |
| Mutual fund flow correlation (i, j) | The correlation between the flows (scaled by total net assets) of two funds over a calendar year. | CRSP Mutual Fund Database |
| Same management company (i, j) | An indicator to whether the two funds share the same parent management company. | CRSP Mutual Fund Database |

## 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. 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. Finally, Panel D presents correlations of key variables used in the analysis. 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 (%) (q) | 624,296 | 3.556 | 2.563 | 0.208 | 1.865 | 2.831 | 4.399 | 24.523 |
| ρ(DGTW-adj ret(t, t-1)) | 562,013 | -0.088 | 0.188 | -0.623 | -0.212 | -0.077 | 0.044 | 0.458 |
| 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 |
| Greenwood and Thesmar Concentration | 493,756 | 0.118 | 0.196 | 0.000 | 0.014 | 0.047 | 0.122 | 1.540 |
| Piotroski Financial Statement Score | 438,469 | 4.090 | 1.710 | 0.000 | 3.000 | 4.000 | 5.000 | 9.000 |
| Ohlson O-Score | 438,469 | -0.041 | 2.450 | -394.000 | -1.040 | 0.168 | 1.220 | 77.700 |
| Altman Z-Score | 438,469 | 6.180 | 26.000 | -299.000 | 2.190 | 3.660 | 5.880 | 5,208.000 |
| CHS (Campbell, et al., 2011) | 438,469 | 7.600 | 5.150 | -1,469.000 | 7.190 | 8.090 | 8.610 | 185.000 |
| Fraction of qtrs with negative income | 438,469 | 0.272 | 0.346 | 0.000 | 0.000 | 0.125 | 0.500 | 1.000 |
| 2009 Blackrock-BGI Merger | | | | | | | | |
| Daily volatility (%) (q) | 31,331 | 3.004 | 1.546 | 0.205 | 1.940 | 2.695 | 3.693 | 11.131 |
| Combined ownership (q-1) | 31,331 | 0.046 | 0.030 | 0.000 | 0.020 | 0.049 | 0.066 | 0.365 |
| Absolute combined trades (q) | 31,331 | 0.004 | 0.008 | 0.000 | 0.000 | 0.001 | 0.004 | 0.142 |
| Mutual Fund Flows | | | | | | | | |
| Mutual funds (i, j) correlation | 2,213,117 | 0.030 | 0.333 | -1.000 | -0.192 | 0.028 | 0.254 | 1.000 |
| Same management company indicator | 2,213,117 | 0.008 | 0.089 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |

## Table 1. Summary Statistics (Cont.)

### Panel B: Characteristics of Large Institutions

| | Top inst ownership | | Same state | | ΔCDS | | Beta | | Total abs trades | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N = 624,296 | | N = 600,649 | | N = 225,505 | | N = 617,884 | | N = 416,624 | |
| | 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 | | | 0.008 | 0.011 |
| Top 5 insts | 0.050 | 0.060 | 0.450 | 0.800 | 0.000 | 0.002 | | | 0.010 | 0.013 |
| Top 7 insts | 0.060 | 0.070 | 0.612 | 1.030 | 0.000 | 0.002 | | | 0.013 | 0.015 |
| Top 10 insts | 0.073 | 0.082 | 0.845 | 1.340 | 0.000 | 0.002 | | | 0.017 | 0.019 |
| Top 11-Top 20 | 0.032 | 0.045 | | | | | | | | |
| Top 21-Top 30 | 0.020 | 0.032 | | | | | | | | |
| Top 30-Top 50 | 0.027 | 0.039 | | | | | | | | |
| > Top 10 | | | | | | | | | 0.030 | 0.044 |

### Panel C: Stock Ownership by Large Institutions, by Index

| | All stocks | | S&P 500 | | Russell 1000 | | Russell 2000 | | Russell 3000 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Top inst own'p (%) | Top inst (0/1) | Top inst own'p (%) | Top inst (0/1) | Top inst own'p (%) | Top inst (0/1) | Top inst own'p (%) | Top inst (0/1) | Top inst own'p (%) | Top inst (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 1. Summary Statistics (Cont.)

### Panel D: Correlation of Key Variables

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.00 | | | | | | | | | | |
| (2) | -0.22 | 1.00 | | | | | | | | | |
| (3) | -0.22 | 0.17 | 1.00 | | | | | | | | |
| (4) | -0.27 | 0.22 | 0.78 | 1.00 | | | | | | | |
| (5) | 0.42 | -0.07 | -0.22 | -0.28 | 1.00 | | | | | | |
| (6) | 0.51 | -0.40 | -0.39 | -0.48 | 0.37 | 1.00 | | | | | |
| (7) | -0.46 | 0.28 | 0.60 | 0.68 | -0.44 | -0.70 | 1.00 | | | | |
| (8) | -0.17 | 0.09 | 0.03 | 0.04 | -0.15 | -0.17 | 0.16 | 1.00 | | | |
| (9) | 0.11 | -0.09 | -0.11 | -0.12 | 0.19 | 0.32 | -0.28 | -0.13 | 1.00 | | |
| (10) | 0.00 | 0.02 | 0.09 | 0.26 | -0.04 | -0.09 | 0.05 | 0.00 | 0.02 | 1.00 | |
| (11) | -0.15 | 0.13 | 0.53 | 0.57 | -0.14 | -0.28 | 0.40 | 0.02 | -0.07 | 0.14 | 1.00 |

(1) Daily volatility (%)
(2) ρ(DGTW-adj ret(t, t-1))
(3) Ownership by Top Ten Insts
(4) Ownership by all institutions (q-1)
(5) 1 / price (q-1)
(6) Amihud illiquidity (q-1)
(7) log(market cap) (q-1)
(8) Past 6-month return (q-3 to q-1)
(9) Book-to-market (q-1)
(10) Ownership by bottom institutions
(11) Greenwood and Thesmar concentration

## 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. Panel C restricts the sample to only S&P 500 stocks, and Panel D focuses on financial crises. Lastly, Panel E incorporates the concentration measure (G) of Greenwood and Thesmar (2011). The sample period is 1980/Q1–2014/Q1. Appendix A provides variable description. t-statistics are 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) (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| Institutions: | Top 3 | Top 5 | Top 7 | Top 10 | Top 11-20 | Top 21-30 | Top 31-50 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Top inst. ownership (q-1) | 0.422*** | 0.586*** | 0.609*** | 0.550*** | 0.563*** | 0.229** | 0.201* |
| | (2.93) | (5.46) | (6.38) | (6.53) | (5.38) | (1.96) | (1.76) |
| Daily volatility (q-1) | 0.689*** | 0.689*** | 0.689*** | 0.689*** | 0.689*** | 0.689*** | 0.689*** |
| | (52.59) | (52.59) | (52.59) | (52.62) | (52.68) | (52.68) | (52.68) |
| Ownership by all institutions (q-1) | 0.152*** | 0.119*** | 0.101*** | 0.090** | 0.137*** | 0.177*** | 0.176*** |
| | (4.81) | (3.48) | (3.01) | (2.55) | (4.22) | (5.42) | (5.13) |
| 1 / price (q-1) | 0.295*** | 0.294*** | 0.294*** | 0.294*** | 0.294*** | 0.295*** | 0.295*** |
| | (7.06) | (7.05) | (7.03) | (7.04) | (7.05) | (7.06) | (7.06) |
| Amihud illiquidity (q-1) | 0.364*** | 0.362*** | 0.361*** | 0.360*** | 0.361*** | 0.363*** | 0.363*** |
| | (12.61) | (12.56) | (12.52) | (12.47) | (12.52) | (12.60) | (12.61) |
| log(market cap) (q-1) | -0.120*** | -0.122*** | -0.123*** | -0.123*** | -0.121*** | -0.119*** | -0.119*** |
| | (-19.33) | (-19.49) | (-19.30) | (-19.40) | (-19.44) | (-19.10) | (-19.06) |
| Past 6-month return (q-3 to q-1) | -0.255*** | -0.254*** | -0.254*** | -0.253*** | -0.253*** | -0.255*** | -0.255*** |
| | (-2.99) | (-2.98) | (-2.98) | (-2.97) | (-2.97) | (-2.99) | (-2.99) |
| Book-to-market (q-1) | -0.175*** | -0.175*** | -0.175*** | -0.175*** | -0.175*** | -0.175*** | -0.175*** |
| | (-10.56) | (-10.54) | (-10.54) | (-10.51) | (-10.56) | (-10.56) | (-10.60) |
| Ownership by bottom institutions (q-1) | -0.509*** | -0.439*** | -0.409*** | -0.394*** | -0.496*** | -0.562*** | -0.560*** |
| | (-4.54) | (-4.12) | (-3.82) | (-3.78) | (-4.55) | (-5.02) | (-5.10) |
| 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 $R^2$ | 0.630 | 0.630 | 0.631 | 0.631 | 0.630 | 0.630 | 0.630 |

## 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) (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| Institutions: | Top 3 | Top 5 | Top 7 | Top 10 | Top 11-20 | Top 21-30 | Top 31-50 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Top inst ownership (q-1) | 0.755*** | 0.842*** | 0.897*** | 0.785*** | 0.993*** | 0.523*** | -0.018 |
| | (3.16) | (4.16) | (5.40) | (5.55) | (5.30) | (3.17) | (-0.11) |
| Ownership by all institutions (q-1) | 0.154*** | 0.124** | 0.096* | 0.085 | 0.128** | 0.189*** | 0.221*** |
| | (2.66) | (2.08) | (1.69) | (1.44) | (1.99) | (3.03) | (3.36) |
| 1 / price (q-1) | 0.597*** | 0.596*** | 0.596*** | 0.596*** | 0.596*** | 0.596*** | 0.597*** |
| | (9.53) | (9.53) | (9.52) | (9.53) | (9.53) | (9.54) | (9.54) |
| Amihud illiquidity (q-1) | 1.499*** | 1.497*** | 1.496*** | 1.495*** | 1.496*** | 1.499*** | 1.499*** |
| | (23.70) | (23.65) | (23.62) | (23.60) | (23.61) | (23.65) | (23.66) |
| log(market cap) (q-1) | -0.284*** | -0.287*** | -0.289*** | -0.289*** | -0.284*** | -0.282*** | -0.281*** |
| | (-10.14) | (-10.21) | (-10.22) | (-10.38) | (-10.33) | (-10.20) | (-10.20) |
| Past 6-month return (q-3 to q-1) | -0.108 | -0.107 | -0.106 | -0.105 | -0.106 | -0.109 | -0.109 |
| | (-0.93) | (-0.92) | (-0.91) | (-0.91) | (-0.91) | (-0.93) | (-0.94) |
| Book-to-market (q-1) | 0.002 | 0.001 | 0.002 | 0.002 | 0.003 | 0.002 | 0.003 |
| | (0.07) | (0.05) | (0.06) | (0.07) | (0.11) | (0.07) | (0.09) |
| Ownership by bottom institutions (q-1) | -1.637*** | -1.575*** | -1.533*** | -1.521*** | -1.615*** | -1.708*** | -1.738*** |
| | (-7.26) | (-7.12) | (-6.85) | (-6.92) | (-7.42) | (-7.63) | (-7.77) |
| Stock FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 623,805 | 623,805 | 623,805 | 623,805 | 623,805 | 623,805 | 623,805 |
| Adj $R^2$ | 0.221 | 0.221 | 0.221 | 0.221 | 0.221 | 0.221 | 0.221 |

## 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) (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| Institutions: | Top 3 | Top 5 | Top 7 | Top 10 | Top 11-20 | Top 21-30 | Top 31-50 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Top inst. ownership (q-1) | 0.910*** | 0.973*** | 1.042*** | 0.823*** | 0.216 | -0.113 | -0.718*** |
| | (2.89) | (4.00) | (4.77) | (4.35) | (1.11) | (-0.48) | (-3.84) |
| Ownership by all institutions (q-1) | -0.065 | -0.112 | -0.157 | -0.154 | -0.009 | 0.027 | 0.094 |
| | (-0.60) | (-1.00) | (-1.49) | (-1.42) | (-0.08) | (0.24) | (0.85) |
| 1 / price (q-1) | 5.476*** | 5.473*** | 5.472*** | 5.486*** | 5.508*** | 5.511*** | 5.508*** |
| | (10.83) | (10.87) | (10.90) | (10.89) | (10.85) | (10.84) | (10.85) |
| Amihud illiquidity (q-1) | 0.263 | 0.254 | 0.236 | 0.229 | 0.247 | 0.251 | 0.253 |
| | (0.75) | (0.72) | (0.67) | (0.65) | (0.70) | (0.71) | (0.72) |
| log(market cap) (q-1) | -0.074** | -0.076** | -0.078** | -0.078** | -0.073** | -0.073** | -0.072** |
| | (-2.04) | (-2.11) | (-2.15) | (-2.17) | (-2.04) | (-2.01) | (-1.99) |
| Past 6-month return (q-3 to q-1) | -0.140 | -0.140 | -0.139 | -0.135 | -0.131 | -0.132 | -0.137 |
| | (-1.44) | (-1.45) | (-1.43) | (-1.40) | (-1.35) | (-1.37) | (-1.42) |
| Book-to-market (q-1) | 0.052 | 0.051 | 0.053 | 0.053 | 0.051 | 0.052 | 0.054 |
| | (1.19) | (1.17) | (1.22) | (1.22) | (1.17) | (1.18) | (1.24) |
| Ownership by bottom institutions (q-1) | -0.967 | -0.793 | -0.627 | -0.661 | -1.031 | -1.126 | -1.263 |
| | (-0.73) | (-0.60) | (-0.47) | (-0.50) | (-0.79) | (-0.86) | (-0.96) |
| Stock FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 65,396 | 65,396 | 65,396 | 65,396 | 65,396 | 65,396 | 65,396 |
| Adj $R^2$ | 0.072 | 0.072 | 0.073 | 0.072 | 0.071 | 0.071 | 0.072 |

## 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 | | | |
| Institutions: | Top 3 | Top 5 | Top 7 | Top 10 | Top 3 | Top 5 | Top 7 | Top 10 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Top inst ownership (q-1) | 0.943* | 1.207*** | 1.365*** | 1.134*** | 2.032*** | 1.798** | 1.856*** | 0.640** |
| | (1.79) | (2.90) | (3.82) | (4.08) | (2.60) | (2.46) | (3.48) | (2.12) |
| Ownership by all institutions (q-1) | 0.396*** | 0.340** | 0.291** | 0.279** | 0.729** | 0.689* | 0.628* | 0.803** |
| | (3.14) | (2.49) | (2.29) | (2.16) | (2.07) | (1.95) | (1.85) | (2.43) |
| 1 / price (q-1) | 0.462*** | 0.462*** | 0.462*** | 0.462*** | 0.091 | 0.091 | 0.091 | 0.090 |
| | (5.95) | (5.95) | (5.94) | (5.94) | (0.56) | (0.56) | (0.55) | (0.55) |
| Amihud illiquidity (q-1) | 1.401*** | 1.400*** | 1.398*** | 1.397*** | 0.989*** | 0.988*** | 0.989*** | 0.982*** |
| | (13.94) | (13.94) | (13.93) | (13.92) | (9.38) | (9.44) | (9.43) | (9.30) |
| log(market cap) (q-1) | -0.391*** | -0.394*** | -0.397*** | -0.397*** | -1.042*** | -1.040*** | -1.043*** | -1.040*** |
| | (-5.91) | (-6.00) | (-5.99) | (-6.06) | (-4.05) | (-4.03) | (-4.03) | (-4.03) |
| 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 |
| | (-4.20) | (-4.20) | (-4.18) | (-4.18) | (-1.27) | (-1.27) | (-1.26) | (-1.26) |
| Book-to-market (q-1) | -0.010 | -0.011 | -0.011 | -0.010 | -0.145** | -0.145** | -0.144** | -0.144** |
| | (-0.31) | (-0.33) | (-0.32) | (-0.30) | (-2.16) | (-2.16) | (-2.16) | (-2.15) |
| Ownership by bottom institutions (q-1) | -1.953*** | -1.852*** | -1.775*** | -1.766*** | -1.058 | -1.029 | -0.955 | -1.114 |
| | (-4.45) | (-4.37) | (-4.07) | (-4.09) | (-1.41) | (-1.35) | (-1.27) | (-1.52) |
| Stock FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 170,078 | 170,078 | 170,078 | 170,078 | 34,853 | 34,853 | 34,853 | 34,853 |
| Adj $R^2$ | 0.189 | 0.189 | 0.189 | 0.189 | 0.110 | 0.110 | 0.110 | 0.109 |

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

### Panel E: Ownership by Large Asset Managers and Daily Volatility, Including Greenwood and Thesmar's (2011) Measure of Concentration

| Dependent variable: | Daily volatility (q) (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| Institutions: | Top 3 | Top 5 | Top 7 | Top 10 | Top 11-20 | Top 21-30 | Top 31-50 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Top inst. ownership (q-1) | 0.437** | 0.489*** | 0.617*** | 0.548*** | 0.524*** | 0.332** | 0.161 |
| | (2.50) | (3.24) | (5.02) | (5.14) | (3.50) | (2.26) | (1.23) |
| Daily volatility (q-1) | 0.443*** | 0.443*** | 0.443*** | 0.443*** | 0.443*** | 0.443*** | 0.443*** |
| | (48.68) | (48.69) | (48.65) | (48.63) | (48.71) | (48.64) | (48.65) |
| Ownership by all institutions (q-1) | 0.368*** | 0.351*** | 0.323*** | 0.313*** | 0.356*** | 0.387*** | 0.393*** |
| | (7.46) | (6.89) | (6.52) | (6.22) | (6.83) | (7.78) | (7.60) |
| 1 / price (q-1) | 0.281*** | 0.281*** | 0.281*** | 0.281*** | 0.281*** | 0.281*** | 0.281*** |
| | (6.18) | (6.18) | (6.17) | (6.17) | (6.17) | (6.17) | (6.17) |
| Amihud illiquidity (q-1) | 0.724*** | 0.723*** | 0.723*** | 0.723*** | 0.722*** | 0.723*** | 0.723*** |
| | (20.28) | (20.28) | (20.28) | (20.27) | (20.23) | (20.22) | (20.24) |
| log(market cap) (q-1) | -0.287*** | -0.288*** | -0.290*** | -0.290*** | -0.287*** | -0.286*** | -0.286*** |
| | (-12.83) | (-12.88) | (-12.92) | (-13.04) | (-12.95) | (-12.86) | (-12.87) |
| Past 6-month return (q-3 to q-1) | -0.165** | -0.165** | -0.164** | -0.164** | -0.165** | -0.166** | -0.166** |
| | (-2.24) | (-2.24) | (-2.23) | (-2.22) | (-2.24) | (-2.25) | (-2.25) |
| Book-to-market (q-1) | -0.082*** | -0.082*** | -0.082*** | -0.082*** | -0.081*** | -0.082*** | -0.082*** |
| | (-5.37) | (-5.39) | (-5.38) | (-5.37) | (-5.32) | (-5.36) | (-5.35) |
| Ownership by bottom institutions (q-1) | -1.288*** | -1.259*** | -1.219*** | -1.210*** | -1.280*** | -1.323*** | -1.328*** |
| | (-8.57) | (-8.45) | (-8.22) | (-8.29) | (-8.94) | (-8.89) | (-9.05) |
| Greenwood and Thesmar Concentration (q-1) | 0.081*** | 0.079*** | 0.077*** | 0.078*** | 0.088*** | 0.083*** | 0.086*** |
| | (3.59) | (3.55) | (3.43) | (3.48) | (3.82) | (3.58) | (3.73) |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 490,541 | 490,541 | 490,541 | 490,541 | 490,541 | 490,541 | 490,541 |
| Adj $R^2$ | 0.721 | 0.721 | 0.721 | 0.721 | 0.721 | 0.721 | 0.721 |

## 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 3, 5, 7, and 10 institutions. 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 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. Panel C presents the second set of results from an analysis containing the concentration measure (G) from Greenwood and Thesmar (2011). The sample period is 1980/Q1–2014/Q1. Appendix A provides variable description. t-statistics are based on standard errors clustered at the stock level are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

## Table 3. Instrumenting Large Institutional Ownership (Cont.)

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

| Dependent variable: | Top Inst. 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*** |
| | (3.19) | (3.85) | (4.54) | (4.75) |
| Daily volatility (q-1) (%) | 0.000*** | 0.000*** | 0.000*** | 0.001*** |
| | (2.89) | (3.17) | (3.20) | (4.16) |
| Ownership by all institutions (q-1) | 0.088*** | 0.116*** | 0.141*** | 0.177*** |
| | (34.93) | (29.46) | (34.78) | (42.24) |
| 1 / price (q-1) | 0.001** | 0.001*** | 0.002*** | 0.002*** |
| | (2.15) | (3.46) | (5.67) | (5.23) |
| Amihud illiquidity (q-1) | 0.001 | 0.004*** | 0.006*** | 0.008*** |
| | (1.41) | (4.42) | (6.30) | (7.94) |
| log(market cap) (q-1) | 0.003*** | 0.007*** | 0.009*** | 0.010*** |
| | (10.44) | (13.50) | (16.17) | (14.73) |
| Past 6-month return (q-3 to q-1) | -0.001** | -0.002*** | -0.002*** | -0.004*** |
| | (-2.36) | (-4.28) | (-5.67) | (-6.36) |
| Book-to-market (q-1) | 0.001*** | 0.001** | 0.001 | -0.000 |
| | (2.68) | (2.43) | (1.14) | (-0.65) |
| Ownership by bottom institutions (q-1) | -0.169*** | -0.243*** | -0.291*** | -0.354*** |
| | (-24.45) | (-23.98) | (-28.26) | (-30.05) |
| PFS Score | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| | (5.18) | (6.08) | (5.44) | (5.45) |
| O-Score | -0.000*** | -0.000*** | -0.000*** | -0.000*** |
| | (-3.46) | (-4.19) | (-4.17) | (-4.05) |
| Altman's Z | -0.000 | -0.000 | -0.000 | -0.000 |
| | (-0.17) | (-0.79) | (-1.18) | (-1.37) |
| CHS | -0.000* | -0.000** | -0.000* | -0.000** |
| | (-1.75) | (-2.14) | (-1.77) | (-2.26) |
| Fraction of qtrs with negative income | -0.003*** | -0.001 | -0.000 | -0.001 |
| | (-4.63) | (-1.58) | (-0.42) | (-0.94) |
| State-level dGDP (q) | -0.005 | -0.004 | -0.003 | -0.003 |
| | (-1.04) | (-0.64) | (-0.37) | (-0.45) |
| State-level dGDP (q-1) | -0.003 | -0.005 | -0.004 | -0.000 |
| | (-0.61) | (-0.81) | (-0.68) | (-0.06) |
| State-level dGDP (q-2) | 0.007 | 0.000 | 0.001 | 0.011 |
| | (1.51) | (0.07) | (0.20) | (1.50) |
| Calendar quarter FE | Yes | Yes | Yes | Yes |
| Observations | 433,561 | 433,561 | 433,561 | 433,561 |
| Adj $R^2$ | 0.593 | 0.661 | 0.689 | 0.718 |
| Stock and Yogo (2005) F-test | 10.20 | 14.80 | 20.56 | 22.56 |

**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 Inst. Ownership (IV) (q-1) | 42.214*** | 27.007*** | 18.739*** | 12.424*** |
| | (2.59) | (2.98) | (3.07) | (2.75) |
| Daily volatility (q-1) (%) | 0.596*** | 0.598*** | 0.602*** | 0.603*** |
| | (44.51) | (47.33) | (49.52) | (49.93) |
| Ownership by all institutions (q-1) | -3.492** | -2.936*** | -2.432*** | -1.991** |
| | (-2.47) | (-2.86) | (-2.88) | (-2.51) |
| 1 / price (q-1) | 0.208*** | 0.201*** | 0.193*** | 0.205*** |
| | (4.80) | (4.80) | (4.63) | (5.12) |
| Amihud illiquidity (q-1) | 0.452*** | 0.386*** | 0.377*** | 0.386*** |
| | (11.11) | (7.65) | (7.34) | (7.75) |
| log(market cap) (q-1) | -0.240*** | -0.273*** | -0.257*** | -0.222*** |
| | (-4.21) | (-4.47) | (-4.76) | (-4.76) |
| Past 6-month return (q-3 to q-1) | -0.149* | -0.140* | -0.140* | -0.138* |
| | (-1.89) | (-1.87) | (-1.82) | (-1.84) |
| Book-to-market (q-1) | -0.222*** | -0.217*** | -0.202*** | -0.189*** |
| | (-9.16) | (-9.23) | (-10.14) | (-10.58) |
| Ownership by bottom institutions (q-1) | 6.115** | 5.535*** | 4.425** | 3.370** |
| | (2.28) | (2.59) | (2.57) | (2.16) |
| PFS Score | -0.048*** | -0.046*** | -0.042*** | -0.040*** |
| | (-6.10) | (-7.35) | (-7.95) | (-8.76) |
| O-Score | 0.004 | 0.005 | 0.003 | 0.001 |
| | (1.05) | (1.27) | (0.89) | (0.40) |
| Altman's Z | 0.000 | 0.000 | 0.000 | 0.000 |
| | (1.10) | (1.41) | (1.42) | (1.44) |
| CHS | -0.002 | -0.002 | -0.003** | -0.003** |
| | (-1.50) | (-1.61) | (-2.06) | (-2.09) |
| Fraction of qtrs with negative income | 0.840*** | 0.753*** | 0.728*** | 0.735*** |
| | (11.39) | (15.28) | (16.48) | (17.57) |
| State-level dGDP (q) | 1.008*** | 0.891*** | 0.859*** | 0.833*** |
| | (3.27) | (3.49) | (3.56) | (3.70) |
| State-level dGDP (q-1) | 0.968*** | 0.998*** | 0.947*** | 0.867*** |
| | (3.52) | (3.89) | (3.82) | (3.68) |
| State-level dGDP (q-2) | 0.199 | 0.498** | 0.485** | 0.368* |
| | (0.71) | (2.10) | (2.19) | (1.71) |
| Calendar quarter FE | Yes | Yes | Yes | Yes |
| Observations | 433,561 | 433,561 | 433,561 | 433,561 |

## Table 3. Instrumenting Large Institutional Ownership (Cont.)

### Panel C: Second Stage: Instrumented Ownership by Large Institutional Investors and Stock Volatility and Including Greenwood and Thesmar's (2011) Concentration Measure

| Dependent variable: | Daily volatility (q) (%) | | | |
|---|---|---|---|---|
| Institution: | Top 3 insts | Top 5 insts | Top 7 insts | Top 10 insts |
| | (1) | (2) | (3) | (4) |
| Top Inst. Ownership (IV) (q-1) | 135.658 | 56.661*** | 34.767*** | 24.875*** |
| | (1.64) | (2.72) | (3.08) | (2.80) |
| Daily volatility (q-1) (%) | 0.586*** | 0.594*** | 0.597*** | 0.597*** |
| | (35.35) | (45.90) | (48.41) | (48.34) |
| Ownership by all institutions (q-1) | -5.069* | -3.208** | -2.494** | -2.182** |
| | (-1.82) | (-2.39) | (-2.44) | (-2.04) |
| 1 / price (q-1) | 0.236*** | 0.226*** | 0.216*** | 0.226*** |
| | (5.29) | (5.56) | (5.40) | (5.77) |
| Amihud illiquidity (q-1) | 0.545*** | 0.465*** | 0.447*** | 0.443*** |
| | (9.70) | (12.04) | (12.06) | (11.90) |
| log(market cap) (q-1) | -0.259*** | -0.251*** | -0.228*** | -0.199*** |
| | (-3.03) | (-4.07) | (-4.51) | (-4.39) |
| Past 6-month return (q-3 to q-1) | -0.164** | -0.171** | -0.177** | -0.175** |
| | (-1.96) | (-2.26) | (-2.32) | (-2.31) |
| Book-to-market (q-1) | -0.247*** | -0.227*** | -0.207*** | -0.193*** |
| | (-6.51) | (-8.55) | (-10.00) | (-10.67) |
| Ownership by bottom institutions (q-1) | 8.617* | 5.534** | 4.083** | 3.293* |
| | (1.71) | (2.16) | (2.13) | (1.72) |
| PFS Score | -0.053*** | -0.048*** | -0.043*** | -0.041*** |
| | (-4.45) | (-6.63) | (-7.75) | (-8.27) |
| O-Score | 0.004 | 0.003 | 0.001 | -0.001 |
| | (0.72) | (0.65) | (0.16) | (-0.40) |
| Altman's Z | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.48) | (0.91) | (0.77) | (0.70) |
| CHS | -0.002 | -0.002 | -0.003** | -0.003** |
| | (-1.16) | (-1.60) | (-2.01) | (-1.99) |
| Fraction of qtrs with negative income | 0.919*** | 0.784*** | 0.757*** | 0.762*** |
| | (7.48) | (13.87) | (15.68) | (16.66) |
| State-level dGDP (q) | 1.358*** | 1.008*** | 0.896*** | 0.827*** |
| | (2.66) | (3.44) | (3.55) | (3.50) |
| State-level dGDP (q-1) | 0.933*** | 0.893*** | 0.829*** | 0.760*** |
| | (2.75) | (3.23) | (3.30) | (3.15) |
| State-level dGDP (q-2) | 0.246 | 0.485* | 0.501** | 0.328 |
| | (0.65) | (1.74) | (1.99) | (1.34) |
| Greenwood and Thesmar's Fragility | 65.979* | 31.906** | 20.517** | 14.105** |
| | (1.86) | (2.46) | (2.54) | (2.16) |
| Calendar quarter FE | Yes | Yes | Yes | Yes |
| Observations | 344,301 | 344,301 | 344,301 | 344,301 |

## Table 4. 2009 Blackrock-BGI 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 the merger between Blackrock and BGI 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/Q4) and several quarters after the merger, as specified. Appendix A provides variable description. t-statistics are 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) |
| Post-merger dummy | | | | | | | | |
| × Combined ownership (q-1) | 2.034*** | 1.955*** | 2.221*** | 1.501** | 1.579*** | 1.400*** | 1.533*** | 1.703*** |
| | (3.22) | (3.25) | (4.58) | (2.16) | (2.73) | (2.61) | (3.14) | (3.61) |
| × Absoltue combined trades (q) | -0.499 | 3.154 | 2.513 | 3.189 | 2.056 | 2.058* | 1.775** | 1.881* |
| | (-0.21) | (1.53) | (1.23) | (1.61) | (1.36) | (1.80) | (2.15) | (1.95) |
| × Ownership by all institutions (q-1) | 0.045 | 0.095* | 0.202* | 0.210*** | 0.186** | 0.179*** | 0.244*** | 0.292*** |
| | (0.66) | (1.78) | (1.95) | (2.58) | (2.53) | (2.64) | (2.99) | (3.58) |
| × 1 / price (q-1) | -0.010 | 0.081 | -0.081 | -0.084 | -0.044 | -0.050 | -0.035 | -0.021 |
| | (-0.11) | (0.87) | (-0.48) | (-0.61) | (-0.35) | (-0.43) | (-0.33) | (-0.21) |
| × Amihud illiquidity (q-1) | -0.005 | -0.153 | -0.159* | -0.125 | -0.154* | -0.143* | -0.249** | -0.278*** |
| | (-0.06) | (-1.23) | (-1.71) | (-1.41) | (-1.70) | (-1.67) | (-2.11) | (-2.60) |
| × log(market cap) (q-1) | 0.031*** | 0.035*** | 0.018 | 0.016 | 0.019* | 0.021** | 0.017** | 0.010 |
| | (3.52) | (4.26) | (1.29) | (1.41) | (1.78) | (2.20) | (1.99) | (1.01) |
| × Past 6-month return (q-3 to q-1) | -0.278*** | -0.100 | -0.092 | -0.044 | 0.010 | -0.027 | -0.122 | -0.169 |
| | (-3.23) | (-0.94) | (-0.98) | (-0.38) | (0.10) | (-0.26) | (-0.97) | (-1.33) |
| × Book-to-market (q-1) | -0.139*** | -0.061 | -0.044 | -0.069 | -0.086** | -0.107** | -0.118*** | -0.107*** |
| | (-4.71) | (-1.10) | (-1.08) | (-1.50) | (-2.00) | (-2.41) | (-2.78) | (-2.98) |
| × Ownership by bottom institutions (q-1) | -0.897** | -0.893** | -0.557 | -0.857** | -0.745** | -0.729** | -0.875*** | -0.907*** |
| | (-2.02) | (-2.31) | (-1.44) | (-2.16) | (-2.17) | (-2.26) | (-2.62) | (-2.89) |
| Combined ownership (q-1) | 1.098 | -2.244 | 1.389 | 1.224 | 0.964 | 0.314 | 0.586 | 1.020 |
| | (0.85) | (-1.26) | (0.95) | (1.05) | (0.98) | (0.33) | (0.68) | (1.17) |
| Absoltue combined trades (q) | 0.900 | 2.110** | 2.634*** | 2.142*** | 1.611** | 1.533** | 1.452** | 1.645*** |
| | (1.09) | (2.08) | (3.37) | (2.73) | (2.10) | (2.31) | (2.28) | (2.61) |
| Ownership by all institutions (q-1) | -0.135 | -0.062 | -0.190 | -0.409** | -0.447*** | -0.463*** | -0.362*** | -0.335*** |
| | (-0.42) | (-0.24) | (-0.83) | (-2.08) | (-3.26) | (-3.67) | (-2.73) | (-2.88) |
| 1 / price (q-1) | 0.473 | 0.211 | 0.514* | 0.551** | 0.595** | 0.560** | 0.483** | 0.565*** |
| | (1.56) | (1.04) | (1.65) | (2.02) | (2.49) | (2.55) | (2.53) | (3.19) |
| Amihud illiquidity (q-1) | 0.538*** | 0.740*** | 0.665*** | 0.710*** | 0.502*** | 0.514*** | 0.444*** | 0.433*** |
| | (2.73) | (5.90) | (5.39) | (5.34) | (2.74) | (3.37) | (3.27) | (3.47) |
| log(market cap) (q-1) | 0.395*** | -0.011 | -0.131 | -0.198 | -0.188 | -0.193 | -0.329** | -0.351*** |
| | (2.78) | (-0.07) | (-1.14) | (-1.45) | (-1.41) | (-1.61) | (-2.39) | (-3.14) |
| Past 6-month return (q-3 to q-1) | 0.339*** | 0.352*** | 0.297*** | 0.338*** | 0.373*** | 0.391*** | 0.408*** | 0.397*** |
| | (7.26) | (9.21) | (6.71) | (6.77) | (7.36) | (8.70) | (9.61) | (10.21) |
| Book-to-market (q-1) | 0.166* | 0.197** | 0.312*** | 0.333*** | 0.361*** | 0.387*** | 0.355*** | 0.401*** |
| | (1.69) | (2.31) | (2.65) | (3.86) | (4.91) | (5.50) | (5.19) | (5.65) |
| Ownership by bottom institutions (q-1) | -0.673 | 0.362 | 0.383 | 0.059 | 0.053 | 0.104 | -0.273 | -0.272 |
| | (-0.72) | (0.49) | (0.73) | (0.14) | (0.14) | (0.28) | (-0.57) | (-0.63) |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Stock FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 6,540 | 9,859 | 13,115 | 16,385 | 19,627 | 22,861 | 26,067 | 29,226 |
| Adj $R^2$ | 0.168 | 0.165 | 0.129 | 0.176 | 0.167 | 0.173 | 0.280 | 0.303 |

## Table 5. Large Institutional Investors' Trades

The table reports estimates from regressions in which the dependent variable is stock-quarter daily volatility and the explanatory variables of interest are institutional ownership and stock-level absolute trades by the top 3, 5, 7, and 10institutions,. Absolute trades for the top institutions are the sum of the absolute value of the stock-level trade for each of the institutions in a given quarter. Panel A reports estimates from OLS regressions. Panel B reports estimates from instrument variable regressions. The instrument for ownership is the same-state indicator. The instrument for trades is the two-quarter lagged value of trades. In the specification where both ownership and trades appear, both instruments are used. The sample period is 1980/Q1–2014/Q1. Stock-quarter-institutions in which there was no trade by the top institutions are excluded. Appendix A provides variable description. t-statistics are 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: Horse Race between Ownership and Trades by Large Institutions (OLS)

| Dependent variable: | Daily volatility (q) (%) | | | | | |
|---|---|---|---|---|---|---|
| Institutions: | Top 3 | | | Top 5 | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Total abs trades by top institutions (q) | 7.527*** | | 7.483*** | 7.870*** | | 7.742*** |
| | (34.66) | | (34.55) | (40.86) | | (40.22) |
| Top inst ownership (q-1) | | 0.656*** | 0.048 | | 0.745*** | 0.132** |
| | | (9.43) | (0.71) | | (13.01) | (2.35) |
| Daily volatility (q-1) (%) | 0.669*** | 0.672*** | 0.669*** | 0.668*** | 0.671*** | 0.668*** |
| | (242.67) | (243.46) | (242.61) | (242.05) | (243.18) | (241.89) |
| Total abs trades by all institutions (< Top 10) | 0.381*** | 0.571*** | 0.384*** | 0.318*** | 0.581*** | 0.327*** |
| | (7.39) | (11.09) | (7.41) | (6.17) | (11.29) | (6.33) |
| Ownership by all institutions (q-1) | 0.129*** | 0.154*** | 0.125*** | 0.094*** | 0.124*** | 0.080*** |
| | (9.75) | (10.39) | (8.57) | (7.07) | (8.26) | (5.40) |
| 1 / price (q-1) | 0.594*** | 0.592*** | 0.594*** | 0.595*** | 0.592*** | 0.595*** |
| | (27.84) | (27.81) | (27.83) | (27.83) | (27.79) | (27.82) |
| Amihud illiquidity (q-1) | 0.323*** | 0.310*** | 0.323*** | 0.324*** | 0.308*** | 0.324*** |
| | (32.27) | (31.11) | (32.27) | (32.37) | (30.94) | (32.31) |
| log(market cap) (q-1) | -0.120*** | -0.120*** | -0.120*** | -0.123*** | -0.122*** | -0.124*** |
| | (-48.47) | (-48.03) | (-48.35) | (-49.76) | (-48.54) | (-49.39) |
| Past 6-month return (q-3 to q-1) | -0.177*** | -0.170*** | -0.177*** | -0.178*** | -0.169*** | -0.178*** |
| | (-25.32) | (-24.19) | (-25.32) | (-25.58) | (-24.09) | (-25.54) |
| Book-to-market (q-1) | -0.175*** | -0.177*** | -0.175*** | -0.174*** | -0.177*** | -0.174*** |
| | (-27.95) | (-28.10) | (-27.97) | (-27.82) | (-28.13) | (-27.85) |
| Ownership by bottom institutions (q-1) | -0.316*** | -0.289*** | -0.308*** | -0.256*** | -0.223*** | -0.228*** |
| | (-3.83) | (-3.46) | (-3.71) | (-3.11) | (-2.67) | (-2.73) |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 |
| Adj $R^2$ | 0.690 | 0.689 | 0.690 | 0.690 | 0.689 | 0.690 |

## Table 5. Large Institutional Investors' Trades (Cont.)

### Panel A: Horse Race between Ownership and Trades by Large Institutions (OLS) (Continued)

| Dependent variable: | Daily volatility (q) (%) | | | | | |
|---|---|---|---|---|---|---|
| Institutions: | Top 7 | | | Top 10 | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Total abs trades by top institutions (q) | 7.888*** | | 7.844*** | 7.554*** | | 7.626*** |
| | (46.35) | | (45.97) | (49.37) | | (49.29) |
| Top inst ownership (q-1) | | 0.733*** | 0.043 | | 0.668*** | -0.070 |
| | | (14.36) | (0.87) | | (14.61) | (-1.56) |
| Daily volatility (q-1) (%) | 0.667*** | 0.671*** | 0.667*** | 0.665*** | 0.671*** | 0.665*** |
| | (241.23) | (243.15) | (241.16) | (240.19) | (243.13) | (240.22) |
| Total abs trades by all institutions (< Top 10) | 0.270*** | 0.581*** | 0.274*** | 0.209*** | 0.581*** | 0.203*** |
| | (5.25) | (11.29) | (5.30) | (4.06) | (11.28) | (3.93) |
| Ownership by all institutions (q-1) | 0.055*** | 0.108*** | 0.050*** | 0.006 | 0.094*** | 0.016 |
| | (4.15) | (7.07) | (3.31) | (0.42) | (5.89) | (1.03) |
| 1 / price (q-1) | 0.596*** | 0.591*** | 0.596*** | 0.598*** | 0.592*** | 0.598*** |
| | (27.79) | (27.76) | (27.78) | (27.75) | (27.75) | (27.76) |
| Amihud illiquidity (q-1) | 0.323*** | 0.307*** | 0.323*** | 0.325*** | 0.305*** | 0.326*** |
| | (32.27) | (30.72) | (32.18) | (32.37) | (30.55) | (32.32) |
| log(market cap) (q-1) | -0.126*** | -0.124*** | -0.126*** | -0.127*** | -0.124*** | -0.127*** |
| | (-50.90) | (-48.92) | (-50.16) | (-51.54) | (-49.29) | (-50.48) |
| Past 6-month return (q-3 to q-1) | -0.180*** | -0.168*** | -0.180*** | -0.180*** | -0.167*** | -0.180*** |
| | (-25.78) | (-24.00) | (-25.78) | (-25.79) | (-23.89) | (-25.87) |
| Book-to-market (q-1) | -0.173*** | -0.176*** | -0.173*** | -0.171*** | -0.176*** | -0.171*** |
| | (-27.67) | (-28.10) | (-27.68) | (-27.38) | (-28.02) | (-27.37) |
| Ownership by bottom institutions (q-1) | -0.201** | -0.199** | -0.190** | -0.133 | -0.179** | -0.153* |
| | (-2.43) | (-2.38) | (-2.28) | (-1.61) | (-2.13) | (-1.82) |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 |
| Adj $R^2$ | 0.691 | 0.689 | 0.691 | 0.691 | 0.689 | 0.691 |

## Table 5. Large Institutional Investors' Trades (Cont.)

### Panel B: Horse Race between Ownership and Trades by Large Institutions (2SLS)

| Dependent variable: | Daily volatility (q) (%) | | | | | |
|---|---|---|---|---|---|---|
| Institutions: | Top 3 | | | Top 5 | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Total abs trades by top institutions (IV) (q) | 16.741*** | | 347.330*** | 17.947*** | | 305.921*** |
| | (19.15) | | (3.99) | (23.67) | | (3.47) |
| Top inst ownership (IV) (q-1) | | 91.815*** | -74.738*** | | 56.526*** | -63.522*** |
| | | (2.80) | (-3.79) | | (3.34) | (-3.26) |
| Daily volatility (q-1) (%) | 0.665*** | 0.591*** | 0.595*** | 0.662*** | 0.600*** | 0.584*** |
| | (238.51) | (20.24) | (31.38) | (236.03) | (27.25) | (23.86) |
| Total abs trades by all institutions (< Top 10) | 0.173*** | 3.340*** | -9.578*** | 0.019 | 2.798*** | -11.054*** |
| | (3.12) | (3.28) | (-3.73) | (0.33) | (4.07) | (-3.26) |
| Ownership by all institutions (q-1) | 0.028* | -7.900*** | 2.999*** | -0.058*** | -6.423*** | 3.074*** |
| | (1.71) | (-2.72) | (3.81) | (-3.34) | (-3.23) | (3.19) |
| 1 / price (q-1) | 0.597*** | 0.733*** | 0.611*** | 0.600*** | 0.661*** | 0.670*** |
| | (27.83) | (11.86) | (23.61) | (27.81) | (17.94) | (19.55) |
| Amihud illiquidity (q-1) | 0.340*** | 0.427*** | 0.848*** | 0.343*** | 0.254*** | 0.952*** |
| | (33.34) | (8.11) | (6.21) | (33.65) | (8.67) | (5.05) |
| log(market cap) (q-1) | -0.122*** | -0.435*** | 0.040 | -0.130*** | -0.488*** | 0.090 |
| | (-49.50) | (-3.82) | (0.90) | (-51.25) | (-4.39) | (1.32) |
| Past 6-month return (q-3 to q-1) | -0.185*** | -0.114*** | -0.533*** | -0.189*** | -0.081*** | -0.599*** |
| | (-26.45) | (-4.66) | (-5.72) | (-27.07) | (-2.80) | (-4.72) |
| Book-to-market (q-1) | -0.174*** | -0.238*** | -0.087*** | -0.172*** | -0.219*** | -0.059 |
| | (-27.81) | (-7.42) | (-3.14) | (-27.45) | (-9.88) | (-1.56) |
| Ownership by bottom institutions (q-1) | -0.219*** | 14.432*** | -8.815*** | -0.078 | 12.626*** | -9.629*** |
| | (-2.64) | (2.72) | (-3.84) | (-0.93) | (3.23) | (-3.26) |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 |
| Stock and Yogo (2005) F-test | 7848.8 | 7.9 | 3955.5 | 8334.6 | 11.4 | 4198.8 |

## Table 5. Large Institutional Investors' Trades (Cont.)

### Panel B: Horse Race between Ownership and Trades by Large Institutions (2SLS) (Continued)

| Dependent variable: | Daily volatility (q) (%) | | | | | |
|---|---|---|---|---|---|---|
| Institutions: | Top 7 | | | Top 10 | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Total abs trades by top institutions (IV) (q) | 15.706*** | | 368.675** | 14.025*** | | 7,774.142 |
| | (26.24) | | (2.27) | (29.12) | | (0.06) |
| Top inst ownership (IV) (q-1) | | 38.087*** | -83.880** | | 25.861*** | -2,007.824 |
| | | (4.18) | (-2.18) | | (4.01) | (-0.06) |
| Daily volatility (q-1) (%) | 0.661*** | 0.621*** | 0.522*** | 0.659*** | 0.630*** | -3.499 |
| | (234.81) | (48.07) | (8.16) | (232.63) | (56.52) | (-0.05) |
| Total abs trades by all institutions (< Top 10) | -0.008 | 2.081*** | -15.953** | -0.084 | 1.677*** | -439.157 |
| | (-0.15) | (5.42) | (-2.18) | (-1.51) | (5.70) | (-0.06) |
| Ownership by all institutions (q-1) | -0.100*** | -5.167*** | 4.740** | -0.171*** | -4.370*** | 143.719 |
| | (-5.64) | (-4.01) | (2.13) | (-9.19) | (-3.83) | (0.06) |
| 1 / price (q-1) | 0.601*** | 0.632*** | 0.748*** | 0.605*** | 0.636*** | 4.788 |
| | (27.73) | (21.43) | (10.06) | (27.66) | (22.18) | (0.07) |
| Amihud illiquidity (q-1) | 0.338*** | 0.171*** | 1.281*** | 0.339*** | 0.154*** | 28.767 |
| | (33.22) | (4.48) | (2.94) | (33.28) | (3.72) | (0.06) |
| log(market cap) (q-1) | -0.134*** | -0.444*** | 0.220 | -0.136*** | -0.381*** | 10.100 |
| | (-52.28) | (-5.64) | (1.34) | (-52.65) | (-5.77) | (0.06) |
| Past 6-month return (q-3 to q-1) | -0.190*** | -0.080*** | -0.832*** | -0.188*** | -0.071*** | -17.796 |
| | (-27.12) | (-3.41) | (-2.81) | (-26.97) | (-2.72) | (-0.06) |
| Book-to-market (q-1) | -0.171*** | -0.196*** | -0.002 | -0.167*** | -0.170*** | 4.324 |
| | (-27.20) | (-13.52) | (-0.03) | (-26.69) | (-15.76) | (0.06) |
| Ownership by bottom institutions (q-1) | -0.009 | 9.762*** | -13.699** | 0.092 | 7.956*** | -379.191 |
| | (-0.10) | (3.99) | (-2.17) | (1.08) | (3.81) | (-0.06) |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 | 526,181 |
| Stock and Yogo (2005) F-test | 8816.4 | 18.3 | 4438.1 | 8762.3 | 17.9 | 4401.2 |

## Table 6. Large Institutional Investors vs. Synthetic Institutions

The table presents evidence on the trade sizes of large institutions. Trades of large institutions are 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 $50^{th}$, $90^{th}$, $95^{th}$, and $99^{th}$ percentiles of all synthetic institutions.

### Panel A: Large Trades by Large Institutional Investors

| | %Stock-quarter with abs(trade) of top institutions | | | |
|---|---|---|---|---|
| | > 50th pctile | > 90th pctile | > 95th pctile | > 99th pctile |
| Top 1 | 57.1% | 17.7% | 10.7% | 5.9% |
| Top 2 | 56.4% | 14.6% | 8.3% | 4.4% |
| Top 3 | 48.0% | 13.8% | 8.4% | 3.9% |
| Top 4 | 59.7% | 18.7% | 10.9% | 4.8% |
| Top 5 | 55.8% | 17.1% | 10.0% | 4.0% |
| Top 6 | 59.4% | 19.3% | 11.4% | 4.4% |
| Top 7 | 64.5% | 22.1% | 13.4% | 5.1% |
| Top 8 | 61.3% | 16.7% | 9.6% | 3.5% |
| Top 9 | 62.6% | 18.0% | 10.8% | 4.0% |
| Top 10 | 62.1% | 18.0% | 10.6% | 4.1% |
| Average | 58.7% | 17.6% | 10.4% | 4.4% |
| Expected | 50% | 10% | 5% | 1% |

## Table 7. Correlation of Mutual Fund Flows and Mutual Fund Ownership

The table presents evidence on the correlation of mutual fund flows and their ownership. A random sample of 1% of all possible pairs of mutual funds-years are drawn. For each pair-year, we compute the 12-month correlation of flows (scaled by lagged total net assets) over the calendar year. The dependent variable is the correlation between each pair of funds. The variable of interest if an indicator to whether both funds belong to the same parent management company. Appendix A provides variable description. t-statistics in parentheses are based on standard errors with three-way clustering: year, fund i, and fund j. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| Dependent variable: | Correlation between Fund i and Fund j | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Same management company (i, j) | 0.033*** | 0.033*** | 0.031*** | 0.031*** |
| | (10.41) | (10.65) | (10.91) | (10.52) |
| Year FE | No | Yes | Yes | No |
| Fund i, Fund j FE | No | No | Yes | No |
| Year × Fund i FE, Year × Fund j FE | No | No | No | Yes |
| Observations | 2,213,117 | 2,213,115 | 2,213,062 | 2,211,017 |
| $R^2$ | 0.000 | 0.002 | 0.025 | 0.103 |

## Table 8. Large Institutional Ownership and Stock Autocorrelation

This table presents ordinary least squares (OLS) regression results. In Panel A, the dependent variable is the *Autocorrelation* of the DGTW-adjusted returns of stocks held by large institutional investors. In Panel B, the dependent variable is the absolute value of the autocorrelation. 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 are 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: Return Autocorrelation

| Dependent variable: | ρ(DGTW-adjusted returns(t, t-1)) (q) | | | | | | |
|---|---|---|---|---|---|---|---|
| Institutions: | Top 3 | Top 5 | Top 7 | Top 10 | Top 11-20 | Top 21-30 | Top 31-50 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Top inst ownership (q-1) | -0.039** | -0.048*** | -0.036*** | -0.063*** | -0.058*** | -0.017 | -0.041*** |
| | (-2.19) | (-3.25) | (-2.72) | (-4.91) | (-4.17) | (-1.11) | (-3.42) |
| Ownership by all institutions (q-1) | 0.043*** | 0.045*** | 0.045*** | 0.050*** | 0.045*** | 0.041*** | 0.043*** |
| | (8.60) | (8.85) | (8.67) | (9.41) | (8.61) | (8.18) | (8.28) |
| 1 / price (q-1) | 0.020*** | 0.020*** | 0.020*** | 0.020*** | 0.020*** | 0.020*** | 0.020*** |
| | (12.82) | (12.84) | (12.86) | (12.86) | (12.88) | (12.84) | (12.85) |
| Amihud illiquidity (q-1) | -0.096*** | -0.096*** | -0.096*** | -0.096*** | -0.096*** | -0.096*** | -0.096*** |
| | (-31.85) | (-31.79) | (-31.72) | (-31.78) | (-31.75) | (-31.78) | (-31.80) |
| log(market cap) (q-1) | 0.004*** | 0.004*** | 0.004*** | 0.005*** | 0.004*** | 0.004*** | 0.004*** |
| | (3.74) | (3.86) | (3.81) | (4.12) | (3.74) | (3.63) | (3.64) |
| Past 6-month return (q-3 to q-1) | 0.015*** | 0.015*** | 0.015*** | 0.015*** | 0.015*** | 0.015*** | 0.015*** |
| | (7.00) | (6.99) | (6.99) | (6.97) | (6.99) | (7.03) | (7.00) |
| Book-to-market (q-1) | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (-0.35) | (-0.32) | (-0.34) | (-0.33) | (-0.39) | (-0.36) | (-0.35) |
| Ownership by bottom institutions (q-1) | -0.013 | -0.017 | -0.016 | -0.025 | -0.015 | -0.009 | -0.011 |
| | (-0.78) | (-1.05) | (-0.97) | (-1.53) | (-0.89) | (-0.51) | (-0.63) |
| Stock FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 561,631 | 561,631 | 561,631 | 561,631 | 561,631 | 561,631 | 561,631 |
| Adj $R^2$ | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 |

## Table 8. Large Institutional Ownership and Stock Autocorrelation (Cont.)

### Panel B: Absolute Value of Return Autocorrelation

| Dependent variable: | ABS(ρ(DGTW-adjusted returns(t, t-1))) (q) | | | | | | |
|---|---|---|---|---|---|---|---|
| Institutions: | Top 3 | Top 5 | Top 7 | Top 10 | Top 11-20 | Top 21-30 | Top 31-50 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Top inst ownership (q-1) | 0.049*** | 0.047*** | 0.039*** | 0.049*** | 0.024*** | -0.002 | 0.006 |
| | (4.71) | (5.22) | (5.04) | (6.44) | (3.12) | (-0.26) | (0.94) |
| Ownership by all institutions (q-1) | -0.018*** | -0.019*** | -0.019*** | -0.022*** | -0.016*** | -0.014*** | -0.014*** |
| | (-6.65) | (-7.05) | (-7.02) | (-7.78) | (-5.77) | (-5.13) | (-5.14) |
| 1 / price (q-1) | -0.010*** | -0.010*** | -0.010*** | -0.010*** | -0.010*** | -0.010*** | -0.010*** |
| | (-9.96) | (-9.97) | (-9.99) | (-10.01) | (-9.98) | (-9.96) | (-9.96) |
| Amihud illiquidity (q-1) | 0.065*** | 0.065*** | 0.065*** | 0.065*** | 0.065*** | 0.065*** | 0.065*** |
| | (31.32) | (31.26) | (31.20) | (31.23) | (31.23) | (31.21) | (31.21) |
| log(market cap) (q-1) | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.005*** |
| | (-8.01) | (-8.12) | (-8.09) | (-8.37) | (-7.81) | (-7.74) | (-7.74) |
| Past 6-month return (q-3 to q-1) | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.005*** |
| | (-6.51) | (-6.47) | (-6.48) | (-6.41) | (-6.52) | (-6.57) | (-6.56) |
| Book-to-market (q-1) | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** |
| | (-3.96) | (-3.99) | (-3.96) | (-3.97) | (-3.87) | (-3.89) | (-3.90) |
| Ownership by bottom institutions (q-1) | 0.000 | 0.003 | 0.002 | 0.007 | -0.004 | -0.007 | -0.006 |
| | (0.01) | (0.27) | (0.24) | (0.73) | (-0.37) | (-0.70) | (-0.64) |
| Stock FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Calendar quarter FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 561,631 | 561,631 | 561,631 | 561,631 | 561,631 | 561,631 | 561,631 |
| Adj $R^2$ | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 | 0.048 |

## Table 9. 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 are 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 top institution's 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 inst 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 (q-1) | -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 |

**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.

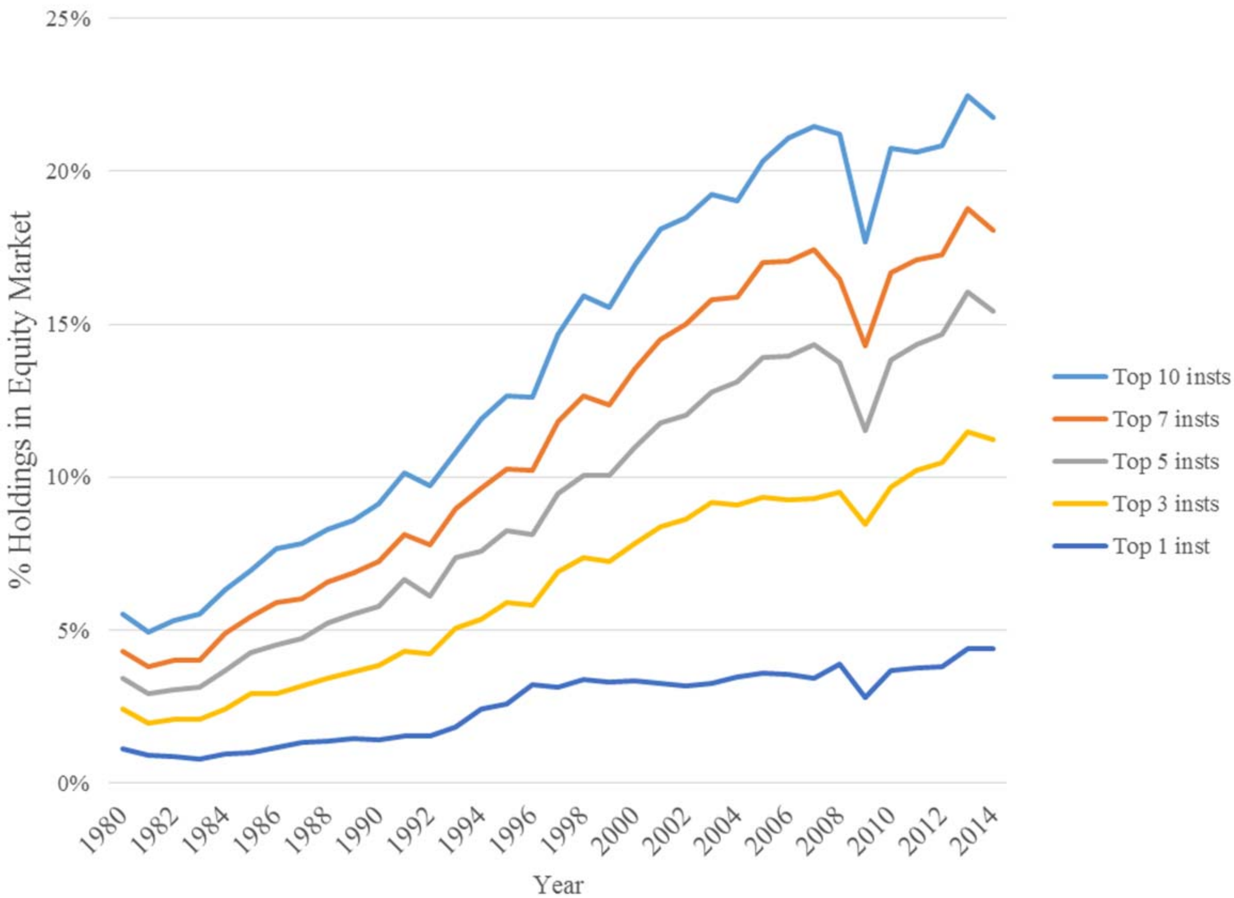
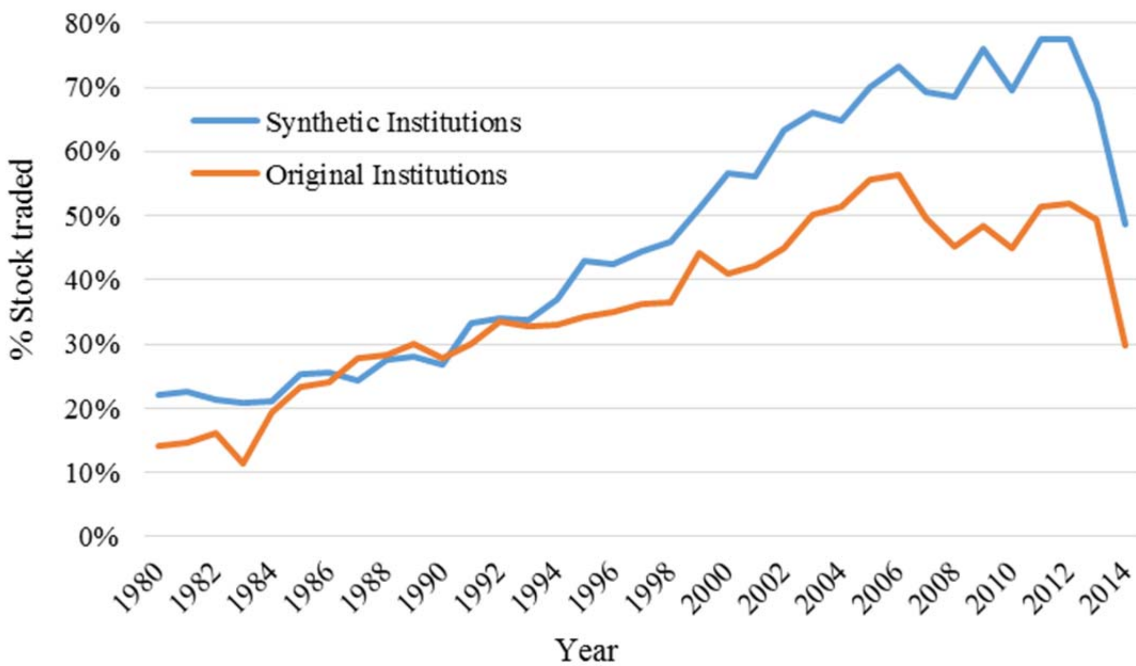


**Figure 2. Evolution of Fraction of Stock Traded by the Largest 10 Institutions (Original and Synthetic)**

The chart shows the fraction of stocks in CRSP that are traded by large institutions and by synthetic institutions. For each large institutional investor, in each calendar quarter, we created a synthetic institutional investor made up from institutions that are not in the top ten largest institutions. Each of the synthetic institutions has the same equity holdings at the end of the previous quarter as the original institution. Next, we measure the fraction of stocks that are owned by stocks that are traded by the original institutions as well as by the synthetic institutions. Then, we average these fractions across the top original institutions and across the synthetic institutions.



## Figure 3. 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 institutions 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 in the particular stock-quarter. 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 50$^{th}$, 90$^{th}$, 95$^{th}$, and 99$^{th}$ percentile in each quarter. The dashed lines represent the null hypothesis, that the likelihood of having a trade larger than X$^{th}$ percentile equals to (1-X), i.e., generated by a uniform distribution. The y-axis of the plot uses a logarithmic scale.