Ownership Structure, Limits to Arbitrage and Stock Returns: Evidence from Equity Lending Markets*

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ABSTRACT

We examine how institutional ownership structure gives rise to limits to arbitrage through its impact on short-sale constraints. Stocks with lower or more concentrated institutional ownership have greater borrowing costs, higher recall risk and increased levels of arbitrage risk. In addition to ownership concentration, we show that stocks with greater investor churn and a smaller fraction held by passive investors face tighter short-sale constraints. These limit the ability of arbitrageurs to take short positions and correct mispricing. Prices of stocks with more concentrated ownership take longer to react to negative information. A positive shorting demand shock for stocks in the top quintile of ownership concentration is associated with negative abnormal returns of 0.42% in the following week relative to stocks with dispersed ownership.

Keywords: Limits to arbitrage, short-sale constraints, institutional investors, arbitrage risk, equity lending.

JEL classification: G10, G12, G14.

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What causes short-sale constraints? Short-sale constraints collectively describe the market frictions that constrain investors from freely selling short a stock that they do not own. Constraints include liquidity concerns about whether the stock is available to borrow and the fee paid to a broker for the loan, both at the at the time of the transaction and in the future.

Prior literature has argued that short-sale constraints increase limits to arbitrage, reduce market efficiency and increase mispricing and market anomalies.[1] However, much less is known about the sources of these constraints. Aggregate cross-country evidence shows that they vary due to different regulatory environments and levels of financial development (see Bris, Goetzmann, and Zhu (2007), Charoenrook and Daouk (2009)), but there few studies on how short-sale constraints vary at the stock-level.

The goal of this paper is to better understand how the composition of institutional ownership increases short sale constraints and creates limits to arbitrage through the market for borrowing stock. In doing so, we are also able to shed light on whether equity lending supply matters for stock prices. We use a proprietary dataset of equity lending supply and loans from over 125 custodians and 32 prime brokers and combine it this with the methodology developed by Cohen, Diether, and Malloy (2007). This approach allows us to identify the upward sloping part of the loan supply schedule and separate the pricing effects of demand shocks for shorting stock from restricted lending supply owing to ownership structure.

Our main findings are as follows. First, stocks with lower or more concentrated institutional ownership exhibit greater borrowing costs, higher recall risk and increased levels of arbitrage risk. Negative shocks to lending supply increase arbitrage risk, but only through the component explained by ownership structure. Second, the abnormal returns following shocks to shorting demand are concentrated among firms with high ownership concentration. Stocks in the top quartile of ownership concentration have average abnormal return after an outward

[1] See Miller (1977), Diamond and Verrecchia (1987), De Long, Shleifer, Summers, and Waldmann (1990), Shleifer and Vishny (1997), Stein and Hong (1999) and Chen, Hong, and Stein (2002) among others.

demand shock of -0.42% per week (-1.7% per month) relative to similar shock to stocks with a dispersed ownership.

The following example illustrates how ownership structure affects the equity lending market and can hinder arbitrage opportunities. In the summer of 2007 Reuters was acquired by the Canadian family-controlled Thomson Corp. The newly-formed group became a dual-listed company, trading shares in London and Toronto, being siamese-twin stocks with claims to almost identical dividend streams that trade at significantly different prices. The Thomson family continued to own 55% of shares on the Toronto exchange. Following the conclusion of the deal in April 2008, the London listing has traded on average at a 15 per cent discount to the Toronto quote. The Financial Times reported "One factor was that the high concentration of the Thomson family's stake in Canada limited liquidity in Toronto, benefiting the price by restricting opportunities for borrowing stock to sell short", and that despite the twins arbitrage strategy of shorting Toronto-listed stocks and buying London-listed stocks, "6 per cent of the London line was on loan as of Friday, according to Data Explorers, compared to 5.4 per cent in Toronto".[2]

We hypothesize that the decision to lend depends on institutional investors characteristics. Specifically, active investors should be less willing to lend than passive ones, investors should be less willing to lend stock in which they hold large positions, and when they have a shorter investment horizon. Thus, differences in investor composition at the stock-level can affect the equity lending supply of the firm and, in turn, give rise to short-sale constraints and limits to arbitrage.

For each of the 4,713 U.S. stocks in our sample, we estimate total institutional ownership, ownership concentration, investor churn, and the fraction held by passive institutional investors. We then examine the effect that institutional ownership structure has on the eq-

[2] "How parochialism hampered Thomson Reuters", Financial Times, June 24 2009, and "Concern over Thomson Reuters' UK listing", Financial Times, January 9 2009.

uity lending supply and a variety of short-sale constraint measures. Combined, the tighter short-sale constraints limit the ability of arbitrageurs to take short positions in the stock and to correct mispricing.

We also examine how these tighter constraints affect stock returns. Tighter constraints prevent short-sellers from exploiting inefficiencies (Saffi and Sigurdsson (2011) and Boehmer and Wu (2012)), leading to both higher prices and delays in incorporating pessimistic investors' opinions. Specifically, if short sale constraints tied to lending supply affect stock prices, then we should observe more negative returns to short selling for stocks with more concentrated ownership compared with stocks with dispersed ownership. We find that the abnormal returns following shocks to shorting demand found by Cohen, Diether, and Malloy (2007) are concentrated among firms with high ownership concentration. Stocks in the top quartile of ownership concentration have average abnormal returns following an outward demand shock of -0.42% per week, or -1.7% per month, compared to similar shocks to stocks with dispersed ownership.[3] The results are robust to differences in investor sentiment, alternative sources of supply friction, alternative measures of ownership structure and to abnormal returns based on the four-factor model.

As an illustration of our econometric approach consider the following example. If a stock is fairly valued short sale constraints should not impact the price because there would be no demand to short it. However, as a stock becomes overvalued, the demand for shorting increases. In the absence of short sale constraints investors will borrow the stock, short it, and the price should return to the fair value. In the presence of short-sales constraints investors will not be able to immediately borrow shares, perhaps because of the costs or the lack of supply. If the overpricing becomes sufficiently high to compensate investors for the short sale constraints, investors will short the share and the price reverts back to its fair value. Thus, the

[3]This difference is large but it does not account for transaction costs. Cohen, Diether, and Malloy (2007) estimates that the excess return is reduced by 80% once transaction costs are accounted for. We find similar values.

price adjustment associated with short selling a constrained stock should be greater because the constraints result in delays in incorporating the pessimistic investors' beliefs.

Our results relate to the findings of Cohen, Diether, and Malloy (2007), who identify short selling demand as driving the relation between shorting indicators and subsequent stock returns. We highlight an important role for the composition of lending supply, as abnormal returns following shocks to shorting demand are concentrated among firms with high ownership concentration. Nagel (2005) uses institutional ownership as a proxy for short-sale constraints to explain cross-sectional stock return anomalies. Our results suggest a link between institutional ownership concentration, limits to arbitrage and the cross-section of stock returns, which to the best of our knowledge has not been previously explored.

This paper also contributes to the literature on how to measure short sales constraints (D'Avolio (2002) and Nagel (2005)). We show that institutional ownership is not a sufficient statistic to proxy for lending supply constraint as is often assumed in the literature (see Asquith, Pathak, and Ritter (2005), Lamont (2004), Nagel (2005), Akbas, Boehmer, Erturk, and Sorescu (2008), and Kolasinski, Reed, and Ringgenberg (2012) among others). Instead, both institutional ownership and the composition of institutional ownership should be taken into consideration. Boehmer and Kelley (2009) discuss the impact of institutional holdings on price efficiency and our results are evidence that the equity lending market is a channel through which this happens.

The paper is organized as follows. Section 1 places our work in the context of the existing literature on short selling and ownership structure. Section 2 describes the market for borrowing stock. Section 3 outlines our research design and describes the data. Section 4 presents results and Section 5 additional robustness tests. Finally, Section 6 concludes.

I. Literature Review

Trading strategies designed to correct mispricing can be both risky and costly. Psychological biases, institutional frictions, and transaction costs can render the correction of mispricing unattractive to arbitrageurs. De Long, Shleifer, Summers, and Waldmann (1990) introduced the notion of noise trader risk, i.e. the possibility that mispricing worsens in the short run due to the presence of noise traders. Shleifer and Vishny (1997) further argue that financial institutions are constrained by agency frictions: if mispricing worsens and generates negative returns this may lead the principal owner of the underlying invested capital to close his position. Another important limit to arbitrage is implementation costs. Shorting is often an essential part of the arbitrage process and the presence of transaction costs like locating shares to borrow and lending fees make arbitrage opportunities less attractive.

Short-sale constraints contribute to the persistence of price inefficiencies and prevent information revelation, making financial markets more inefficient and changing equilibrium asset prices. There is a large body of academic research studying how short selling affects stock returns and market efficiency. Miller (1977) shows how short selling constraints lead to overvaluation due to the absence of the more pessimistic investors from the market. Diamond and Verrecchia (1987) propose a model in which short-sale constraints eliminate some informative trades. Prices are not biased upwards, but become less efficient when restrictions are in place, as they reduce the speed of adjustment to private information. Kyle (1985) and Holden and Subrahmanyam (1992) argue that ownership concentration reduces price efficiency in that a monopolistic owner will slowly exploit its information advantage. The impact of institutional ownership on price efficiency is studied empirically by Boehmer and Kelley (2009), who show that stocks with greater institutional ownership are priced more efficiently.

In classical asset-pricing models it is assumed that market participants can buy, sell and short sell securities at no cost. In practice, restrictions can make shorting a stock not as

straightforward as standard buy and sell orders. To establish a short position an arbitrageur needs to post collateral to borrow shares. The interest rate earned on the cash is below market interest rate. These rebate rates can even be negative (i.e., loan fees in excess of the risk-free rate) and therefore be an important source of arbitrage costs.

Moreover, to borrow a share an arbitrageur needs to locate it first. At the time a short position is initiated, the short seller has three days to locate, borrow and deliver the shares to the buyer. Kolasinski, Reed, and Ringgenberg (2012) document that the presence of search frictions benefits lenders such that they can charge higher fees. Autore, Boulton, and Braga-Alves (2010) and Blocher, Reed, and Van Wesep (2012) show that hard-to-borrow stocks that reach thresholds of failures become highly overvalued. These costs or limitations faced by arbitrageurs can prevent them from eliminating mispricing. In line with this, Stambaugh, Yu, and Yuan (2012) and Avramov, Chordia, Jostova, and Philipov (2012) find that profits from anomaly-based strategies reside mostly on the short side of the trade.

Institutional investors choose both to participate in equity lending and, if they lend, the amounts to make available and for which stocks. Different institutional investors likely have different preferences regarding their willingness to participate in the market for lending shares. Evans, Ferreira, and Prado (2012) show that the decision to lend out shares by mutual funds is taken consciously. Certain investors, like index funds, are much more likely to engage in securities lending as they face no negative impact on performance due to the lack of manager discretion over the fund's asset allocation. Aggarwal, Saffi, and Sturgess (2013) study the supply of shares in the equity lending market around shareholder meeting record dates and show that institutional investors vary in their preference for making supply available to borrow.

The supply of shares available for borrowing is an important determinant if a stock is easy to locate and cheap to borrow. According to D'Avolio (2002), institutional investors are the main suppliers of stock loans. There is ample empirical evidence that the demand to borrow

stock, and hence short selling, impacts stock prices.[4] However, there is much less evidence on whether similar effects arise from the lending supply channel. Examining an increase in loan demand and fee suffers from the usual identification problem. It is not clear if there is an increase in the demand to short and/or if there is a decrease in the supply of stock to borrow. A couple of papers have attempted to overcome this challenge. Cohen, Diether, and Malloy (2007) show that while demand shifts are linked to future stock returns, shifts in supply are not. Kaplan, Moskowitz, and Sensoy (2012) study a lender-specific shock to the supply of lendable shares and find that lending supply impacts short sale constraints such as fees, but do not find any impact on stock returns. However, this may not be surprising if there is sufficient slack supply, as shown in our paper and by Kolasinski, Reed, and Ringgenberg (2012), who study the loan supply schedule using data from twelve lenders. They stress that the loan supply schedule is nonmonotonic, with a downward slope at low short demand quantity levels, a relatively flat slope for moderate ones, and an upward slope at high quantity levels.

In this paper, we stress that the ownership composition other than the level of institutional ownership is also important in explaining short-sale constraints. The ownership structure can affect equity lending supply, and in turn induce short-sale constraints and limits to arbitrage. The type of institutional investor holding a stock, its investment horizon and trading activity can determine the desirability of the lender and besides increasing costs, they also increase the risk faced by short sellers. When borrowing shares from an active institutional investors the risk of a recall of the loan is much more prevalent. Additionally, the more concentrated the ownership is, the more bargaining power the lender has in setting the fee (e.g., Kolasinski, Reed, and Ringgenberg (2012)).

[4]See, for example, Asquith, Pathak, and Ritter (2005), Lamont (2004), Nagel (2005), Akbas, Boehmer, Erturk, and Sorescu (2008), and Kolasinski, Reed, and Ringgenberg (2012) among others)

II. The Market for Borrowing Stock

We use a proprietary dataset of equity lending supply and loans from Data Explorers, which collects this information from a significant number of the largest custodians and prime brokers in the securities lending industry.[5] The data comprise security-level daily information from August 1st, 2006 to December 31st, 2010. As of December 2010, there are $5.7 trillion in stocks available to borrow, out of which $387 billion are actually lent out. This corresponds to an utilization level (i.e., amount lent out divided by amount available to borrow) of around 15%.[6]

Equity supply postings contain the dollar value of shares available for borrowing on a given day. We define lending supply as supply relative to a firm's market capitalization. Similarly, loan quantity is the dollar value of shares on loan on a given day relative to market capitalization. Loan fees are set in two different ways depending on the type of collateral placed by the borrower. If borrowers use cash - the dominant form in the U.S. - then the loan fee is defined as the difference between the risk-free interest rate and the rebate rate. The rebate rate is the portion of the interest rate on the collateral which the borrower receives back. If instead the transaction uses other securities as collateral, like U.S. Treasuries, the fee is directly negotiated between the borrower and the lender. The contract type variable examines whether equity loan transactions are open-term or fixed-term. Open-term loans are renegotiated every day. Fixed-term ones have predefined clauses and maturities. The overnight risk-free rate of the collateral's currency is used for open-term loans. The Fed Funds rate is used for loans with cash collateral denominated in U.S. dollars and the Euro Overnight Index average (EONIA) is used for loans denominated in Euros. The risk-free rate proxy for other currencies is the

[5]The information is currently collected daily from 125 custodians and 32 prime brokers. Data Explorers estimates that the data represent 85% of global equity lending. See Saffi and Sigurdsson (2011) for a detailed description.

[6]Note that equity loans are not an perfect measure of short selling activity, since stock loans might be used as part of tax-arbitrage strategies (see for example Christoffersen, Geczy, and Musto (2006)).

overnight rate at London Interbank market (LIBOR) and local money market rates for other currencies. Linear interpolation of LIBOR rates is used for fixed-term loans in accordance with conventions in the securities lending industry.

Because the ownership data is reported at a quarterly frequency, we compute quarterly averages of daily equity lending variables for each firm. Variables are winsorized at the 1%-level to reduce the impact of outliers.

[Insert Figure 1 HERE]

In Figure 1 we show lending supply and loaned shares as a fraction of market capitalization (left-axis) and the average loan fee (right-axis). The average loan fee in December 2010 is around 116% a year (116bps) , similar to the figures reported by D'Avolio (2002), and Kolasinski, Reed, and Ringgenberg (2012). Lending supply has been around 20-25% for most of the period, but we can see the noticeable reduction in shares available to borrow that takes place after the financial crisis on October 2008.

[Insert Figure 2 HERE]

In Figure 2 we plot the total lending supply and total loaned shares in billions of dollars (right-axis) and the average utilization (left-axis) in a given quarter. After 2008 utilization rates fell from 24% in September 2008 to 14.6% in December 2010 due to deleveraging that takes place after the financial crisis.

III. Research Design

A. Hypotheses

We test three hypotheses on how the equity lending market is affected by the structure of institutional ownership.

Recent literature has shown that short selling is associated with higher price efficiency and that it places downward pressure on stock prices. Furthermore, it has been argued that lending supply increases with institutional ownership and subsequently that it leads to an increase in price efficiency. The main reasoning behind these arguments is that large institutional owners are willing to lend stock that they hold as a way to generate extra returns through lending income (e.g. D'Avolio (2002), Nagel (2005) and Evans, Ferreira, and Prado (2012)).

However, where institutional ownership is more concentrated this may not necessarily hold true. Holden and Subrahmanyam (1992) present a model in which prices are less efficient when ownership is more concentrated. A more concentrated ownership structure, or a structure including larger single institutional investors, results in shareholders having greater influence in the equity lending market vis-à-vis a highly dispersed ownership structure. If shareholders prefer higher valuations, and short sale constraints allow stocks to be overpriced, shareholders should act to impede short-selling by limiting equity lending supply. Larger and more concentrated owners may prefer not to lend stock and therefore retain control of voting rights, that would otherwise pass to the borrower. Evans, Ferreira, and Prado (2012) show that passive institutional investors, like index funds, are much more likely to engage in securities lending as a way to gain lending income and lower expenses. Moreover, index funds face no negative impact on performance due to the lack of manager discretion over the fund's asset allocation. This suggests that stocks held by passive investors are much more likely to be available to short sellers to borrow from. Using the N-SAR form's answers to the question of whether a fund is an index fund (question 69) we classify funds as passive funds and calculate the fraction of passive ownership of each specific stock.

Hypothesis 1 posits a negative relation between ownership concentration and equity lending supply and a positive relation between investment horizon, passive investor base and equity lending supply.

Hypothesis 1 *Lending supply is decreasing in the concentration of institutional ownership and increasing in passive ownership and the investment horizon of a stock's investor base.*

Another characteristic that affects lending supply is the investment horizon of a stock's investor base. Short-term shareholders are more likely to trade on short-term signals and consequently should prefer not to lend while holding a long position. This leads to a lower lending supply and tighter short sales constraints. Existing literature shows that investor investment horizon influences corporate investment, proxy fights, going private transactions, and self-tender offers. Lending supply is an additional channel through which institutional investor composition may affect corporate outcomes. Examining the turnover of institutional investors' portfolios is one way to measure how often their holdings are traded. We expect to find that stocks with higher investor "churn" (Gaspar, Massa, and Matos (2005)) have less lending supply.

We also examine investment horizon by identifying long-term and short-term investors. Chen, Harford, and Li (2007) define long-term investors as those that hold their stakes in a firm for at least one year. We classify the top five largest investors into long-term investors, and expect a higher sensitivity of lending supply to long-term institutional ownership.

While the effect of ownership structure on lending supply is interesting, the important issue is whether there are economic pricing implications due to changes in short sales constraints. Short selling carries various costs and risks, such as the expense and difficulty of shorting and the risk that the short position will have to be involuntarily closed due to recall of the borrowed shares. This leads to the second hypothesis:

Hypothesis 2 *Short sale constraints are increasing in the concentration of institutional ownership and decreasing in the investment horizon of a stock's investor base.*

We examine the effects of institutional ownership structure on the following constraints. First, we use the loan fee for borrowing stock. Second, we test whether institutional ownership

structure affects the likelihood of a stock becoming "special" in the lending supply market. Specialness is a commonly used term in lending markets that refers to stocks with large loan fees (defined here as loans with average annualized fees in a quarter above 100 basis points). In our sample, about 14.4% of firms in a given quarter are classified as such. Third, we examine if concentrated ownership decreases the length of the loan contract, the loan tenure. Finally, we examine the effect of ownership structure on arbitrage risk. We measure arbitrage risk by computing the standard deviation of the residuals based on the Carhart (1997) 4-factor model of returns. Firms with higher idiosyncratic volatility present riskier opportunities to arbitrageurs, measuring the systematic volatility of the component of returns that cannot be hedged (Wurgler and Zhuravskaya (2002)).

Hypotheses 1 and 2 describe the effects of ownership structure on equity lending supply and short sale constraints. Hypothesis 3 switches our focus to the returns associated with arbitrage trading strategies. If ownership concentration results in higher short sale constraints and increases arbitrage risk, then these tighter constraints will affect stock returns. If arbitrageurs face greater limits to arbitrage stemming from the short sale constraints then mispricing builds up and the subsequent returns to short-selling will be more negative as prices take longer to adjust. Specifically, we should observe more negative returns to short selling for stocks with more concentrated ownership compared with stocks with dispersed ownership, leading to the following hypothesis:

Hypothesis 3 *The returns associated with an outward demand shift are more negative for firms with a high concentration of institutional ownership.*

To investigate the effects of ownership structure on stock returns we employ the methodology proposed by Cohen, Diether, and Malloy (2007) and test its sensitivity to ownership concentration in the previous quarter. The identification strategy consists of constructing price-quantity "pairs" from the equity lending market to isolate clear shifts in supply and demand.

For example, an increase in the loan fee (i.e., price) coupled with an increase in the percentage of shares on loan (i.e., quantity) corresponds to an increase in shorting demand, as would be the case for any increase in price coupled with an increase in quantity.

We define DOUT and DIN in the following way:

$$\text{DOUT}_{i,t-1} = \begin{cases} 1 & \text{if Fee Score}_{t-1} - \text{Fee Score}_{t-2} > 0 \text{ and Loan}_{t-1} - \text{Loan}_{t-2} > 0 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

$$\text{DIN}_{i,t-1} = \begin{cases} 1 & \text{if Fee Score}_{t-1} - \text{Fee Score}_{t-2} < 0 \text{ and Loan}_{t-1} - \text{Loan}_{t-2} < 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

where *i* stands for stock and *t* for week.

Each of the shifts has an economic interpretation. *DOUT* captures the case in which there is an increase in both the cost of shorting (i.e., loan fee) and the amount that investors are willing to short at this higher cost. Effectively, more capital is betting that the price will decrease, despite the higher explicit cost of betting. *DIN* captures the case in which both shorting costs and the amount that investors borrow at this lower price decrease. The effect of DIN on returns is likely to be smaller than the one from *DOUT* because if investors have positive expectations about the stock they can purchase it in the spot market.

However, this strategy does not uniquely identify an outward demand shift. Instead, a shift of price and quantity into this quadrant implies that at least an outward demand shift has occurred. Stocks that have experienced at least an outward demand shift (*DOUT*) have seen both their loan fees and their loan amounts rise; and stocks that experienced at least an inward demand shift (*DIN*) have seen both their loan fee and loan quantity fall.

Cohen, Diether, and Malloy (2007) show that *DOUT* is a strong predictor of negative abnormal returns in the following week. Our hypothesis is that this effect is related to ownership concentration because of its impact on equity lending supply and short sales constraints.

Conditional on an outward demand shock (i.e. *DOUT*=1), we compute the 75th percentile of ownership concentration in the previous quarter for all stocks. Then, we define a dummy variable (*Top(HHI)*) equal to one if a stock's ownership concentration is above the 75th percentile and test if its interaction with *DOUT* is negative and statistically significant.

B. Data

The main explanatory variables in our study are measures of the structure of ownership held by institutional investors. The ownership data come from the Thomson Reuters CDA/Spectrum database on SEC 13F filings. Form 13F is filed on a quarterly basis by institutional investment managers who exercise investment discretion over accounts holding at least $100 Million in eligible equity securities. These managers report the total long positions in each eligible security, aggregated across all accounts over which they exercise investment discretion.[7] The data is available from August 1st, 2006 until December 31st, 2010 for approximately 5,000 stocks. For each stock we calculate the ownership by each institution and total institutional ownership, both as a percentage of market capitalization. We additionally compute several characteristics of the ownership structure: *HHI* is the concentration of institutions' holdings using the Hirschman-Herfindahl Index, normalized to be between zero and one; and Δ*(Breadth)* is the number of institutional investors from Chen, Hong, and Stein (2002), *Churn* is the portfolio churn of investors, *Top5 / Total* is the percentage of institutional ownership held by the largest five institutions, *Top5 - LT / Total* is the percentage of institutional ownership held by the largest five long-term institutional investors, and *% Passive* is the fraction held by passive institutional investors as in Evans, Ferreira, and Prado (2012).

We match firms in the equity lending database with those available on CRSP. The final sample has 59,316 firm-quarter observations with lending data available. From CRSP data,

[7] We thank Stewart Mayhew for detailed advice on 13F holdings.

we compute market capitalization, turnover and share price, cumulative quarterly returns, the standard deviation of daily returns, cumulative abnormal returns based on the Daniel, Grinblatt, Titman, and Wermers (1997) characteristics-matched factor, and the market beta using the CRSP value-weighted market index as the benchmark. Throughout, we only use common shares with prices larger than $1.

C. Descriptive Statistics

Table I presents descriptive statistics for the main variables used in this paper. The average firm in our sample has 19.6% of its market capitalization available to lend. On average, 4.8% of its capitalization is on loan, with the shares costing 70.6 basis points per year to be borrowed. In our sample, 14.4% of firm-quarter observations are "on special", i.e. have lending fees above 100 basis points. Average total institutional ownership is 58%, with 140 institutions being shareholders of the average firm.

[Insert Table I HERE]

Given our focus on lending supply, in Table II we report the sample's main characteristics sorted by lending supply quintiles. In Panel A, we find that the difference in lending supply between the lowest and highest quintiles corresponds to about 36% of market capitalization. The number of shares loaned out (as a percentage of total shares outstanding) increases with lending supply. As expected, loan fees are decreasing in supply. Firms with low supply are about five times more expensive to borrow (199 basis points per year) than those in the highest lending supply quintile (26 basis points per year). These numbers are similar to those reported by D'Avolio (2002), though shares in our database are slightly more expensive and are lent much more often, which reflects the growth in the equity lending market in recent years and the fact that our data cover a much bigger number of data providers.

Examining institutional ownership variables in Panel B, we find that total ownership grows with lending supply, consistent with its use as a proxy for lending supply as in Nagel (2005). We also observe that the average size of institutional holdings decreases with lending supply. Further, lending supply is positively related to the size of the long-term investor base, but not to the short-term investor base. Our measure of investor's ownership concentration, *HHI* decreases with lending supply. In Panel C, we find that firms with higher supply tend to be larger, have higher stock turnover and analyst coverage, but lower arbitrage risk.

[Insert Table II HERE]

IV. Empirical Results

A. How does institutional ownership structure affect equity lending supply?

We apply multivariate regression analysis to study the impact of ownership structure on lending supply by using pooled OLS regressions with quarterly data. All models include quarterly dummies and standard errors are double clustered at the firm and year-quarter levels using the procedure described in Petersen (2009). In each quarter we standardize all variables to have zero mean and unit standard deviation. We apply this transformation to allow for an easier comparison of each variable's impact on supply, with estimated coefficients denoting the impact of a one standard deviation change in the explanatory variable.[8]

Table III presents evidence on lending supply and ownership structure. We first examine how institutional ownership influences lending supply in column 1. The coefficient for total ownership, *Total*, on equity lending supply is positive and statistically significant. A one standard deviation increase in total ownership is associated with lending supply 0.788 standard deviations higher, equivalent to a 51.2% ($= \frac{0.788*0.1294}{0.1990}$) increase relative to the mean lending supply. In column 2, we examine how institutional ownership concentration, measured as the

[8]Our results are unchanged if we use raw values instead.

Hirschman-Herfindahl Index of institutional holdings. The coefficient of ownership concentration, *HHI*, on equity lending supply is negative and statistically significant. A one standard deviation increase in ownership concentration decreases lending supply by 0.169 standard deviations, equivalent to a 11.0% ($= \frac{-0.169*0.129}{0.199}$) decrease relative to the mean lending supply). Throughout, we include Δ*(Breadth)*, the change in the number of institutional investors, as a control variable for investor sentiment, as in Chen, Hong, and Stein (2002). Equity lending supply is greater for stocks with larger Δ*(Breadth)*, but this effect is explained by ownership concentration in column 2. We also find that firms with low turnover, low book-to-market ratios and prices below $5 have smaller lending supply. Our results show that the strong link between ownership and lending supply found in previous work (D'Avolio (2002)) is present but that the impact of ownership concentration is also relevant in explaining the availability of stocks to borrow.

[Insert Table III HERE]

In column 3 we investigate if investors' investment horizons affect lending supply. We use *Churn*, which measures how frequently investors rotate their portfolio holdings. A higher *Churn* indicates that, on average, investors owning the stock have a higher turnover in their portfolio and hold stocks for shorter periods of time. We find that *Churn* is an important determinant of lending supply, though do not rule out that low investor turnover is likely a consequence of high ownership concentration. Lending supply is lower for stocks with investors who rotate their positions more frequently, i.e. a stock with more investors that hold it for shorter time periods has a smaller supply of shares in the equity lending market.

We use an alternative measure of ownership concentration, $Top5/Total$, which measures the fraction of total institutional ownership held by the institutions with the largest five holdings in column 4. The results mirror those in column 1. While higher institutional ownership is associated with higher lending supply, concentrated institutional ownership has the opposite

effect. Both measures of institutional concentration, HHI and $Top5/Total$, capture the effects of concentration and institutional influence alike. Larger institutional investors are more likely to able to hold court with the firm's management, which in itself may determine whether an institutional owner is willing to lend shares. The decision to lobby or lend shares is similar to the decision to lobby or walk, which has been studied by Admati and Pfleiderer (2009), Edmans (2009) and Edmans and Manso (2009). Prior literature has used measures of investor influence to show that firms with more influential institutional investors have higher CEO pay for performance and lower compensation Hartzell and Starks (2003). Our results suggest that concentrated and influential ownership structures both reduce equity lending.

Next, we examine how the investment horizon of institutional investors affects equity lending supply. Following the strategy used by Chen, Harford, and Li (2007) we define long-term investors as those that hold their stakes in a firm for at least one year. We examine the ownership of the top five largest investors for each stock and separate the total ownership of the top five largest investors into long-term investors. In column 5 we include both the fraction of total institutional ownership held by the institutions with the largest five holdings ($Top5/Total$), and the fraction of total institutional ownership held by the largest five institutions with a long-term horizon ($Top5 - LT/Total$). The results show that Top 5 institutional investors with a long-term horizon are no more or less likely to contribute equity lending supply than other Top 5 institutions. This result suggests that concentration rather than investor horizon is more important in explaining lending supply.

Finally, in column 6 we examine how the split between active and passive investor base influences lending supply. Using the N-SAR form response to the question of whether a fund is an index fund we classify funds as passive funds and calculate the fraction of passive ownership of the specific stock. In line with Evans, Ferreira, and Prado (2012)'s findings that index funds are more likely to engage in security lending, we find that passive ownership is

positively related to lending supply.[9] In summary, these results support Hypothesis 1: stocks with concentrated ownership and an active investor base with a higher portfolio turnover have lower lending supply.

B. How does institutional ownership structure affect short sale constraints?

An important issue in analyzing the effects of ownership on equity lending is measuring to what extent ownership affects short sale constraints. While ownership effects may be large for lending supply, they may be irrelevant if they do not have consequences for the pricing of borrowing stock, which in turn constrain short sales and affect asset prices. We investigate the relation between institutional ownership structure and short sale constraints by focusing on the cost of borrowing stock, the likelihood of a stock being on special, the loan contract tenure, and arbitrage risk. All four characteristics may constrain short sales by increasing costs or the risk of short selling.

We examine loan fees in Table IV. Loan fees reflect the cost of borrowing stock and are the most direct form of short-sale constraint. If the profits from short-sale trade are smaller than the loan fee, investors face limits to arbitrage and anomalies may persist over time. The results in IV present evidence that loan fees are higher where institutional ownership is more concentrated or investors have short investment horizons. Once again we employ pooled OLS regressions with time effects and double clustering of standard errors at the stock and time level. In all regressions estimated in Table IV we include the same set of control variables used in Table III. In the first two columns we test for the effects of total ownership and ownership concentration on loan fees. If lower equity lending supply - as determined by ownership structure - has consequences for loan fees then we expect that larger total institutional own-

[9] Stocks with no change in passive ownership are dropped out of the sample due to the standardization.

ership should have a negative impact on fees while a higher ownership concentration should increase loan fees. We find this to be true.

From column 2, a one standard deviation increase in total ownership is associated with a decrease in fee of 28 basis points, while a one standard deviation increase in ownership concentration is associated with an increase in fee of 10 basis points, both economically significant when compared to the mean lending fee of 71 basis points.

In columns 3-5 we examine if the alternate measures of ownership composition explain lending fee. The results show that concentration, measured as the fraction of total institutional ownership held by the institutions with the largest five holdings, is positively associated with the cost of borrowing. Further, this effect is reduced where larger holdings are held by institutional investors with a long-term horizon. Put differently, stocks with a large investor base with long-term horizons, such as pension funds, are associated with lower equity lending fees. Finally, in column 6 we show that stocks with a passive investor base exhibit lower short sale constraints, as measured by lending fee. In all estimations we also show estimated coefficients for Δ*(Breadth)* and *Mkt. Cap*. Generally, larger firms have lower fees, but we do not find any impact from Δ*(Breadth)* on loan fee.

[Insert Table IV HERE]

In Table V we switch attention to alternative proxies of short sale constraints. In Panel A we investigate the effects of ownership structure on the probability that a stock is "on special". Examining stocks that are "on special" focuses on those that are relatively expensive to borrow and hence the most short-sale constrained. We present results from a logit model in which the dependent variable is equal to one if the stock is "on special" and zero otherwise. We find similar results to those in Table 4, supporting Hypothesis 2. Institutional ownership, both total as passive, reduces the likelihood of a stock being "on special", while concentrated ownership increases this likelihood.

In Panel B Table V we examine the effects of ownership structure on loan contract tenure. A loan contract may have a fixed-term maturity or be open-ended, in which case the the lender may recall the loan or the borrower return shares at any time. The option to recall allows the lender to more easily retain the control rights of the share while receiving a borrowing fee. For a borrower, an open-ended contract significantly increases recall risk, specially if the lender decides to sell his stake. Thus, if concentrated ownership increases limits to arbitrage through higher recall risk then we should expect a shorter loan contract tenure. We estimate OLS regressions where the dependent variable is the loan contract tenure in days. The results in Panel B support Hypothesis 2 for ownership concentration and portfolio churn is supported. Greater ownership concentration and investor portfolio churn decrease the loan tenure. Additionally, stocks held by long term investors have longer contract tenures, making a recall less likely.

[Insert Table V HERE]

In Table VI we present our final piece of analysis on short sale constraints by investigating the effect of ownership on arbitrage risk. Arbitrage risk is calculated using the Wurgler and Zhuravskaya (2002) idiosyncratic risk variable - measured as the standard deviation of daily stock returns' residuals from the Carhart (1997) 4-factor model. Firms with a higher variability of the portion of returns that cannot be explained by the benchmark model are riskier for arbitrageurs trying to correct for mispricing. As argued by Shleifer and Vishny (1997), idiosyncratic risk poses a limit to arbitrage that deters short-selling simply because a large amount of stocks' volatility cannot be hedged. For our sample, arbitrage risk has a mean of 3.00% and a standard deviation of 2.67%. If ownership structure results in short-sale constraints these in turn should increase arbitrage risk. We find that total ownership decreases arbitrage risk and that ownership concentration increases arbitrage risk. The coefficient on HHI (0.093) has a comparable but opposite impact on arbitrage risk than total ownership (-0.082), illustrating that ownership concentration should be taken into account by investors

concerned with arbitrage risk. We also present evidence that ownership structure affects arbitrage risk using alternate measures of ownership in columns 3 - 6. Stocks with a dispersed investor base, an investor base with a long-term horizon, and with passive investors all exhibit lower arbitrage risk.

[Insert Table VI HERE]

A valid concern in interpreting these results is that, while ownership structure clearly affects limits to arbitrage, there may be alternative channels to equity lending supply through which this impact takes place. For example, lending supply may affect limits to arbitrage independently of ownership structure, or it could be that ownership structure affects limits to arbitrage through channels other than equity lending supply. We address this concern in results presented in Table VII. We repeat the analysis presented in Table VI but focus on the channel through which ownership structure impacts arbitrage risk.

First, in column 1 of Panel A, we show that higher lending supply is associated with lower arbitrage risk, consistent with Table VII. Next, we split supply in a component explained by ownership variables (*Predicted Supply*) and the remaining portion of supply that is unrelated to ownership (*Residual Supply*). We employ total ownership, concentration and the fraction of passive investors to forecast supply in the first-stage estimates (shown in Panel B) and use these forecasts to explain arbitrage risk in Panel A. Further both the first and second stage estimates include firm fixed effects and controls in columns 4-6. The inclusion of firm fixed effects in the first stage estimation allows us to identify how within firm shocks affect lending supply (the first stage), and how lending supply shocks originating from shocks in ownership affect arbitrage risk (the second stage).

[Insert Table VII HERE]

In columns 2 - 4 we find that arbitrage risk is affected by supply only through the fraction explained by ownership structure. We estimate that a one standard deviation in *Predicted*

Supply using total ownership decreases arbitrage risk by -0.132 standard deviations. The unexplained component of supply, *Residual Supply*, does not have explanatory power for arbitrage risk. In columns 5 - 6 we repeat the same regressions but include firm-fixed effects and controls in both stages. Our results are even stronger and show that supply shocks affect limits to arbitrage only when these shocks are related to ownership structure shocks.

In summary, limits to arbitrage are higher for stocks with more concentrated ownership structures. This result arises because tightly-held ownership squeezes equity lending supply, which in turn increases the cost of borrowing stock and increases recall risk. Stocks with concentrated ownership exhibit higher arbitrage risk, which in the spirit of Shleifer and Vishny (1997) deters arbitrage and if these impediments prevent investors from shorting certain stocks can result in stocks becoming overpriced.

C. How Does Ownership Structure Affect the Relationship between Equity Loan Demand Shocks on Stock Returns?

C.1. Portfolio Analysis

Hypothesis 3 states that returns associated with an outward demand shift are decreasing in the concentration of institutional ownership. If ownership concentration results in higher short sale constraints and increases arbitrage risk, then these tighter constraints will affect stock returns. Short sale constraints allows mispricing to build up and the subsequent returns to short-selling will be more negative as the correction sets in. Kolasinski, Reed, and Ringgenberg (2012) stress that the loan supply schedule is nonmonotonic, with only an upward slope at high short sale demand levels. To study the relation between lending supply and stock prices we combine this with the methodology developed by Cohen, Diether, and Malloy (2007). This approach allows us to identify the upward sloping part of the loan supply schedule and separate the pricing effects of an increase in demand for shorting stock, perhaps because of private

information on future returns, from constrained supply owing to the composition of ownership. We will thus focus on stocks in which there is an outward demand shift *and* ownership concentration is high. Cross-sectionally, we should observe that abnormal returns following a demand shock are more negative for stocks with concentrated ownership.

In Table VIII we examine average returns of portfolios formed using the demand shock classification defined in the discussion of Hypothesis 3 and split by institutional ownership concentration. We place all stocks into two demand shift portfolios: $DOUT = 1$ and $DOUT = 0$, and further sort on quartiles of HHI. Demand shift portfolios are formed in week $t - 1$, HHI quartiles are based on the prior quarter (the most recent data available) and the stocks are held in the portfolios during week *t* and rebalanced every week. We present results for raw returns and abnormal returns, measured as the difference between the weekly stock return and the return on a characteristics-matched benchmark portfolio sorted on market capitalization, book-to-market and momentum following Daniel, Grinblatt, Titman, and Wermers (1997).

Panel A examines raw returns and Panel B examines abnormal returns. Comparing the abnormal returns across $DOUT = 1$ and $DOUT = 0$ shows that an outward demand shift is associated with a negative future return, as documented by Cohen, Diether, and Malloy (2007). The average difference is statistically significant at 5% and equal to -0.129% per week (-0.496% per month). However, examining the portfolio sorts when we further sort returns by ownership concentration reveals that the negative future return associated with an outward demand shock is greater for stocks with concentrated ownership. The future abnormal return for high concentration stocks that experience an outward demand shift (relative to those that experience no outward demand shock) is 0.439% a week compared with the future abnormal return for low concentration stocks that experience and outward demand shift (relative to those that experience no outward demand shock) of -0.020% a week. The difference-in-difference abnormal return (across ownership structure and DOUT) is -0.419% a week and significant at the 1% level.

[Insert Table VIII HERE]

In Panels C to H of Table VIII we display characteristics of these portfolios. We present averages for total ownership, ownership concentration, lending supply, on loan amount, fee scores and arbitrage risk. Firms in the top quartile of ownership concentration have lower total ownership, fees and arbitrage risk, and smaller lending regardless of whether the stock has suffered an outward demand shock or not. Furthermore, the difference-in-difference is negative for total ownership and supply, and positive for concentration, on loan and fees. These results provide evidence of asymmetric changes depending on ownership concentration levels following outward demand shocks.

While these returns look extremely high, they do not take into account any transaction costs needed to rebalance the portfolio every week. Every week, the trade involves new short positions and reversing existing short positions. In our sample, 2.61% of stocks are estimated to have an outward demand shock in the last week (i.e. $DOUT = 1$) and no observed shock in the week prior to that (i.e. lagged $DOUT = 0$). Similarly, 2.63% of stocks have $DOUT = 0$ and lagged $DOUT = 1$. Thus, the estimated weekly turnover in the portfolio is around 5.24%. If we follow a conservative approach and take the average total trading costs shown in Keim and Madhavan (1998) for Nasdaq stocks in the middle quintile of firms ranked by market capitalization, we estimate weekly trading costs for the $DOUT = 1 - DOUT = 0$ portfolio to be equal to $2 * 0.524 * 0.92\% = 0.1\%$ per week.[10] This would reduce the estimated abnormal returns by almost a quarter, from 0.42% per week to 0.32% per week.

Another source of costs are the lending fees paid to borrow shares required to implement short leg of the $DOUT = 1$ strategy. The average lending fee of the $DOUT = 1$ portfolio is 3.5% a year or 0.07% a week. This would reduce the weekly return of the $DOUT =$

[10] Keim and Madhavan (1998) use trades by 21 institutions between January 1991 and March 1993. Given the reduction in transaction costs over time, the trading costs during our sample period are likely to be lower.

$1 - DOUT = 0$ portfolio in column 1 by $0.07/2 = 0.035\%$, with average abnormal returns decreasing from -0.129% to -0.095% per week.

C.2. Cross-Sectional Estimations

To determine the effect of ownership concentration combined with an outward demand shift in predicting future abnormal returns while properly controlling for a wide array of factor variables that might be correlated with outward demand shocks and ownership concentration, we employ a regressions methodology. We estimate cross-sectional pooled regressions using weekly abnormal returns, including calendar month dummies, and cluster standard errors at the firm-level.[11] We interact demand shocks with total ownership and ownership concentration measures measured at end of the previous quarter. As control variables we also include lagged loan fees and total ownership. The baseline specification takes the form:

$$\begin{aligned} R_{i,t} &= \alpha + \theta_t + \beta_1 DOUT_{t-1} + \beta_2 Top(HHI_{i,q-1}) + \beta_3 Total_{i,q-1} \\ &\quad + \beta_4 DOUT_{t-1} * Top(HHI)_{i,q-1} + \beta_6 CTRLS_{i,t-2} + \epsilon_{i,t} \end{aligned} \tag{3}$$

where R_{it} is the abnormal return on stock i in week t, $DOUT_{t-1}$ is a dummy variable equal to one if there was an outward demand shift in the prior week, 0 otherwise; $Top(HHI)$ is a dummy variable equal to one if ownership concentration in the previous quarter (as measured by the Herfindahl index) is above the 75th percentile conditional on *DOUT*=1; and *Total* is institutional ownership.[12] Finally, $CTRLS$ denotes the set of additional controls used for robustness tests.

We present the results in Table IX. In column 1 we show that outward demand shifts convey negative information for returns, similar to the results presented by Cohen, Diether,

[11] Results are robust to using standard errors clustered by time.

[12] This timing is used such that all variables are known to investors when forecasting returns.

and Malloy (2007). The coefficient on *DOUT* of -0.130 implies that an outward demand shock decreases abnormal returns by approximately 0.13% per week (0.52% per month).[13]

[Insert Table IX HERE]

In column 2 we introduce institutional ownership and a dummy variable for stocks in the top quartile of ownership concentration. Ownership structure alone explains none of the future returns. Next, in column 3, we estimate the effect of institutional ownership structure on stock returns associated with an outward demand shift. If a more concentrated ownership structure poses greater limits to arbitrage then we should expect to observe more negative abnormal returns associated with outward demand shocks in firms with concentrated ownership than for other firms. This is precisely what we find. The coefficient on *DOUT* $*$ *Top(HHI)* is negative and significant, and implies that an outward demand shock decreases abnormal returns in more concentrated firms by approximately 0.42% per week (1.7% per month). The result that outward demand shocks predict negative returns is concentrated amongst firms with greater short sale constraints and limits to arbitrage owing to ownership concentration. Column 4 of Table IX confirms that our results are robust to the inclusion of borrowing fee. In column 5 we check that the result for ownership concentration is not driven by other non-concentration determinants of short sale constraints. We add two variables to the regressions: $Bottom(Total)$ is a dummy variable equal to one if total ownership is in the bottom quartile in the previous quarter and $Bottom(Supply)$ is a dummy variable equal to one if lending supply is in the bottom quartile in week $t-2$. For example, there is no difference in abnormal returns following an outward demand shock between firms with above or below-top quartile total ownership. The result that future returns are negative following an outward demand shock but concentrated among stocks with high ownership concentration continues to hold, in line with a higher delay in adjusting to new information.

[13]Cohen, Diether, and Malloy (2007) find returns of 3.27% per month associated with outward demand shifts. However, once transaction costs are considered these reduce to 0.37% per month.

In Table X we use an alternative measure of concentration. Instead of HHI, we define concentration as the percentage of institutional ownership that is held by the largest five institutional shareholders in the firm (Top5 / Total). Coefficients are about 25% smaller than when using HHI, but still significant at the 10% level.

[Insert Table X HERE]

Combined, the results in Section 4.C support Hypotheses 3. Outward demand shifts are associated with negative returns, but this negative return is much larger for stocks with more concentrated ownership. These larger negative abnormal returns are linked to limits to arbitrage and longer delays to incorporate information.

V. Robustness Checks

A. *Are the abnormal return results stronger for firms that are more subject to short-sale constraints?*

Theoretical studies such as Blocher, Reed, and Van Wesep (2012) and empirical studies including Cohen, Diether, and Malloy (2007) have proposed that short-sale constraints and the impact of the equity lending market on prices depend on whether a stock is hard-to-borrow.

In Table XI we split the sample according to several measures associated with firms that face higher limits to arbitrage. It is possible that our results are non-linear and are concentrated among firms that are "constrained" or even caused by spurious correlation between omitted characteristics and ownership concentration. *Bottom(Total)* restricts the sample to firms in the bottom quartile of institutional ownership in the previous quarter. Top(Churn) and Top(Arb. Risk) capture, respectively, firms in the top quartile of portfolio churn and arbitrage risk. Specialness denotes firms with a fee score, a measure of loan fees that ranges from 1 (cheapest

to borrow) to 10 (hardest to borrow), that is greater than one two weeks before.[14] Bottom(Size) are firms in the bottom quartile of marker capitalization in the previous quarter. Our main result that abnormal returns following outward demand shocks are more negative for firms with high concentration holds for all of the "constrained" subsamples, apart of those firms in the top arbitrage risk quartile. For example, in the subset of firms with high fees (i.e. Special), the *DOUT*Top(HHI)* coefficient is equal to -0.524, equivalent to abnormal returns of -2.1% per month. In Table XII we look at the remaining sample, i.e. the "unconstrained" data, and find that results are similar. Overall, our effects remain regardless of whether stocks are relatively constrained or unconstrained.

[Insert Table XI and Table XII HERE]

B. Short-term Overreaction, Liquidity, Lending Costs, and Change in Breadth

We also subject our results to further robustness tests in Table XIII, with column 1 displaying our baseline regressions for comparison. In column 2 we rule out that our results are affected by the inclusion of previous weeks' return. Diether, Lee, and Werner (2009) shows that short selling activity increases following higher returns in the previous week. It is possible that firms with high concentration are even more affected by overreaction and our main result is simply due to spurious correlation between lending demand shocks and reversals. The -0.027 coefficient provides evidence of reversals and this effect is even stronger for Top(HHI) firms, with the interaction term being negative and statistically significant. Accounting for price reversals does not affect the significance of the *DOUT*Top(HHI)* coefficient. In columns 3 and 4 we control for liquidity measures by using average daily turnover and closing bid-ask spreads. Column 5 controls for extremely high fees with a dummy variable equal to 1 for firms with fee scores above the 95th percentile. In all cases, our main results remain unchanged.

[14] Approximately 90% of firm-weeks have a fee score equal to 1. We also examine stocks with raw loan fees above 1% in the previous week with similar results.

We also test whether our results could be caused by lower sentiment in stocks that suffer demand shocks. In column 6 we use the change in the breadth of institutional ownership in the previous two quarters as defined by Chen, Hong, and Stein (2002). We find that lower breadth is associated with lower returns but not more so for stocks that experience a demand shock. Once more, our results for *DOUT*Top(HHI)* remain the same.

[Insert Table XIII HERE]

C. Four-Factor Model Calendar-Time Regressions

Our final set of robustness results is to estimate time-series regressions of several portfolios using well-known risk factors rather than panel regressions with characteristically adjusted returns. In Table XIV we estimate regressions of weekly portfolio returns on the Fama-French factors and momentum, with each panel using a different portfolio formation rule. In Panel A, we form a portfolio that buys stocks without outward demand shocks and not in the top quartile of ownership concentration (i.e., DOUT=0 and Top(HHI)=0) while shorting those with demand shocks and in the top quartile of ownership concentration (i.e., DOUT=0 and Top(HHI)=0). In column 1 we see that the long-short difference is statistically significant at the 10% level (p-value is equal to 0.07) and equal to 0.46% per week, similar to our findings using cross-sectional regressions. In columns 2 to 4, this result in unaffected by controlling for the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) factors. The long-short portfolio has positive and significant loadings on the market and momentum factors.

In Panels B and C we split the impact of outward demand shocks according to ownership concentration looking at the difference between portfolios that buy DOUT=0 stocks and short DOUT=1 stocks split by Top(HHI). In Panel B, we do not find any statistical difference in returns between DOUT=0 and DOUT=1 for firms that are not in the top quartile of ownership

concentration. Panel C shows that the abnormal returns only arise for those stocks with high ownership concentration. These results mirror our findings using the cross-sectional regressions.

We also include dummies to examine the behavior of these returns during two periods associated with market turmoil. Similar to Khandani and Lo (2011), we create a dummy variable to capture the Quant crisis, being equal to 1 for the two weeks between August 3rd and August 17th, 2007. Similarly, we look at the Lehman Brothers' bankruptcy by defining a dummy variable equal to 1 for the period between September 19th and 26th, 2008. Surprisingly, during these two periods when stocks markets had significant price decreases, the long-short portfolios also had significant negative returns. In column 5 of Panels B and C we find that the long-short portfolios based on DOUT exhibited relatively more negative returns during the Lehman crisis for high concentration firms. The long-short portfolio had abnormal returns equal to -3.32% in that week, relative to a decrease of -2.30% for Top(HHI)=0 firms. Results for the Quant crisis are not as strong and we only find a significant decrease in returns for the DOUT strategy for Top(HHI)=0 portfolio.

[Insert Table XIV HERE]

VI. Concluding Remarks

Arbitrageurs often use short selling as part of their trading strategies, borrowing securities they do not own to correct overvaluation. Short selling entails various costs and risks, such as locating shares to borrow, loan fees, and the risk that the short position is involuntarily closed due to recall by the original lender of the borrowed shares. We argue that stocks with a more concentrated ownership structure, or with an investor base that is more active or has a shorter investment investment horizon are less willing to lend shares, affecting arbitrageurs' ability to engage in short selling.

The main objective of this paper is to examine how the composition of institutional ownership affects the market for borrowing stock. Using a proprietary data set with information on equity lending supply, loan transactions and loan fees we show that ownership structure is an important determinant of equity lending supply and short sale constraints. More specifically, we find that firms with low total ownership, high concentration of ownership, and an investor base with shorter investment horizon or higher portfolio churn tend to have smaller lending supply, higher loan fees, and arbitrage risk. For example, firms in the low-ownership/high-concentration tercile have just 3.8% of their market capitalization available to borrow, against 26.9% for firms in the high-ownership/low-concentration tercile.

We show that institutional ownership concentration negatively impacts stock lending supply, even after controlling for total institutional ownership. We also examine measures of short sale constraints and find that total ownership relieves constraints while ownership concentration increases the costs of borrowing equity and inhibits arbitrage.

If arbitrageurs face greater limits to arbitrage stemming from the short sale constraints then mispricing builds up and the subsequent returns to short-selling will be more negative. We examine the impact of changes on stock returns by identifying demand shifts using price-quantity pairs based on the methodology proposed by Cohen, Diether, and Malloy (2007) and find that outward demand shocks are more likely for stocks with less institutional ownership and more ownership concentration. We show that abnormal returns are more negative following an outward demand shock for a stock with more concentrated ownership, consistent with short sale constraints limiting negative information from being released in prices. We find that stocks in the top quintile of ownership concentration earn an average abnormal return following an outward demand shock of -0.42% per week, or -1.7% per month, compared to similar shocks on stocks with dispersed ownership. These results suggest a link between the limits to arbitrage and ownership structure, which to the best of our knowledge has not been explored

previously. Our results are robust to several alternatives including liquidity, price reversals, time-series portfolio returns regressions, and changes in investor sentiment among others.

Our contribution is also methodological in nature. We show that institutional ownership is not a sufficient statistic to proxy for lending supply as is often assumed in the literature (see Asquith, Pathak, and Ritter (2005), Lamont (2004), Nagel (2005), Akbas, Boehmer, Erturk, and Sorescu (2008), and Kolasinski, Reed, and Ringgenberg (2012) among others). Instead, both institutional ownership levels and the structure of institutional ownership should be taken into consideration.

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Figure 1. Equity Lending Market - Size relative to Capitalization and Loan Fees
The figure shows average lending supply and the average shares on loan as a fraction of firm capitalization, and average value-weighted annualized loan fee for each quarter between August 2006 and December 2010.

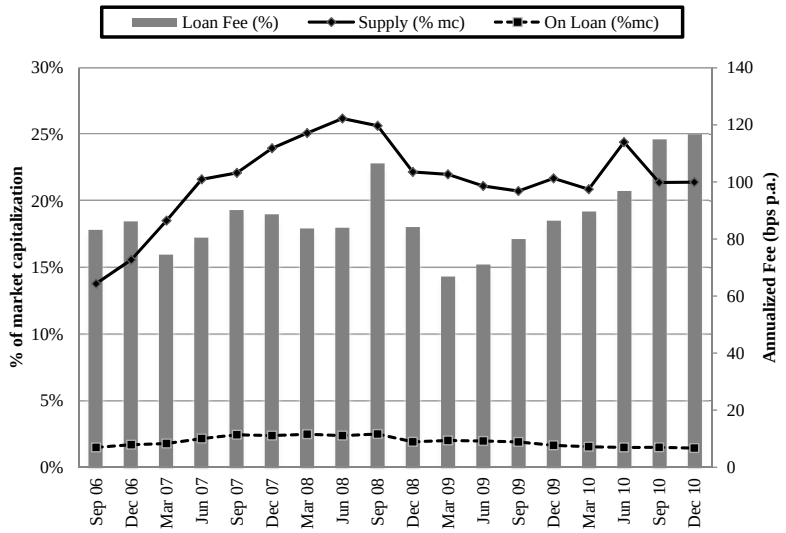

Figure 2. Equity Lending Market - Total Size and Utilization
The figure shows average lending supply and the average shares on loan as a fraction of firm capitalization, and average value-weighted annualized loan fee for each quarter between August 2006 and December 2010.

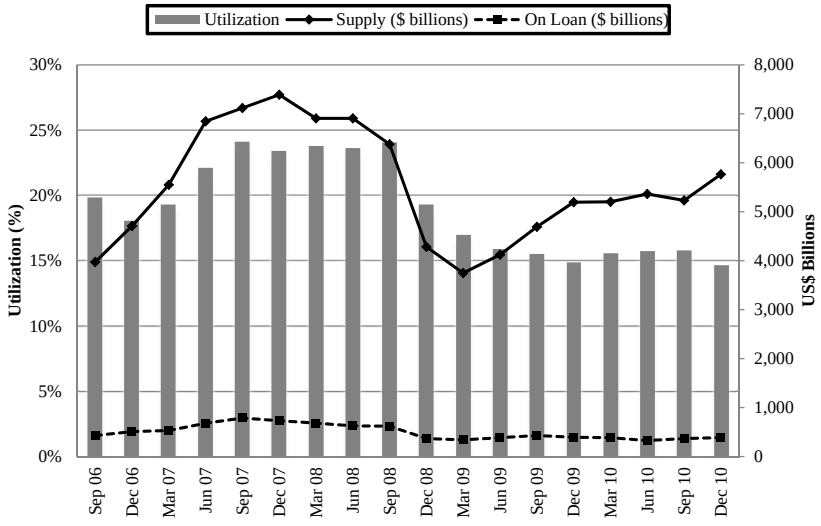

Table I
Descriptive Statics

The table shows quarterly descriptive statistics between August 2006 and December 2010 of the main variables used in the paper. Equity lending data are provided by Data Explorers, price data are from CRSP, ownership data from SEC's 13F holdings, and accounting data from Compustat. Obs is the number of firm-quarter observations available, Supply is the quarterly average fraction of market capitalization available to lend, On Loan is the fraction effectively lent out, Fee(VW) is the value-weighted average loan fee, Fee Score is a measure of fee that ranges from 1 (cheapest to borrow) to 10 (hardest to borrow), Specialness is a dummy variable equal to one if the loan fee is above 100 basis points (summary statistics describe sample metrics), Utilization is On Loan divided by Supply, Price is the quarterly average, Size is firm size in billions, μ(Ret) is the average quarterly return, σ(Ret) is the standard deviation of returns, Arb. Risk is the mean squared error of residuals from Carhart (1997)'s 4-factor model, Turnover is average daily turnover (x100), β_{mkt} is the market beta from the same regression, and BM is the book-to-market ratio. Total is the total institutional ownership, *HHI* is concentration of ownership measured by the Hirschman-Herfindahl index, Top5 is the percentage held by the largest 5 shareholders, and Top5 - LT, and Top5 - ST, is the percentage held by the largest 5 shareholders with a long and short-term investment horizon, respectively, as in Chen, Harford, and Li (2007). Churn is the average investor portfolio churn in the previous quarter as in Gaspar, Massa, and Matos (2005). Breadth is the number of institutional investors as in Chen, Hong, and Stein (2002). Δ(Breadth) is the percentage change from the previous quarter.

Variable	Obs	Mean	Median	St.Dev	Min	Max
Supply	59,674	19.90%	20.01%	12.94%	0.00%	53.69%
On Loan	59,673	4.80%	2.47%	6.11%	0.00%	30.42%
Fee(VW) (bps p.a.)	59,281	70.61	13.36	184.92	-6.83	1,301
Fee Score	58,751	1.50	1.00	1.23	1.00	10.00
Specialness	59,674	14.43%	0.00%	35.14%	0.00%	100%
Utilization	59,674	19.12%	11.68%	20.49%	0.00%	84.61%
Price	59,674	22.67	15.32	40	0.04	2,432
Size (bi)	59,674	3,662	397	16,260	0.31	513,362
μ(Ret)	59,674	2.43%	0.53%	34.12%	-94.23%	1833%
σ(Ret)	59,674	3.53%	2.84%	2.82%	0.15%	245%
Arb. Risk	59,669	3.00%	2.35%	2.67%	0.15%	230.90%
Turnover	59,674	0.90%	0.64%	1.03%	0.00%	33.72%
$\beta_{mkt}(FF3)$	59,669	0.85	0.89	0.73	-1.54	2.82
B/M	59,674	0.76	0.58	0.70	-0.05	4.39
Total	59,674	58.01%	63.42%	30.55%	0.00%	100%
HHI	59,674	12.35%	6.61%	14.38%	1.27%	100%
Top5	59,674	3.08%	3.19%	1.86%	0.00%	60%
Top5 - ST	59,674	2.27%	2.31%	2.05%	0.00%	60%
Top5 - LT	59,674	0.82%	0.00%	1.72%	0.00%	50%
% Passive	46,893	1.66%	0.00%	5.44%	0.00%	27.52%
Churn	46,893	20.81%	20.26%	6.02%	0.17%	100%
Breadth	59,674	140.21	89.00	179.65	1.00	1,683
Δ(Breadth)	59,674	0.98%	0.00%	3.06%	-4.29%	18.57%

Table II
Descriptive Statics - Lending Supply Quintiles

The table shows quarterly descriptive statistics of U.S. firms between August 2006 and December 2010 sorted by equity lending supply quintiles. Equity lending data are provided by Data Explorers, price data are from CRSP, ownership data from SEC's 13F holdings, and accounting data from Compustat. Panel A report equity lending characteristics: Obs_{Supply} is the number of firm-quarter observations for which lending supply data is available, *Supply* is the quarterly average fraction of market capitalization available to lend, *On Loan* is the fraction effectively lent out, Specialness is a dummy variable equal to one if the loan fee is above 100 basis points, Utilization is On Loan divided by Supply, Fee(VW) is the value-weighted average loan fee, Fee Score is a measure of fee that ranges from 1 (cheapest to borrow) to 10 (hardest to borrow). Panel B reports institutional ownership characteristics: Total is the total institutional ownership, *HHI* is concentration of ownership measured by the Hirschman-Herfindahl index, Top5 is the percentage held by the largest 5 shareholders, and Top5 - LT, and Top5 - ST, is the percentage held by the largest 5 shareholders with a long and short-term investment horizon, respectively, as in Chen, Harford, and Li (2007). Churn is the average investor portfolio churn in the previous quarter as in Gaspar, Massa, and Matos (2005). Breadth is the number of institutional investors as in Chen, Hong, and Stein (2002). Panel C price data: Price is the quarterly average, Size(bi) is firm size in billions, μ(Ret) is the average quarterly return, σ(Ret) is the standard deviation, Arb. Risk is the mean squared error of residuals from Carhart (1997)'s 4-factor model, Turnover is average daily turnover and β_{mkt} is the market index beta from the Carhart (1997) 4 factor model.

Panel A: Equity Lending

Quintile	Obs_{Supply}	*Supply*	*On Loan*	Specialness	Util.	Fee(VW)	Fee Score
1	10,294	2.16%	0.50%	0.46	13.44%	199.32	2.34
2	11,635	9.70%	2.30%	0.193	19.47%	93.44	1.75
3	12,322	18.73%	4.50%	0.063	20.50%	39.90	1.31
4	12,717	26.50%	5.90%	0.032	18.87%	23.71	1.16
5	12,706	38.12%	9.80%	0.034	22.31%	26.08	1.18
Overall	59,674	19.90%	4.80%	0.144	19.12%	70.61	1.50

Panel B: Institutional Ownership

Quintile	Total	HHI	Mean	Top5	Top5 - LT	Top5 - ST	Churn	Breadth
1	15.3%	33.1%	1.1%	0.8%	0.5%	0.3%	0.21	17.46
2	38.2%	15.1%	1.0%	2.3%	1.6%	0.7%	0.21	66.10
3	62.1%	7.7%	0.7%	3.4%	2.5%	0.9%	0.21	180.07
4	77.3%	5.2%	0.6%	3.9%	2.9%	1.0%	0.21	230.64
5	87.5%	4.7%	0.7%	4.6%	3.5%	1.1%	0.21	178.35
Overall	58.0%	12.3%	0.8%	3.1%	2.3%	0.8%	0.21	140.21

Panel C: Price Data

Quintile	Price	Size(bi)	μ(Ret)	σ(Ret)	Arb. Risk	Turnover	β_{mkt}
1	9.60	199.95	6.3%	4.7%	4.59%	0.31%	0.32
2	17.11	2140.09	5.5%	3.8%	3.45%	0.53%	0.70
3	24.87	6572.75	5.3%	3.2%	2.56%	0.91%	0.98
4	31.27	6225.06	3.7%	2.9%	2.23%	1.18%	1.06
5	27.64	2473.60	-7.5%	3.3%	2.51%	1.42%	1.08
Overall	22.67	3662.25	2.4%	3.5%	3.00%	0.90%	0.85

Table III
Lending Supply & Ownership Structure

The table displays regressions of equity lending supply as a function of corporate ownership measures, with quarterly stock data between August 2006 and December 2010 of U.S. firms. All explanatory variables are standardized each quarter such that they have zero mean and unit standard deviation. *Total* is total ownership, *HHI* is concentration of ownership measured by the Hirschman-Herfindahl index, *Churn* is the portfolio churn of the average investor, *Top5/Total* is the percentage held by the largest 5 shareholders, *Top5 - LT/Total* is the percentage of total ownership held by the largest 5 shareholders that have held the stock by more than one year as in Chen, Harford, and Li (2007) and *% Passive* is the fraction of the firm held by passive investors. *Mkt. Cap.* denotes market capitalization, $D_{P<5}$ is a dummy variable equal to one if the quarterly average price is below five dollars, *Tover* measures the quarterly average of daily stock turnover, *BM* the book-to-market ratio, *Momentum* is the cumulative return in the previous two quarters, and Δ*(Breadth)* is the change in the number of institutional investors as in Chen, Hong, and Stein (2002). All regressions include year-quarter dummies, and fixed-effects' standard errors are double-clustered at the stock and quarterly level. We report standard errors in brackets and significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level.

	(1)	(2)	(3)	(4)	(5)	(6)
Total	0.788***	0.731***	0.790***	0.620***	0.622***	0.774***
	[0.012]	[0.012]	[0.013]	[0.013]	[0.013]	[0.012]
HHI		-0.169***				
		[0.017]				
Churn			-0.054***			
			[0.008]			
Top5 / Total				-0.392***	-0.398***	
				[0.023]	[0.023]	
Top5 - LT / Total					0.001	
					[0.004]	
% Passive						0.027***
						[0.006]
Mkt. cap	0.080***	0.010	0.074***	-0.123***	-0.125***	0.084***
	[0.016]	[0.019]	[0.017]	[0.022]	[0.022]	[0.017]
$D_{P<5}$	-0.116***	-0.106***	-0.075***	-0.092***	-0.091***	-0.100***
	[0.025]	[0.023]	[0.029]	[0.022]	[0.022]	[0.029]
Turnover	0.042***	0.036***	0.062***	0.012	0.011	0.050***
	[0.011]	[0.011]	[0.012]	[0.011]	[0.011]	[0.013]
B/M	0.109***	0.108***	0.115***	0.117***	0.121***	0.123***
	[0.013]	[0.012]	[0.013]	[0.012]	[0.012]	[0.013]
Momentum	-0.006	-0.005	0.005	-0.004	-0.004	0.002
	[0.008]	[0.008]	[0.010]	[0.008]	[0.008]	[0.010]
$\Delta(Breadth)$	0.030***	0.010	0.031***	0.003	0.002	0.029***
	[0.010]	[0.009]	[0.011]	[0.008]	[0.009]	[0.011]
Constant	0.040***	0.033***	0.039***	0.030***	0.029***	0.047***
	[0.006]	[0.005]	[0.005]	[0.005]	[0.005]	[0.007]
Observations	59,674	59,674	46,893	59,674	58,872	46,894
Adj. R^2	0.712	0.725	0.710	0.746	0.740	0.708
Firms	4,483	4,483	4,363	4,483	4,454	4,364

Table IV
Short-Sale Constraints & Ownership Structure: Loan Fee

The table regress equity loan fees as a function of ownership structure, with quarterly stock data between August 2006 and December 2010 of U.S. firms. All explanatory variables are standardized each quarter such that they have zero mean and unit standard deviation. *Total* is total ownership, *HHI* is concentration of ownership measured by the Hirschman-Herfindahl index, *Churn* is the portfolio churn of the average investor, *Top5/Total* is the percentage held by the largest 5 shareholders, *Top5 - LT/Total* is the percentage of total ownership held by the largest 5 shareholders that have held the stock by more than one year as in Chen, Harford, and Li (2007) and *% Passive* is the fraction of the firm held by passive investors. *Mkt. Cap.* denotes market capitalization, $D_{P<5}$ is a dummy variable equal to one if the quarterly average price is below five dollars, *Tover* measures the quarterly average of daily stock turnover, *BM* the book-to-market ratio, *Momentum* is the cumulative return in the previous two quarters, and Δ*(Breadth)* is the change in the number of institutional investors as in Chen, Hong, and Stein (2002). All regressions include year-quarter dummies, and fixed-effects' standard errors are double-clustered at the stock and quarterly level. We report standard errors in brackets and significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level.

	(1)	(2)	(3)	(4)	(5)	(6)
Total	-0.312***	-0.277***	-0.303***	-0.254***	-0.251***	-0.303***
	[0.016]	[0.017]	[0.017]	[0.019]	[0.019]	[0.017]
HHI		0.104***				
		[0.018]				
Churn			-0.015			
			[0.017]			
Top5 / Total				0.136***	0.134***	
				[0.022]	[0.022]	
Top5 - LT / Total					-0.022***	
					[0.005]	
% Passive						-0.012***
						[0.005]
Mkt. cap	-0.084***	-0.042**	-0.084***	-0.013	-0.012	-0.083***
	[0.019]	[0.019]	[0.020]	[0.019]	[0.021]	[0.021]
$D_{P<5}$	0.259***	0.253***	0.307***	0.250***	0.255***	0.300***
	[0.051]	[0.050]	[0.056]	[0.051]	[0.050]	[0.061]
Turnover	0.206***	0.209***	0.214***	0.216***	0.214***	0.211***
	[0.013]	[0.013]	[0.015]	[0.013]	[0.013]	[0.014]
B/M	-0.068***	-0.068***	-0.080***	-0.071***	-0.071***	-0.078***
	[0.014]	[0.014]	[0.014]	[0.014]	[0.014]	[0.015]
Momentum	-0.031***	-0.031***	-0.029***	-0.031***	-0.030***	-0.030***
	[0.009]	[0.009]	[0.010]	[0.009]	[0.009]	[0.010]
$\Delta(Breadth)$	0.001	0.013	0.005	0.011	0.010	0.004
	[0.011]	[0.011]	[0.013]	[0.011]	[0.012]	[0.012]
Constant	-0.071***	-0.068***	-0.103***	-0.069***	-0.095***	-0.096***
	[0.011]	[0.011]	[0.012]	[0.011]	[0.010]	[0.011]
Obs.	59,316	59,316	46,593	59,316	58,600	46,594
Adj R^2	0.164	0.170	0.161	0.169	0.166	0.161
Firms	4,483	4,483	4,363	4,483	4,454	4,364

Table V: Short-Sale Constraints & Ownership Structure: Specialness and Loan Tenure

The table uses regressions to study additional characteristics of equity loans as a function of ownership structure, with quarterly stock data between August 2006 and December 2010 of U.S. firms. Panel A uses logistic regressions to estimate the probability that a stock is "on special" and Panel B uses OLS regressions to with average loan tenure. All explanatory variables are standardized each quarter such that they have zero mean and unit standard deviation. *Total* is total ownership, *HHI* is concentration of ownership measured by the Hirschman-Herfindahl index, *Churn* is the portfolio churn of the average investor, *Top5/Total* is the percentage held by the largest 5 shareholders, *Top5 - LT/Total* is the percentage of total ownership held by the largest 5 shareholders that have held the stock by more than one year as in Chen, Harford, and Li (2007) and *% Passive* is the fraction of the firm held by passive investors. *Mkt. Cap.* denotes market capitalization, $D_{P<5}$ is a dummy variable equal to one if the quarterly average price is below five dollars, *Tover* measures the quarterly average of daily stock turnover, *BM* the book-to-market ratio, *Momentum* is the cumulative return in the previous two quarters, and Δ*(Breadth)* is the change in the number of institutional investors as in Chen, Hong, and Stein (2002). All regressions include year-quarter dummies, and fixed-effects' standard errors are double-clustered at the stock and quarterly level. We report standard errors in brackets and significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level.

	Panel A: Specialness					**Panel B: Loan Tenure**				
Total	-0.084***	-0.094***	-0.070***	-0.067***	-0.092***	0.042**	0.055**	0.057***	0.052***	0.040
	[0.004]	[0.005]	[0.005]	[0.005]	[0.005]	[0.021]	[0.024]	[0.018]	[0.018]	[0.024]
HHI	0.024***					-0.088***				
	[0.003]					[0.025]				
Churn		0.003					-0.100***			
		[0.002]					[0.011]			
Top5 / Total			0.050***	0.049***				-0.033	-0.025	
			[0.006]	[0.005]				[0.034]	[0.034]	
Top5 - LT / Total				-0.006***					0.014***	
				[0.001]					[0.005]	
% Passive					-0.008***					-0.001
					[0.005]					[0.006]
Mkt. Cap	-0.034***	-0.053***	-0.017***	-0.015**	-0.054***	0.068**	0.092***	0.087***	0.092***	0.104***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.030]	[0.030]	[0.032]	[0.034]	[0.030]
$D_{P<5}$	0.054***	0.063***	0.053***	0.053***	0.065***	0.159***	0.259***	0.157***	0.158***	0.210***
	[0.007]	[0.009]	[0.007]	[0.007]	[0.009]	[0.042]	[0.040]	[0.042]	[0.043]	[0.040]
Turnover	0.057***	0.061***	0.059***	0.057***	0.062***	-0.068***	-0.018	-0.067***	-0.064***	-0.039**
	[0.003]	[0.004]	[0.003]	[0.003]	[0.004]	[0.017]	[0.016]	[0.018]	[0.019]	[0.017]
B/M	-0.017***	-0.022***	-0.018***	-0.017***	-0.022***	-0.009	-0.013	-0.008	-0.007	0.000
	[0.003]	[0.003]	[0.002]	[0.002]	[0.003]	[0.012]	[0.012]	[0.011]	[0.011]	[0.012]
Momentum	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***	-0.055***	-0.046***	-0.056***	-0.057***	-0.052***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.008]	[0.010]	[0.008]	[0.008]	[0.010]
$\Delta(Breadth)$	0.016***	0.012**	0.014***	0.015***	0.012**	0.107***	0.084***	0.115***	0.121***	0.081***
	[0.006]	[0.005]	[0.005]	[0.006]	[0.005]	[0.025]	[0.024]	[0.026]	[0.025]	[0.025]
Obs.	59,709	46,928	59,709	58,907	46,929	59,316	46,593	59,316	58,600	46,594
Pseudo R^2	0.293	0.273	0.297	0.290	0.274	0.020	0.019	0.016	0.016	0.011
Firms	4,483	4,363	4,483	4,454	4,364	4,480	4,360	4,480	4,449	4,361

Table VI
Short-Sale Constraints & Ownership Structure: Arbitrage Risk

The table shows regressions of arbitrage risk as a function of ownership structure, with quarterly US stock data between August 2006 and December 2010. Arbitrage risk is defined as the mean squared error of residuals from Carhart (1997)'s 4-factor model. All variables are standardized each quarter such that they have zero mean and unit standard deviation. *Total* is total ownership, *HHI* is concentration of ownership measured by the Hirschman-Herfindahl index, *Churn* is the portfolio churn of the average investor, *Top5/Total* is the percentage held by the largest 5 shareholders, *Top5 - LT/Total* is the percentage of total ownership held by the largest 5 shareholders that have held the stock by more than one year as in Chen, Harford, and Li (2007) and *% Passive* is the fraction of the firm held by passive investors. *Mkt. Cap.* denotes market capitalization, $D_{P<5}$ is a dummy variable equal to one if the quarterly average price is below five dollars, *Tover* measures the quarterly average of daily stock turnover, *BM* the book-to-market ratio, *Momentum* is the cumulative return in the previous two quarters, and Δ*(Breadth)* is the change in the number of institutional investors as in Chen, Hong, and Stein (2002). All regressions include year-quarter dummies, and fixed-effects' standard errors are double-clustered at the stock and quarterly level. We report standard errors in brackets and significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level.

	(1)	(2)	(3)	(4)	(5)	(6)
Total	-0.113***	-0.082***	-0.121***	-0.064***	-0.059***	-0.113***
	[0.012]	[0.011]	[0.013]	[0.012]	[0.012]	[0.014]
HHI		0.093***				
		[0.014]				
Churn			0.020**			
			[0.009]			
Top5 / Total				0.115***	0.116***	
				[0.014]	[0.014]	
Top5 - LT / Total					-0.009***	
					[0.003]	
%Passive						-0.016***
						[0.005]
Mkt. cap	-0.486***	-0.447***	-0.470***	-0.426***	-0.430***	-0.475***
	[0.020]	[0.017]	[0.021]	[0.018]	[0.017]	[0.021]
$D_{P<5}$	0.614***	0.608***	0.629***	0.606***	0.599***	0.638***
	[0.049]	[0.048]	[0.059]	[0.049]	[0.047]	[0.061]
Turnover	0.357***	0.360***	0.358***	0.366***	0.360***	0.363***
	[0.019]	[0.019]	[0.022]	[0.019]	[0.019]	[0.023]
B/M	-0.024	-0.024	-0.025	-0.026*	-0.029*	-0.028
	[0.015]	[0.015]	[0.018]	[0.015]	[0.015]	[0.018]
Momentum	-0.024**	-0.025**	-0.027*	-0.025**	-0.023*	-0.026*
	[0.012]	[0.012]	[0.015]	[0.012]	[0.012]	[0.015]
$\Delta(Breadth)$	-0.110***	-0.099***	-0.109***	-0.102***	-0.109***	-0.108***
	[0.012]	[0.010]	[0.013]	[0.011]	[0.010]	[0.014]
Constant	-0.175***	-0.172***	-0.171***	-0.173***	-0.182***	-0.174***
	[0.011]	[0.010]	[0.014]	[0.011]	[0.011]	[0.013]
Obs.	59,704	59,704	46,924	59,704	58,902	46,925
Adj. R^2	0.459	0.464	0.441	0.463	0.463	0.441

Table VII
Short-Sale Constraints & Ownership Structure: Arbitrage Risk and Lending Supply

The table shows regressions of arbitrage risk as a function of lending supply and decompositions using ownership variables. We use quarterly U.S. stock data between August 2006 and December 2010. Panel B shows the first-stage estimates of supply as a function of ownership characteristics. Arbitrage risk is defined as the mean squared error of residuals from Carhart (1997)'s 4-factor model. Supply is the available lending supply as a fraction of market capitalization, Prediction Supply (Residual Supply) is forecasted (residual) supply from the first-stage regressions using the variables in *Instruments*, *Total* is total ownership, *HHI* is concentration of ownership measured by the Hirschman-Herfindahl index, *% Passive* is the fraction of the firm held by passive investors. Residual Supply (Prediction Supply) are the residuals (forecasts) of supply from the first-stage regressions using the variables in *Instruments*. The Control variables are:*Mkt. Cap.* denotes market capitalization, $D_{P<5}$ is a dummy variable equal to one if the quarterly average price is below five dollars, *Tover* measures the quarterly average of daily stock turnover, *BM* the book-to-market ratio, *Momentum* is the cumulative return in the previous two quarters, and Δ*(Breadth)* is the change in the number of institutional investors as in Chen, Hong, and Stein (2002). All regressions include year-quarter dummies and robust standard errors. We report standard errors in brackets and significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level.

Panel A: Arbitrage Risk and Supply

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Supply	-0.105***						
	[0.010]						
Predicted Supply		-0.132***	-0.158***	-0.104***	-0.187***	-0.260***	-3.760***
		[0.023]	[0.027]	[0.021]	[0.031]	[0.041]	[0.633]
Residual Supply		0.000	0.003	-0.005	0.000	0.002	-0.005
		[0.011]	[0.011]	[0.012]	[0.010]	[0.010]	[0.012]
Mkt. cap	-0.499***	-0.976***	-0.961***	-1.039***	-0.931***	-0.875***	1.426***
	[0.019]	[0.038]	[0.039]	[0.045]	[0.039]	[0.043]	[0.416]
$D_{P<5}$	0.608***	0.246***	0.244***	0.244***	0.236***	0.233***	-0.042
	[0.050]	[0.022]	[0.022]	[0.025]	[0.021]	[0.021]	[0.053]
Turnover	0.353***	0.429***	0.431***	0.448***	0.436***	0.437***	0.627***
	[0.019]	[0.025]	[0.025]	[0.029]	[0.025]	[0.025]	[0.039]
B/M	-0.014	-0.033***	-0.032***	-0.040***	-0.002	0.015	0.763***
	[0.016]	[0.011]	[0.011]	[0.013]	[0.012]	[0.013]	[0.136]
Momentum	-0.023**	0.002	0.002	0.005	0.003	0.002	-0.021***
	[0.011]	[0.005]	[0.005]	[0.006]	[0.005]	[0.005]	[0.007]
$\Delta(Breadth)$	-0.114***	-0.020***	-0.021***	-0.028***	-0.019***	-0.022***	-0.064***
	[0.012]	[0.007]	[0.007]	[0.006]	[0.007]	[0.007]	[0.008]
Constant	-0.177***	-0.079***	-0.078***	-0.066***	-0.076***	-0.062***	0.286***
	[0.012]	[0.010]	[0.010]	[0.012]	[0.010]	[0.011]	[0.061]
Instruments	None	Total	Total+HHI	% Passive	Total	Total+HHI	% Passive
Obs.	59,669	59,669	59,669	46,890	59,669	59,669	46,890
FE	N	N	N	N	Y	Y	Y

Panel B: First-stage Estimates of Supply

Total	0.843***	0.754***		0.549***	0.533***	
	[0.006]	[0.100]		[0.015]	[0.015]	
HHI		-0.166***			-0.059***	
		[0.011]			[0.008]	
% Passive			0.173***			0.003
			[0.010]			[0.008]
Obs.	59,669	59,669	46,890	59,669	59,669	46,890
Adj. R^2	0.698	0.713	0.036	0.122	0.124	0.003
Firms	4,483	4,483	4,364	4,483	4,483	4,364
Controls	N	N	N	Y	Y	Y
FE	N	N	N	Y	Y	Y

Table VIII
Portfolio Returns & Characteristics sorted on Demand Shocks and Ownership Concentration

The table shows returns and characteristics of portfolios sorted on outward demand shocks (DOUT) in the previous week and ownership concentration (Top HHI) in the previous quarter using U.S. stock data from August 2006 to December 2010. Panels A and B display return, with weekly abnormal returns computed as the difference in returns relative to a matched benchmark portfolio sorted on market capitalization, book-to-market and momentum as in Daniel, Grinblatt, Titman, and Wermers (1997). *DOUT* captures outward equity lending demand shocks, being equal to 1 if in the previous week there is an increase in the fee score and an increase in loaned amount, 0 otherwise. Ownership concentration is measuredd by the Hirschman-Herfindahl index of institutional ownership in the previous quarter. Top HHI is equal to 1 if concentration is in the top HHI quartile conditional on DOUT=1. Panel C shows total ownership, Panel D shows ownership concentration, Panel E displays lending supply as a fraction of market capitalization and Panel F the amount on loan as a fraction of market capitalization. Panel G displays the Fee Score, a measure of fee that ranges from 1 (cheapest to borrow) to 10 (hardest to borrow). Panel H shows arbitrage risk defined as the mean squared error of residuals from Carhart (1997)'s 4-factor model. Significance levels are indicated as follows: ***=statistical significance at the 1% level.

Panel A: Raw Returns

	Top HHI		
DOUT	0	1	1-0
0	0.262	-0.150	-0.412***
1	-0.011	-0.545	-0.534***
1-0	-0.273***	-0.395***	-0.122

Panel B: DGTW Abnormal Returns

	Top HHI		
DOUT	0	1	1-0
0	0.006	-0.015	-0.021
1	-0.014	-0.454	-0.439***
1-0	-0.020	-0.439***	-0.419***

Panel C: Total Ownership

	Top HHI		
DOUT	0	1	1-0
0	69.30%	30.55%	-38.75%***
1	54.45%	27.47%	-26.98%***
1-0	-14.85%***	-3.09%***	11.77%***

Panel D: HHI

	Top HHI		
DOUT	0	1	1-0
0	6.31%	27.11%	20.80%***
1	8.20%	24.55%	16.35%***
1-0	1.89%***	-2.56%***	-4.44%***

Panel E: Supply

	Top HHI		
DOUT	0	1	1-0
0	24.4%	7.4%	-17.0%***
1	17.2%	7.1%	-10.1%***
1-0	-7.2%***	-0.3%***	6.9%***

Panel F: On Loan

	Top HHI		
DOUT	0	1	1-0
0	5.95%	1.65%	-4.30%***
1	8.19%	3.40%	-4.79%***
1-0	2.23%***	1.75%***	-0.49%***

Panel G: Fee Score

	Top HHI		
DOUT	0	1	1-0
0	1.351	2.119	0.768***
1	2.125	2.757	0.632***
1-0	0.774	0.638***	-0.136***

Panel H: Arbitrage Risk

	Top HHI		
DOUT	0	1	1-0
0	2.58%	4.01%	1.43%***
1	3.30%	4.51%	1.20%***
1-0	0.72%***	0.50%***	-0.23%

Table IX
Stock Returns, Equity Lending Shocks & Ownership Structure

The table displays regressions of abnormal returns as a function of equity lending market shocks and lagged ownership characteristics using weekly U.S. stock data between August 2006 and December 2010. Abnormal returns are computed based on a characteristics-matched benchmark portfolio sorted on market capitalization, book-to-market and momentum as in Daniel, Grinblatt, Titman, and Wermers (1997). *DOUT* captures outward equity lending demand shocks, being equal to 1 if in the previous week there is an increase in the fee score and an increase in loaned amount, 0 otherwise. *DIN* equals 1 if there is a decrease in both fee scores and loaned amount. *SOUT* equals 1 if there is a decrease in the fee score and an increase in loaned amount. *SIN* equals 1 if there is an increase in the fee score and a decrease in loaned amount. *Top(HHI)* is equal to 1 if the concentration of ownership measured by the Hirschman-Herfindahl index in the previous quarter is in the top quartile conditional on DOUT=1. *Fee Score* is measuredd two periods before week w. *Bottom(Total)* equals 1 if the stock is in the bottom quartile of institutional ownership and *Bottom(Supply)* equals 1 if the firm belongs to the bottom quartile of lending supply as a fraction of market capitalization. Ownership characteristics are lagged one quarter. Regressions include calendar-month dummies and standard errors clustered at the firm level. Significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level, *=significant at the 10% level.

	(1)	(2)	(3)	(4)	(5)
DOUT	-0.130*	-0.122*	-0.016	0.015	-0.009
	[0.068]	[0.068]	[0.075]	[0.075]	[0.078]
DIN	-0.039	-0.031			
	[0.062]	[0.062]			
SIN	-0.01	-0.002			
	[0.075]	[0.075]			
SOUT	-0.02	-0.012			
	[0.075]	[0.076]			
Top(HHI)		-0.03	-0.009	0.005	0.019
		[0.033]	[0.033]	[0.033]	[0.037]
Total		0.023	0.031	-0.047	-0.069*
		[0.036]	[0.035]	[0.036]	[0.040]
DOUT*Top(HHI)			-0.422**	-0.420**	-0.499**
			[0.175]	[0.175]	[0.201]
Bottom(Total)					-0.043
					[0.049]
DOUT*Bottom(Total)					0.049
					[0.205]
Bottom(Supply)					-0.01
					[0.046]
DOUT*Bottom(Supply)					0.129
					[0.214]
Fee Score$_{w-2}$				-0.058***	-0.058***
				[0.009]	[0.010]
Firm-Week Obs.	695,405	695,405	695,405	695,405	695,405
Firms	4,637	4,637	4,637	4,637	4,637

Table X
Stock Returns, Equity Lending Shocks & Ownership Structure: Fraction of Top5 Ownership

The table displays regressions of abnormal returns as a function of equity lending market shocks and lagged ownership characteristics using weekly U.S. stock data between August 2006 and December 2010. Abnormal returns are computed based on a characteristics-matched benchmark portfolio sorted on market capitalization, book-to-market and momentum as in Daniel, Grinblatt, Titman, and Wermers (1997). *DOUT* captures outward equity lending demand shocks, being equal to 1 if in the previous week there is an increase in the fee score and an increase in loaned amount, 0 otherwise. *DIN* equals 1 if there is a decrease in both fee scores and loaned amount. *SOUT* equals 1 if there is a decrease in the fee score and an increase in loaned amount. *SIN* equals 1 if there is an increase in the fee score and a decrease in loaned amount. *Top(Top5)* is equal to 1 if the concentration of ownership measured by fraction of institutional ownership that belongs to the five largest institutional shareholders in the previous quarter is in the top quartile conditional on DOUT=1. *Fee Score* is measured two periods before week w. *Bottom(Total)* equals 1 if the stock is in the bottom quartile of institutional ownership and *Bottom(Supply)* equals 1 if the firm belongs to the bottom quartile of lending supply as a fraction of market capitalization. Ownership characteristics are lagged one quarter. Regressions include calendar-month dummies and standard errors clustered at the firm level. Significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level, *=significant at the 10% level.

	(1)	(2)	(3)	(4)	(5)
DOUT	-0.130*	-0.122*	-0.041	-0.009	-0.025
	[0.068]	[0.068]	[0.075]	[0.075]	[0.078]
DIN	-0.039	-0.031			
	[0.062]	[0.062]			
SIN	-0.01	-0.003			
	[0.075]	[0.075]			
SOUT	-0.02	-0.012			
	[0.075]	[0.076]			
Top(Top5 Own.)		-0.019	-0.003	0.008	0.023
		[0.033]	[0.034]	[0.034]	[0.038]
Total		0.029	0.036	-0.043	-0.067*
		[0.036]	[0.036]	[0.036]	[0.040]
DOUT*Top(Top5 Own.)			-0.318*	-0.315*	-0.369*
			[0.175]	[0.175]	[0.204]
Bottom(Total)					-0.043
					[0.048]
DOUT*Bottom(Total)					0.033
					[0.206]
Bottom(Supply)					-0.012
					[0.047]
DOUT*Bottom(Supply)					0.087
					[0.214]
Fee Score$_{w-2}$				-0.059***	-0.058***
				[0.009]	[0.010]
Firm-Week Obs.	695,405	695,405	695,405	695,405	695,405
Firms	4,637	4,637	4,637	4,637	4,637

Table XI: Stock Returns, Equity Lending Shocks & Ownership Structure: Constrained Firms

The table displays regressions of abnormal weekly returns as a function of equity lending market shocks and lagged corporate ownership structure using weekly U.S. stock data between August 2006 and December 2010 for different sub-samples based on alternative measures of constraints. The samples examined are: Baseline displays results for the full sample, Bottom(Total) only include stocks with below-median institutional ownership, Top(Churn) use only with above-median investor portfolio churn in the previous quarter as in Gaspar, Massa, and Matos (2005), Top(Arb. Risk) uses only firms with above-median arbitrage risk , Special includes stocks with fee scores greater than 1 and Bottom(Size) uses only below-median firms ranked my market capitalization. Abnormal returns are computed based on a characteristics-matched benchmark portfolio sorted on market capitalization, book-to-market and momentum as in Daniel, Grinblatt, Titman, and Wermers (1997). *DOUT* captures outward equity lending demand shocks, being equal to 1 if in the previous week there is an increase in the fee score and an increase in loaned amount, 0 otherwise. *Top(HHI)* is equal to 1 if the concentration of ownership measured by the Hirschman-Herfindahl index in the previous quarter is in the top quartile conditional on DOUT=1. *Bottom(Supply)* equals 1 if the firm belongs to the bottom quartile of lending supply as a fraction of market capitalization. *Total* is the fraction of shares held by institutional shareholders. *Fee Score* is a measure of fee that ranges from 1 (cheapest to borrow) to 10 (hardest to borrow). Ownership characteristics and arbitrage risk are lagged one quarter and fee scores are lagged for two periods. Regressions include calendar-month dummies and standard errors clustered at the firm level. Significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level, *=significant at the 10% level.

	Baseline		Bottom(Total)		Top(Churn)		Top(Arb. Risk)		Special		Bottom(Size)	
DOUT	-0.068	-0.004	-0.135	-0.048	-0.121	-0.064	-0.154	-0.091	0.007	0.091	-0.103	-0.016
	[0.074]	[0.076]	[0.099]	[0.105]	[0.114]	[0.116]	[0.105]	[0.110]	[0.133]	[0.139]	[0.108]	[0.115]
Top(HHI)	-0.011	0.015	-0.005	0.021	-0.066	-0.026	-0.053	-0.029	0.012	0.058	-0.03	-0.004
	[0.036]	[0.037]	[0.041]	[0.042]	[0.070]	[0.073]	[0.050]	[0.051]	[0.073]	[0.075]	[0.044]	[0.045]
DOUT*Top(HHI)		-0.492**		-0.471**		-0.604**		-0.402		-0.524*		-0.465**
		[0.202]		[0.217]		[0.304]		[0.253]		[0.286]		[0.235]
Bottom(Supply)	-0.012	-0.026	0.013	0.001	0.079	0.058	0.011	-0.001	0.059	0.036	0.01	-0.003
	[0.043]	[0.043]	[0.048]	[0.048]	[0.072]	[0.073]	[0.058]	[0.059]	[0.079]	[0.079]	[0.051]	[0.051]
DOUT*Bottom(Supply)	-0.08	0.153	-0.024	0.174	-0.101	0.188	-0.087	0.103	-0.204	0.034	-0.11	0.1
	[0.169]	[0.195]	[0.184]	[0.206]	[0.258]	[0.286]	[0.208]	[0.243]	[0.230]	[0.258]	[0.199]	[0.227]
Total	-0.057	-0.054	0.142	0.148	-0.122*	-0.118*	0.007	0.011	-0.049	-0.045	0.093	0.098
	[0.038]	[0.038]	[0.108]	[0.108]	[0.065]	[0.065]	[0.065]	[0.065]	[0.108]	[0.108]	[0.074]	[0.074]
Fee Score$_{w-2}$	-0.058***	-0.058***	-0.065***	-0.064***	-0.035**	-0.035**	-0.072***	-0.072***	-0.088***	-0.088***	-0.066***	-0.066***
	[0.010]	[0.010]	[0.011]	[0.011]	[0.016]	[0.016]	[0.011]	[0.011]	[0.015]	[0.015]	[0.012]	[0.012]
Firm-Week Obs.	695,405	695,405	293,356	293,356	301,226	301,226	318,528	318,528	122,714	122,714	293,368	293,368
Firms	4,637	4,637	1,703	1,703	2,638	2,638	3,091	3,091	3,109	3,109	1,912	1,912

Table XII: Stock Returns, Equity Lending Shocks & Ownership Structure: Unconstrained Firms

The table displays regressions of abnormal weekly returns as a function of equity lending market shocks and lagged corporate ownership structure using weekly U.S. stock data between August 2006 and December 2010. The samples examined are: Baseline displays results for the full sample, Top(Total) only include stocks with above-median institutional ownership, Bottom(Churn) use only with below-median investor portfolio churn in the previous quarter as in Gaspar, Massa, and Matos (2005), Bottom(Arb. Risk) uses only firms with below-median arbitrage risk , Non-Special includes stocks with fee scores equal to 1 and Top(Size) uses only above-median firms ranked my market capitalization. Abnormal returns are computed based on a characteristics-matched benchmark portfolio sorted on market capitalization, book-to-market and momentum as in Daniel, Grinblatt, Titman, and Wermers (1997). *DOUT* captures outward equity lending demand shocks, being equal to 1 if in the previous week there is an increase in the fee score and an increase in loaned amount, 0 otherwise. *Top(HHI)* is equal to 1 if the concentration of ownership measured by the Hirschman-Herfindahl index in the previous quarter is in the top quartile conditional on DOUT=1. *Bottom(Supply)* equals 1 if the firm belongs to the bottom quartile of lending supply as a fraction of market capitalization. *Total* is the fraction of shares held by institutional shareholders. *Fee Score* is a measure of fee that ranges from 1 (cheapest to borrow) to 10 (hardest to borrow). Ownership characteristics and arbitrage risk are lagged one quarter and fee scores are lagged for two periods. Regressions include calendar-month dummies and standard errors clustered at the firm level. Significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level, *=significant at the 10% level.

	Baseline		Top(Total)		Bottom(Churn)		Bottom(Arb. Risk)		Non-Special		Top(Size)	
DOUT	-0.068	-0.004	-0.048	0.018	-0.016	0.044	-0.152*	-0.088	0.029	0.066	-0.082	-0.03
	[0.074]	[0.076]	[0.080]	[0.083]	[0.091]	[0.096]	[0.083]	[0.085]	[0.077]	[0.079]	[0.072]	[0.075]
Top(HHI)	-0.011	0.015	-0.036	-0.003	0.017	0.039	-0.02	0.001	-0.014	0.001	0.019	0.053
	[0.036]	[0.037]	[0.047]	[0.047]	[0.043]	[0.043]	[0.038]	[0.039]	[0.036]	[0.037]	[0.041]	[0.042]
DOUT*Top(HHI)		-0.492**		-0.715**		-0.441*		-0.571**		-0.367*		-0.595***
		[0.202]		[0.284]		[0.254]		[0.258]		[0.211]		[0.204]
Bottom(Supply)	-0.012	-0.026	-0.078	-0.096	-0.086*	-0.099*	-0.097**	-0.110**	0.004	-0.005	-0.072	-0.088*
	[0.043]	[0.043]	[0.070]	[0.070]	[0.052]	[0.051]	[0.047]	[0.047]	[0.043]	[0.043]	[0.049]	[0.050]
DOUT*Bottom(Supply)	-0.08	0.153	0.159	0.473	-0.022	0.194	-0.004	0.266	0.17	0.328	0.15	0.382*
	[0.169]	[0.195]	[0.309]	[0.327]	[0.217]	[0.254]	[0.230]	[0.259]	[0.197]	[0.214]	[0.188]	[0.201]
Total Own.	-0.057	-0.054	-0.139***	-0.137***	-0.003	0.001	-0.081**	-0.078**	-0.025	-0.024	-0.042	-0.041
	[0.038]	[0.038]	[0.044]	[0.044]	[0.046]	[0.046]	[0.038]	[0.038]	[0.036]	[0.036]	[0.037]	[0.037]
Fee Score$_{w-2}$	-0.058***	-0.058***	-0.048***	-0.048***	-0.050***	-0.050***	0.011	0.011	-0.018	-0.018	-0.051***	-0.051***
	[0.010]	[0.010]	[0.014]	[0.014]	[0.013]	[0.013]	[0.046]	[0.046]	[0.011]	[0.011]	[0.010]	[0.010]
Firm-Week Obs.	695,405	695,405	586,532	586,532	432,284	432,284	604,461	604,461	553,095	553,095	592,387	592,387
Firms	4,637	4,637	3,697	3,697	4,152	4,152	4,503	4,503	4,272	4,272	3,913	3,913

Table XIII
Stock Returns, Equity Lending Shocks & Ownership Structure: Extra Robustness

The table displays regressions of abnormal returns as a function of equity lending market shocks and lagged ownership characteristics using weekly U.S. stock data between August 2006 and December 2010. Abnormal returns are computed based on a characteristics-matched benchmark portfolio sorted on market capitalization, B/M and momentum as in Daniel, Grinblatt, Titman, and Wermers (1997). *DOUT* captures outward equity lending demand shocks, being equal to 1 if in the previous week there is an increase in the fee score and an increase in loaned amount, 0 otherwise. *Top(HHI)* equals 1 if the concentration of ownership measured by the Hirschman-Herfindahl index in the previous quarter is in the top quartile conditional on DOUT=1. Ret_{w-1} is the previous week raw return; *Turnover* is average daily turnover; *High Fee* is equal to 1 if the fee score is above the 95th percentile, 0 otherwise; and $\Delta(Breadth)$ is the change in the number of institutions holding stock between the previous two quarters as in Chen, Hong, and Stein (2002). Regressions include calendar-month dummies and standard errors clustered at the firm level. Significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level, *=significant at the 10% level.

	(1)	(2)	(3)	(4)	(5)	(6)
DOUT	0.015	0.021	0.134	0.051	-0.038	0.011
	[0.075]	[0.075]	[0.100]	[0.077]	[0.088]	[0.084]
Top(HHI)	0.005	0.006	0.007	-0.003	-0.009	0
	[0.033]	[0.034]	[0.033]	[0.035]	[0.037]	[0.033]
Total	-0.047	-0.051	-0.047	-0.041	-0.018	-0.039
	[0.036]	[0.037]	[0.038]	[0.037]	[0.038]	[0.036]
DOUT*Top(HHI)	-0.420**	-0.420**	-0.476***	-0.364**	-0.536**	-0.418**
	[0.175]	[0.176]	[0.181]	[0.182]	[0.223]	[0.175]
Fee Score$_{w-2}$	-0.058***	-0.061***	-0.058***	-0.058***	-0.124***	-0.059***
	[0.009]	[0.010]	[0.010]	[0.009]	[0.040]	[0.009]
Ret$_{w-1}$		-0.027***				
		[0.002]				
Ret$_{w-1}$*Top(HHI)		-0.031***				
		[0.005]				
Turnover			0.318			
			[0.935]			
DOUT*Turnover			-9.748			
			[6.127]			
Spread				0.007		
				[0.012]		
DOUT*Spread				-0.066		
				[0.086]		
High Fee					0.357	
					[0.227]	
DOUT*High Fee					0.173	
					[0.267]	
$\Delta(Breadth)$						4.956***
						[1.799]
DOUT*($\Delta(Breadth)$)						0.266
						[2.128]
Constant	0.119	0.041	0.106	0.113	0.124	0.104
	[0.083]	[0.085]	[0.065]	[0.084]	[0.094]	[0.083]
Firm-Week Obs.	695,403	695,403	695,402	695,316	603,237	695,403
Firms	4,637	4,637	4,637	4,637	4,637	4,637

Table XIV
Four-Factor Model Time Series Regressions

The table displays time-series regressions of long-short portfolios of stocks sorted on outward equity lending demand shocks and institutional ownership concentration, using weekly U.S. stock data between August 2006 and December 2010. Each panel estimates regressions using a different criteria to create the long and short legs of a portfolio. *DOUT* captures outward equity lending demand shocks, being equal to 1 if in the previous week there is an increase in the fee score and an increase in loaned amount, 0 otherwise. *Top(HHI)* is equal to 1 if the concentration of ownership measured by the Hirschman-Herfindahl index in the previous quarter is in the top quartile conditional on DOUT=1. Standard errors are clustered at the firm level. Significance levels are indicated as follows: ***=statistical significance at the 1% level, **=significant at the 5% percent level, *=significant at the 10% level.

Panel A – Long DOUT=0 & Top(HHI)=0; Short DOUT=1 & Top(HHI)=1

	(1)	(2)	(3)	(4)	(5)
α	0.460*	0.430*	0.411*	0.433*	0.426*
	[0.244]	[0.242]	[0.244]	[0.241]	[0.245]
MKT		0.218**	0.295**	0.365***	0.365***
		[0.097]	[0.123]	[0.117]	[0.118]
SMB			0.085	0.048	0.057
			[0.229]	[0.223]	[0.229]
HML			-0.261	-0.004	-0.001
			[0.204]	[0.222]	[0.223]
UMD				0.275***	0.275***
				[0.100]	[0.101]
D(Quant Crisis)					0.097
					[1.463]
D(Lehman)					1.214
					[0.811]

Panel B – Top(HHI)=0 Firms Only: Long DOUT=0; Short DOUT=1

α	0.03	0.029	0.017	0.03	0.055
	[0.127]	[0.128]	[0.121]	[0.115]	[0.117]
MKT		-0.017	0.123**	0.163**	0.160**
		[0.058]	[0.058]	[0.065]	[0.065]
SMB			-0.087	-0.108	-0.117
			[0.102]	[0.104]	[0.107]
HML			-0.415***	-0.263**	-0.271**
			[0.110]	[0.130]	[0.131]
UMD				0.163*	0.158*
				[0.094]	[0.095]
D(Quant Crisis)					-1.629*
					[0.918]
D(Lehman)					-2.229***
					[0.358]

Panel C – Top(HHI)=1 Firms Only: Long DOUT=0, Short DOUT=1

α	0.392*	0.380*	0.368*	0.382*	0.406*
	[0.218]	[0.219]	[0.220]	[0.219]	[0.221]
MKT		0.068	0.178*	0.223**	0.221**
		[0.086]	[0.100]	[0.097]	[0.097]
SMB			-0.04	-0.063	-0.083
			[0.190]	[0.187]	[0.191]
HML			-0.335*	-0.168	-0.177
			[0.187]	[0.195]	[0.196]
UMD				0.179*	0.177*
				[0.091]	[0.092]
D(Quant Crisis)					-0.883
					[2.551]
D(Lehman)					-3.320***
					[0.691]