Price Efficiency and Short Selling*

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ABSTRACT

This article studies how stock price efficiency and the distribution of returns are affected by short-sale constraints. The study is based on a global data set that includes more than 12,600 stocks from 26 countries between 2005 and 2008. Our main findings are as follows. First, lending supply has a significant impact on efficiency. Stocks with higher short-sale constraints, measured by low lending supply, have lower price efficiency. Second, relaxing short-sales constraints is not associated with an increase in either price instability or occurrence of extreme negative returns.

JEL classification: G12, G14, G15.

Keywords: Short-sales constraints, market efficiency, equity lending markets, extreme returns.

Introduction

The financial markets crisis that began in late 2007 brought back a long standing issue: what is the impact of short-selling constraints on financial markets? Do they make markets more or less efficient? After Lehman Brothers' bankruptcy in September 2008, regulators around the world, such as the Securities & Exchange Commission (SEC) in the US and the Financial Services Authority (FSA) in the United Kingdom, altered short-selling regulations, restricting - or even prohibiting - the short selling of particular stocks. In the emergency order enacting the short-selling restrictions in 2008, the SEC recognized the usefulness of short-selling for market liquidity and price efficiency, but it also stated the following:[1]

> *"In these unusual and extraordinary circumstances, we have concluded that, to prevent substantial disruption in the securities markets, temporarily prohibiting any person from effecting a short-sale in the publicly traded securities of certain financial firms, (...), is in the public interest and for the protection of investors to maintain or restore fair and orderly securities markets. This emergency action should prevent short selling from being used to drive down the share prices of issuers even where there is no fundamental basis for a price decline other than general market conditions."* Securities Exchange Act Release No. 34-58952 (September 18th, 2008)

In June 2010, Germany also imposed an unilateral ban on the short-selling of eurozone sovereign bonds and credit default swaps, saying that short-selling "had led to excessive price shifts, which could have led to significant disadvantages for financial markets and have threatened the stability of the entire financial system."

This article studies whether short-sale constraints affect price efficiency and characteristics of the distribution of stock returns of firms around the world. We define price efficiency as the degree to which prices reflect all the available information, both in terms of speed and accuracy. We use unique data on

[1]The release can be found at http://www.sec.gov/rules/other/2008/34-58592.pdf. For the latest information on the SEC's short selling regulatory discussion, refer to
http://www.sec.gov/spotlight/shortsales.shtml

the equity lending market, with lending supply postings and loan transactions between January 2005 and December 2008. This information is supplied on a daily basis by several custodians and prime brokers who lend and borrow securities. Our sample comprises 12,621 stocks in 26 countries and has information on more than 90% of global stocks in terms of market capitalization. This is, to the best of our knowledge, the most comprehensive international dataset on equity lending used in academic research.

Our main findings are as follows. First, lending supply influences price efficiency. Stocks with limited lending supply are associated with lower efficiency. Second, a higher level of lending supply is associated with a greater degree of negative skewness and fewer occurrences of extreme price increases, but is not linked with extreme price decreases. In fact, the decrease in skewness is due to less frequent extreme positive returns, in line with the view that arbitrageurs cannot correct overvaluation as easily when short selling constraints are tighter. Third, limited lending supply does not affect downside risk and total volatility. We actually find that less lending supply and higher loan fees are associated with greater downside risk and total volatility. These findings do not support the view expressed by regulators that unrestricted shorting can destabilize prices, while simultaneously supporting the academic findings that short-sale restrictions generally make market less efficient.[2] We contribute to the literature on price efficiency in international markets by showing that (i) the negative relationship between short-sale constraints and stock price efficiency is found at a stock level all over the world, and (ii) equity lending supply is an important driver of differences in price efficiency.

For each stock and for each week in our sample, we compute two measures of short-sale constraints: the lending supply of shares and the loan fee. Whenever an investor wishes to short a particular firm, he first needs to locate the shares for borrowing in order to subsequently deliver them to the buyer. Thus, a low level of lending supply indicates that short-sale constraints are binding more tightly, as the investor has to bear higher searching costs to locate the shares (Duffie, Garleanu, and Pedersen 2002). Furthermore, even when the borrower finds them, he has to compensate the lender with a loan fee. The higher this fee, the tighter are the short-sale constraints. However, an increase in the fee (i.e. the

[2] Many articles support this view, such as Diamond and Verrecchia (1987); Boehmer, Jones, and Zhang (2008); Bris, Goetzmann, and Zhu (2007); Bris (2008); Boehmer, Jones, and Zhang (2009); Charoenrook and Daouk (2009); Kolasinski, Reed, and Thornock (2009).

price of shorting) could be due to either (1) an increase in the demand for shares, related to private information or (2) a decrease in the supply available for lending. Thus, higher loan fees, accompanied by a larger lending supply of shares, do not necessarily imply that short-sale constraints are tighter. As shown by Cohen, Diether, and Malloy (2007), loan fees are not a sufficient statistic and it is important to differentiate between the demand and supply for shorting whenever testing for the impact of short-sales constraints.

Our analysis proceeds as follows. We estimate panel regressions to explain cross-sectional differences in price efficiency using lending supply and loan fees as proxies for short-sale constraints. Our dependent variables are the following: the correlation between contemporaneous weekly stock returns and lagged local-market returns (Bris, Goetzmann, and Zhu 2007), the absolute deviation of the scaled variance ratio of monthly returns and weekly returns from one (Lo and MacKinlay 1988), and two measures of price delay proposed by Hou and Moskowitz (2005). These delay measures are based on the regression of weekly stock returns on the contemporaneous returns of a world index, a local index and four lags of the local index. We then reestimate this equation after imposing the constraint that coefficients of lagged local returns are zero. The first delay measure (D1) compares the difference in the values of R^2 from these two regressions, with higher values of D1 implying that a stock takes longer to incorporate new market information. The second measure (D2) examines how large the lagged market return betas are relative to the contemporaneous one. All delay measures yield the same result: low levels of lending supply are associated with less price efficiency.

We also compute various characteristics of the distribution of stock returns to test whether short-sale constraints increase the likelihood of extreme price fluctuations: the skewness and kurtosis of weekly stock returns, the frequency of large negative and positive returns, a measure of downside risk and the standard deviation of weekly returns. Our results show that high lending supply is generally associated with smaller skewness and a lower frequency of extreme positive returns. Lower fees are associated with less downside risk and total volatility.

Our findings are robust to membership in the Organization for Economic Cooperation and Development (OECD) countries, and to endogeneity concerns. We also control for several measures of transaction costs and liquidity. We attempt to capture the different dimensions of liquidity with proxies such as bid-ask spreads, turnover, free float of shares, and the frequency of zero-return weeks as controls (Lesmond 2005, Griffin, Nardari, and Stulz 2007). We also include controls for firm size, and for whether a firm cross-lists its shares in the United States or the United Kingdom. Finally, we also find similar results if we use loan utilization (i.e. loan amount divided by lending supply) as an additional measure of short sales constraints, if we constrain the sample to only contain non-financial firms, or if we only use observations before the 2008 financial crisis.[3]

Closest in spirit to our work are Bris, Goetzmann, and Zhu (2007) and Charoenrook and Daouk (2009). They examine the impact of short selling constraints at the country level, with differences in short selling regulations across countries being used to investigate similar research questions. We differ from these articles because our short-sales proxies are of a different nature, containing information on how individual firms, rather than countries are affected by constraints. Our proxies avoid the problem faced by country-level information - such as regulatory constraints, availability of options, and of capturing spurious correlation to other omitted country-specific variables - allowing us to pin-down the nature of short-sale constraints more precisely. We can test for the impact of short selling even in countries without regulatory constraints on short selling, providing a better control sample.

Our findings are important to guide regulators when devising short selling rules. They suggest that stocks that face higher short sale constraints have lower price efficiency but are not more stable, one of desired aims of regulatory changes. This is precisely the outcome found in recent articles investigating the impact of the regulatory restrictions on shorting during the 2008 financial crisis (Boehmer, Jones, and Zhang 2009, Kolasinski, Reed, and Thornock 2009, Beber and Pagano 2010).

The remaining portion of the article is divided as follows. Section I contains a review of the literature. Section II describes our hypotheses and the measures of price efficiency. Section III contains the description of the data and the construction of our measures of short-sale constraints. Section IV reports our empirical results. Finally, section V concludes the study.

[3] The results are reported in an Internet appendix.

I. Literature Review

It is generally accepted that short-sale constraints affect the efficiency of security prices (e.g. Miller 1977, Diamond and Verrecchia 1987, Duffie, Garleanu, and Pedersen 2002, Bai, Chang, and Wang 2006). The main conclusion is that prices may no longer incorporate all available information, when agents have heterogeneous beliefs but are prevented from revealing their beliefs through trading. Miller (1977) argues that short-sale constraints keep pessimistic investors out of the market, causing prices to be biased upward because they only reflect the valuations of the more optimistic investors who trade. Diamond and Verrecchia (1987) have proposed a model in which short-sale constraints eliminate some informative trades. Prices are not biased upward, but become less efficient when restrictions are in place, as they reduce the speed of adjustment to private information. Duffie, Garleanu, and Pedersen (2002) have developed a model in which search costs and bargaining over loan fees generate endogenous short-selling constraints and affect asset prices. In our case, the lending supply of shares could be interpreted as a proxy for the cost of searching. In a recent article, Bai, Chang, and Wang (2006) show that short-sale constraints can actually lower asset prices and make them more volatile. This happens because short-sale constraints have a significant impact on informed investors, leading to a loss in the informativeness of prices. This increases the amount of risk borne by uninformed investors, who require lower prices as compensation to bear this extra risk. Thus, regardless of whether short-sale constraints have positive or negative impacts on prices, these theories imply that these constraints reduce the informational efficiency of prices, i.e. they no longer reflect all available information.

Empirical evidence of the impact of short-sale constraints on price efficiency is mostly concentrated on samples of US stocks. High levels of short interest (i.e. high numbers of stocks sold short as a fraction of total shares outstanding) are generally interpreted as evidence of short-sale constraints and many articles show that stocks with high levels of short interest have lower subsequent returns.[4] D'Avolio (2002) describes the market for borrowing and shows that the cost of short-selling a stock is high at times when investor disagreement is also high, indicating that prices will not fully reflect negative information. Similarly, Reed (2003) studies the rebate rates in the equity lending market as a

[4]See, for example, Figlewski and Webb (1993); Desai, Ramesh, Thiagarajan, and Balachandran (2002); Asquith, Pathak, and Ritter (2004); Diether, Lee, and Werner (2005); Boehmer, Jones, and Zhang (2008); Boehmne, Danielsen, and Sorescu (2006); Cohen, Diether, and Malloy (2007)

proxy for short-sale constraints and shows that stock prices are slower to incorporate information when loan fees are high. However, most of these articles rely on indirect measures of short-sale constraints or a very restricted sample of lending data. These shortcomings are avoided with our proxies for short selling constraints.

For instance, high short interest might be due to increased borrowing demand, which reflects the investors' negative views about the stock that are not related to short-sale constraints. We avoid this problem by estimating short-sales constraints with lending supply and the loan fee. Furthermore, most of the previous studies that use loan fees are based on data from a single custodian (an exception is Kolasinski, Reed, and Ringgenberg 2008). Individual custodians provide various services to prime brokers and might have different pricing strategies. Thus, data from a single custodian may not be representative of the average lending price. The average firm in our data has information provided by 10 custodians and therefore enables us to compute representative estimates of the average loan fee.

International evidence on the relationship between short-sale constraints and price efficiency is rare due to the difficulty in obtaining reliable data for short-sale constraints, especially at the security level. One exception is Bris, Goetzmann, and Zhu (2007), who use regulatory information concerning whether short-selling is prohibited or practiced in 46 different countries. They conclude that stock prices in countries with constraints are less efficient than those where investors are allowed to short stocks. Charoenrook and Daouk (2009) also look at regulations on short selling and put-options and find that countries with fewer constraints have smaller volatility and higher liquidity, but they report no effect on the skewness of returns. Chang, Cheng, and Yu (2007) focus on the regulatory restrictions to against short selling individual stocks in Hong Kong and find that (i) constraints tend to cause overvaluation and (ii) this effect is more dramatic for stocks with wide dispersion of investor opinions.

The short selling regulations implemented during the financial crisis in 2008 have led to a large research effort, specially because they provided academics with the perfect "natural experiment" to study their effects. Bris (2008) studies the ban on naked short selling of 19 financial firms in July 2008, finding that the negative returns observed before the ban cannot be attributed to short selling and that market efficiency declined after the ban. Following the market-wide ban imposed on September

2008, Boehmer, Jones, and Zhang (2009) show how short selling activity decreased by more than 65%, with a large increase in spreads and volatility but find no evidence of artificial price support generated by the ban. Kolasinski, Reed, and Thornock (2009) document that the restrictions imposed in 2008 were successful in reducing settlement and delivery failures, but caused a reduction in liquidity and an increase in short selling costs. Beber and Pagano (2010) use country-specific differences in the type of restrictions and their implementation dates to show that the bans decreased liquidity and slowed price discovery, while failing to support stock prices.

II. Hypotheses and Measures of Price Efficiency

Our main hypothesis is that short-sale constraints decrease the informational content in stock prices, proposed on the basis of the theoretical work by Miller (1977), Diamond and Verrecchia (1987), Duffie, Garleanu, and Pedersen (2002); Bai, Chang, and Wang (2006). To test this hypothesis, we construct novel measures of short-sale constraints and use them to explain various proxies for efficiency that have been proposed in the literature.

The first measure of price efficiency is the cross-correlation between the current stock returns and the lagged local-market returns, and the first-order autocorrelation of stock returns (Bris, Goetzmann, and Zhu 2007). In a given year, we compute $\rho^{Cross} = Corr(r_{i,t}, r_{m,t-1})$ i.e. the correlation between weekly stock returns at time t and the local value-weighted market returns at time $t-1$. Because correlations are bounded by -1 and 1, we apply the transformation ln[(1+ρ)/(1-ρ)] and adopt the result as a proxy for efficiency.

Price efficiency can also be tested using the variance ratios of stock returns sampled at different frequencies. Lo and MacKinlay (1988) show how the absence of autocorrelations makes the variance of stock returns a linear function of the frequency from which they are calculated. We estimate the absolute value of the variance of monthly returns, divide it by four times the variance of weekly returns, subtract one, and compute its absolute value. The result, $|VR|$, should be equal to zero under the null that prices follow a random walk.

However, these measures do not capture any correlation that $r_{i,t}$ and $r_{m,t-1}$ might have with omitted variables, such as contemporaneous local- or world-market indices of returns or their lags. This might be a problem, especially in less-developed markets, where infrequent trading delays the incorporation of new information (e.g Harvey 1995). Hence, we also use two measures of efficiency proposed by Hou and Moskowitz (2005). If investors cannot fully incorporate information in today's stock prices, this will defer their actions such that this information only gradually feeds into prices. The price-response delay is measured from a market-model regression that is extended using the lagged returns of a local market index and the contemporaneous world-index returns. The larger the explanatory power of these lags, the higher is the delay in responding to information. For each stock and year, we estimate a regression of the return in week t on the value-weighted local index return and its lagged values up to the previous four weeks plus the world-index return, as follows:

$$r_{i,t} = \alpha_i + \beta_i * r_{m,t} + \sum_{n=1}^{4} \delta_i(-n) * r_{m,t-n} + \gamma_i * r_{W,t} + \varepsilon_{i,t}, \tag{1}$$

where $r_{i,t}$ represents the returns from stock i in week t, $r_{m,t-n}$ is the corresponding value-weighted local market return in week t and $r_{W,t}$ represents the returns of the value-weighted world index in week t. We focus on the impact of the local market news and only use lags of the local index.

The first delay measure (D1) compares the fraction of variability in stock returns that is due to lagged market returns, by comparing the value of R^2 from the regression above with that obtained when the coefficients on lagged market returns ($\delta_i(-n)$) are constrained to be zero.

$$D1_i = 1 - \frac{R^2_{\delta_i^{(-n)}=0, \forall n \in [1,4]}}{R^2}. \tag{2}$$

The larger this measure, the greater is the variation in stock returns captured by lagged market returns, implying a higher price delay in responding to market information. However, D1 does not take into account the magnitude of the coefficients of lagged market returns. Therefore, we also compute an additional delay measure:

$$D2_i = \frac{\sum_{n=1}^{4} |\delta_i(-n)|}{|\beta_i| + \sum_{n=1}^{4} |\delta_i(-n)|} \tag{3}$$

This measure captures the magnitude of the lagged coefficients relative to the magnitude of all market-return coefficients. We use the absolute values of each coefficient regardless of their estimated signs, because price efficiency is smaller as these measures deviate from zero.

Short selling has been blamed as a contributing factor to many financial crashes in the past, from the 1929 market crash, to the Black Monday in 1987, the 1997 Asian crises, and the financial turmoil in 2008-09.[5] Although most researchers would agree that short-sale constraints reduce the speed with which prices reflect information, it is still relevant - from a policy perspective - to test whether relaxing short-sale constraints makes extreme negative returns more probable or not. In fact these concerns were behind the decision by many regulators, such as the Securities and Exchange Commission (SEC) in the United States or the Financial Services Authority (FSA) in the United Kingdom, to ban short-selling for a short period after the bankruptcy of Lehman Brothers (Boehmer, Jones, and Zhang 2009). Thus, research on whether stock-price volatility and the frequency of extreme negative returns decreases with short-selling constraints is an important issue to regulators. We test this by estimating several characteristics of the distribution of returns that capture the magnitude and likelihood of extreme returns, using skewness, kurtosis and the frequency of weekly returns that are two standard deviations below (and also above) the average for the previous year, downside risk and standard deviation.

Negative skewness means that the left tail of the return distribution becomes thick. Diamond and Verrecchia (1987) hypothesize that short-sale constraints should make returns less skewed. Hong and Stein (2003) argue that short-sale constraints are positively related to skewness through the following mechanism: if constraints are relaxed, investors who are more pessimistic reenter the market to trade on their beliefs, thereby increasing the likelihood of negative returns. Based on these articles, our hypothesis is that whenever short-selling is easier, prices reflect bad news more quickly, thus increasing the likelihood of observing large negative returns. We compute skewness using two different return measures. First, we consider weekly returns and compute their skewness for each firm-year in the sample. Second, in markets with many systematic shocks, it might be interesting to focus on firm-specific movements. Thus, we estimate a market-model equation with the local- and the world-index returns as factors, computing the skewness of this equation's residuals to capture firm-specific variation

[5] Further analysis can be found in Lamont (2003).

in skewness.

Stock volatility is captured with two measures. We define downside risk as the standard deviation of below-average weekly returns, and the total volatility as the annual standard deviation of weekly returns. Few models derive a direct relationship between volatility and short selling constraints. An exception is Bai, Chang, and Wang (2006), who show how constraints can actually increase volatility and conclude that "in the presence of information asymmetry, short-sale constraints can cause the price volatility to increase as less informed investors perceive higher risks and demand larger price adjustments in accommodating trades." In a world where the proportion of uninformed investors is high, the worsening in price informativeness due to short selling constraints leads to a higher volatility.

An important concern is that of endogeneity. Our main hypothesis is that inefficiency is caused by more stringent short-sales constraints. However, it is not possible to rule out that efficiency and short-selling constraints are endogenous, i.e. it could be the case that inefficient stocks drive investors away from the equity lending market, thus reducing lending supply and increasing loan fees. We attempt to mitigate these concerns with instrumental-variables (IV) regressions, treating lending supply and loan fees as endogenous variables. Although it is difficult to obtain truly exogenous instruments in our setting, we use lagged lending supply and lagged loan fees as instruments.[6] Our main findings are unaltered and reinforce our claim that low lending supply is a meaningful proxy of short-sale constraints.

III. Data Description

We collect stock data from 2005 to 2008 for 31 countries and match them to firms in our equity lending database with at least 5 weeks with equity loan transactions in a given year. Returns, market capitalization, book-to-market (B/M) ratios, exchange rates, and interest rates are from Datastream. We add a dummy variable to control for securities that have American Depositary Receipts (ADRs) or Global Depositary Receipts (GDRs) traded outside their home market on the basis of the evidence that cross-

[6] In previous versions of the paper we also used institutional ownership to proxy for lending supply; however, this variable includes mostly US and UK stocks.

listing makes prices more efficient (Doidge, Karolyi, Lins, Miller, and Stulz 2009).[7] Information on ADRs come from the websites of the Bank of New York and JP Morgan, and from CRSP tapes. For GDRs we collect it from the London Stock Exchange website. We further impose the constraint that each firm has at least 50 weekly return observations, less than 10 zero-return observations, and only include a country if it has more than 15 firms satisfying these requirements in a given year. The final sample has about 19,000 firm-year observations.

A. *Stock Lending Data*

The equity lending data are from Data Explorers, which collects data from lending desks from most of the largest firms in the security-lending industry.[8] The data comprise security-level information on the value of shares available for lending and lending transactions from January 2004 to December 2008.[9] Figure 1 shows the evolution of the dataset coverage over time. As of December 2008, there are $15 trillion in stocks available to borrow, which is about 20% of the total market capitalization. Of this amount, $3 trillion are actually lent out, corresponding to a utilization level (i.e. amount lent out divided by amount available to borrow) of around 17%.

[Figure 1 about here]

A.1. *Lending Supply*

Equity supply postings contain the dollar value of shares available for lending for a given day (or week for data before January 2007). We define lending supply for security i at time t as the fraction of lending supply relative to its market capitalization:

$$\text{Lending Supply}_{i,t} = \left(\frac{\text{Value of Shares Supplied}_{i,t}}{\text{Market Capitalization}_{i,t}} \right) \quad (4)$$

[7]The dummy variable is dynamic such that it only takes a value of one on the year following the initial cross-listing date.

[8]This includes ABN Amro, Mellon, and State Street among others, which we cannot name due to a confidentiality agreement. The total number of suppliers is about 10 for each firm.

[9]The data are available at a weekly frequency for 2004 and 2006 and at a daily frequency for later years.

Figure 2 displays a histogram with the distribution of supply as a fraction of firm capitalization. There is a great variation in the lending supply, with about 25% of firms having less than 2% of their market capitalization available to borrow, suggesting that limited supply is likely to be a driver of short-sale constraints in many cases.

[Figure 2 about here]

The data provide a direct estimate of the stock lending supply, regardless of whether they are loaned out or not. In Cohen, Diether, and Malloy (2007), shares on loan are coupled with loan fees as proxies to detect shocks to supply and demand. Our data allow us to directly measure the impact of the supply side of the securities lending industry on both stock price efficiency and the distribution of returns. Because our dependent variables cannot be computed at the weekly level, requiring a certain number of observations for them to be well estimated, we use the averages of weekly measures of lending supply and loan fees within a specific year. Finally, we limit the effect of outliers in the lending supply data by winsorizing it at 0.5%.

A.2. Loan Fee

We also have access to loan transactions with information on the loan fee, the borrowed amount, and the currency used. Fees can be divided into two parts depending on the type of collateral used. If borrowers pledge cash - the dominant type of transaction in the United States - then the loan fee is defined as the difference between the risk-free interest rate and the rate paid for the collateral. If,instead, the transaction uses other securities - such as US Treasuries - as collateral, the fee is directly negotiated between the borrower and the lender. This can be expressed by the following equation:

$$\text{Loan fee}_{n,i,t} = \begin{cases} \text{Fee}_{n,i,t} & \text{if non-cash collateral} \\ \text{Riskfree rate}_t - \text{Rebate rate}_{n,i,t} & \text{if cash collateral} \end{cases} \tag{5}$$

where n denotes transaction, i stands for security and t denotes the date in which the transaction appears in the dataset. Loans can further be divided into two categories: open- and fixed-term loans. Open-term loans can be renegotiated every day, but fixed-term ones have predefined clauses and maturities. The overnight risk-free rate for the collateral currency is used for open-term loans. The Fed Open rate is used for loans with cash collateral denominated in US 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 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.

The loan fee of a given stock on a given date is weighted by the loaned amount using the following equation:

$$\text{Loan Fee}_{i,t} = \sum_{n=1}^{N_{i,t}} \left[\frac{\text{Loan amount}_{n,i,t}}{\sum_{n=1}^{N_{i,t}} \text{Loan amount}_{n,i,t}} \cdot \text{Loan Fee}_{n,i,t} \right], \tag{6}$$

where n denotes the transaction, i stands for security, t denotes the week in which the transaction appears in the dataset and $N_{i,t}$ is the total number of outstanding transactions for the security i in week t. Value-weighting is used to limit the influence of small and expensive transactions on the average loan fee estimate.[10]

Figure 3 plots the distribution of the average value-weighted annualized loan fees. The figure shows that fee levels are highly skewed, with the majority (75%) being very cheap to borrow and costing below 60 bps per year. These stocks are often referred by practitioners as “general collateral”. However, around 20% of the recorded loan transactions are above 100 bps, which are referred to as “specials” by practitioners. Furthermore, in 5% of the cases, the loan fee reaches levels above 400 bps.

[Figure 3 about here]

We also need to control for ownership changes during dividend-payment periods to investors that are domiciled in countries with favorable dividend tax legislation. This widespread practice in the security-lending industry is a common reason for lending stock (e.g. McDonald 2001, Rydqvist and Dai 2005, Christoffersen, Geczy, and Musto 2006), generally referred to as “tax arbitrage”. The gains from this type of transactions are shared through an increase in loan fees. Thus, fees during these

[10] Unreported results show a negative relationship between loan fee and transaction size.

periods are not representative of a general lending price for a given security. Figure 4 shows both the increased loan fees and the loan utilization around ex-dividend dates for dividend-paying stocks. The average increase in fee is approximately 50%, with fees moving from an average of 0.75% six weeks before the ex-divided date, to 1.05% on the ex-dividend week. Utilization (loaned out amount divided by lending supply) almost triples, increasing from 7% to 18% of lending supply. We control for this tax arbitrage effect by excluding from our loan fee estimates all transactions that are less than 3 weeks away from the ex-dividend date.

[Figure 4 about here]

Another possible use of equity lending is for vote-trading, i.e. borrowing shares to use their voting rights during corporate votes. Although our data aggregate the loans intended for short-selling and those used for vote-trading, there is no evidence that the average price charged for lending shares around these corporate votes increases (Christoffersen, Geczy, Musto, and Reed 2007). This makes us believe that our results are unaffected, especially in light of the annual frequencies that are used to compute averages. Moreover, discussions with practitioners suggest that these trades are not very common and should therefore not affect lending supply to a significant degree.

B. Liquidity and Transaction Costs

Recent research has tried to find factors that can explain the differences in price efficiency across stocks. Griffin, Kelly, and Nardari (2009) find that share prices in emerging markets are as efficiently priced as those in the more developed ones, after controlling for firm-level differences. They find no evidence that country-level variables, such as the legal environment and corporate governance practices, are associated with higher price efficiency. In fact, the observed differences are explained by differences in the characteristics of firms in emerging markets, which tend to be smaller, have less analyst coverage and are more costly to trade than those in developed economies (Lesmond 2005).

Considering the potential link between short selling constraints and liquidity- and transaction costs, it is essential to prevent spurious findings by adding proper controls to our regressions. Transaction-level estimates of trading costs are usually not available for international stocks (exceptions are articles by Chiyachantana, Jain, Jiang, and Wood 2004, Eleswarapu and Venkataraman 2006). Thus, in addition to using firm capitalization, we also compute measures based on weekly and monthly data that have been shown to capture several dimensions of liquidity - and transaction costs (Lesmond, Ogden, and Trzcinka 1999, Lesmond 2005, Griffin, Nardari, and Stulz 2007). We use the total share turnover in a given year, defined as the sum of weekly traded amount divided by total market capitalization. The second measure is the incidence of zero weekly returns in a trading year. In the model proposed by Lesmond, Ogden, and Trzcinka (1999), investors do not trade unless the expected profits are below transaction costs, making the absence of returns a valid proxy for transaction costs (e.g. Bekaert, Harvey, and Lundblad 2007). The third measure is the annual average of the weekly quoted bid-ask spread, defined as the average of the difference between the bid and ask quotes at the daily close divided by the average of these quotes (Lesmond 2005). Finally, we use Datastream's measure of the free float of share, defined as the proportion of a firm's capitalization available to ordinary investors. The intuition is that a higher free float makes it easier for investors to trade, increasing stock liquidity. This is computed as one minus the percentage of "strategic holdings" that are not regularly traded in markets.[11] However, it has the drawback that the availability of this measure is low for non-US/UK firms, with only 15% of the firms located outside these two countries (i.e. those that are reported as being part of investment funds in the United States and the United Kingdom). This last variable is used in a subsample of the data for additional robustness tests.

IV. Empirical Results

A. *Descriptive Statistics*

Table I contains descriptive statistics for the equity lending database. The stocks included in the dataset are representative of the world market as a percentage of both market capitalization and the number of stocks. For example, the supply data include more than 93% (78%) of the market capitalization of

[11] Datastream defines a "strategic holding" as equity stakes not held by mutual funds that are also larger than 5% of market capitalization. This information is taken from public ownership sources like the SEC's 13-F filings and the UK companies's share registers.

the US (UK) stock market. A major portion - more than 84% - of the total number of firms found in Datastream is included in our sample. When we examine the statistics of firms with lending transactions, there is a decrease in coverage, which is negligible when measured by market capitalization (it decreases from 91% to 87%) and moderate when measured by the number of firms (decreasing from 87% to 77%). The average proportion of shares lent out in the US is approximately 9% of market capitalization, but this figure has a high standard deviation of 13%. The average (value-weighted) loan fee charged to borrow US shares is close to 68 basis points (bps), but this fee is very volatile in the cross-section, having a standard deviation of 161 bps. The US stocks in our sample have a larger lending supply and are more expensive to borrow than those reported by D'Avolio (2002), who uses data of a single custodian from April 2000 to September 2001. This difference directly reflects the growth of the equity lending market and the inclusion of smaller firms – which are more expensive to borrow – in the pool of lendable securities.

[Table I about here]

In Table II we report the pairwise correlations among our explanatory variables, both for the raw values (Panel A) and after a normalization procedure such that each variable in a given country-year has zero mean and unit standard deviation (Panel B). There is a strong negative correlation between the lending supply and loan fees ($\rho = -0.41$ in Panel B). Lending supply is also positively related to market capitalization ($\rho = 0.11$) and negatively related with (a) zero-return weeks ($\rho = -0.21$) and (b) the bid-ask spread ($\rho = -0.26$). As expected, the loan fee correlations have the opposite signs, but are usually smaller in magnitude. Overall, our statistics match the patterns previously documented in the literature.

[Table II about here]

In Table III we construct decile portfolios sorted by lending supply to better understand the characteristics of firms with high and low lending supply. Firms with higher supply tend to have smaller and less volatile fees. Loan utilization (shares lent out divided by lending supply) is generally stable across most deciles excluding the first one. This means that once a stock is relatively unconstrained, loan utilization does not depend much on lending supply. Firms with higher lending supply also tend to have larger market capitalization.

[Table III about here]

B. Determinants of Lending Supply, Borrowing Fees and Utilization

To shed more light on how our main explanatory variables are related to firm characteristics, we show in Table IV how lending supply, loan fees, and utilization relate to the firm characteristics. All regressions include country-year dummies to remove any influence due to the effects of time and country, with standard errors being clustered at both the firm and year levels to obtain standard-error estimates that are more conservative as suggested by Petersen (2009); Thompson (2009). Firms with higher B/M ratios, market capitalization, and liquidity tend to have higher lending supply, lower loan fees, and higher utilization. Cross-listing does not affect lending supply, although it is associated with smaller fees in Panel A. Firms with higher free float tend to have higher supply and lower fees. This is logical because many of these shares belong to investors such as passive index funds or long-only mutual funds, which earn extra returns for their shareholders by lending stocks in their portfolios and additionally are prime providers of shares for lending (D'Avolio 2002, Nagel 2005, Kolasinski, Reed, and Ringgenberg 2008).

[Table IV about here]

C. Impact of Short Selling Constraints on Price Efficiency and the Distribution of Returns

Our main research method is to estimate regressions using annual measures of both price efficiency and characteristics of the returns distribution as dependent variables, with standard deviations double-clustered at the firm and year levels (Thompson 2009). All variables are standardized such that each variable has zero mean and unit standard deviation for each country-year, which allows the evaluation of each coefficient as the response of our dependent variables to a one standard deviation change of the variable of interest. We also include country dummies to control for country-specific variation, such as those related to differences in corporate governance regimes (Morck, Yeung, and Yu 2000, Lesmond 2005) and opaqueness (Jin and Myers 2006).

Our main sample uses a cross-listing dummy, market capitalization, the proportion of zero-return weeks, turnover, and bid-ask spreads as control variables. For a subsample, we also use free float and B/M ratios as additional controls, which are only available for a smaller sample mostly consisting of US and UK firms.

C.1. Analysis of Price Efficiency Measures

We start by examining whether our proxies for short-sale constraints are related to the different measures of price efficiency. We first use the absolute value of the cross-correlation of stock returns proposed by Bris, Goetzmann, and Zhu (2007) and use lending supply and loan fees as explanatory variables. The cross-correlation is defined as the absolute value of the correlation between contemporaneous stock returns and lagged market returns. In Table V, the results in the first column of Panel A show that a one standard deviation increase in lending supply reduces the cross-correlation by 0.1 standard deviation, being statistically significant at the 5% level.

[Table V about here]

Our second measure, $|VR|$, is given by the absolute deviation from one of the ratio between (i) variance of monthly returns and (ii) four times the variance of weekly returns (Lo and MacKinlay 1988, Griffin, Kelly, and Nardari 2009). As expected, in column 2, we find that stocks with low lending supply and higher fees show more deviations from a random walk process.

However, these measures might be biased measures of efficiency because they do not control for potentially omitted variables. The price delay measures, D1 and D2, based on Hou and Moskowitz (2005), address these concerns. These measures compare the usefulness of the lagged local-market returns to explain stock returns, controlling for contemporaneous market returns (both for local- and world indices). D1 is based on the increase of R^2 after adding the lagged local-market return, and D2 is computed using the magnitude of the estimated lagged return coefficients. In columns three and four of Panel A in Table V we see that D1 and D2 are negatively related to lending supply. For example, a one standard deviation increase in lending supply is associated with a decrease D1 of 0.097 standard deviations. The loan fee parameters are not significant.

Firms with high market capitalization, large free float and high liquidity (measured by low bid-ask spreads and fewer zero-return weeks) are also associated with smaller price delay. Turnover is not significant across efficiency measures. We would expect smaller price delays to be associated with cross-listing if the firms that cross-list their shares internationally benefit locally from the better disclosure and transparency environments. However, we do not find support for this hypothesis using either the correlation or price delay measures. Considered together, these results show that short-sale constraints, measured by lending supply, are associated with lower price efficiency.

C.2. Stock Return Distribution and Regulatory Concerns

Regulators are generally concerned that relaxing short-sale constraints increase the probability of crashes and market volatility. The widespread use of short selling by hedge funds and their huge impact on trading volume has generated questions about the fairness and legality of this type of trade (see for example the article at Forbes.com 2006). We investigate these claims in Table VI, testing whether our proxies for short selling constraints affect skewness, kurtosis, the frequencies of extreme negative and positive returns at the stock level, downside risk and volatility.

We estimate a negative relationship between skewness and lending supply, which is significant at the 1% level. These results are similar regardless of whether we use raw skewness or remove the impact of systematic market fluctuations by using the residuals from a market-model equation. This is in accordance with the theoretical prediction of Xu (2007) that skewness should decrease with fewer short-sale constraints. Skewness also decreases with higher turnover and a smaller fraction of zero-return weeks in the main sample, but none of our liquidity proxies is significant in the smaller sample shown in Panel B. Overall, we show that the positive link between skewness and short-sale constraints exists also at the stock level, unlike the results of Bris, Goetzmann, and Zhu (2007), and of Chang, Cheng, and Yu (2007) in Hong Kong's stock market.

[Table VI about here]

Next, we use kurtosis to test whether short-sales constraints are associated with "thicker" tails (i.e. high kurtosis) in the distribution of returns, implying a higher overall frequency of extreme returns. In columns three and four of Table VI we present the results using kurtosis computed from stock returns and residuals from a market-model regression as dependent variables. We find that higher lending supply and lower loan fees are indeed associated with smaller kurtosis. From Panel A, a one standard deviation increase in lending supply and loan fee lead to, respectively, a -0.067 decrease and 0.014 standard deviation increase in Kurtosis. We find mixed results for the liquidity proxies: although kurtosis increases with higher zero-return weeks, it also increases with higher turnover. Overall, we can conclude that short-sales constraints are associated with higher kurtosis.

Considering the lack of association for the frequency of extreme negative returns, how can we reconcile this with the fact that higher supply is associated with a decrease in skewness? In columns 5 and 6, we estimate the relationship between short-sale constraints and extreme returns, the latter defined as the proportion of returns that are two standard deviations below (Down) or above (Up) the previous year's average. For extreme negative returns we do not find any explanatory power for lending supply. However, higher fees are associated with fewer extreme negative returns. On the contrary, extreme positive returns are significantly associated with lower lending supply. This suggests that the positive relationship between skewness and short-sale constraints found earlier is not due to the increased frequency of extreme negative returns but decreased frequency of extreme positive returns. A potential explanation is that fewer short-sale constraints enable arbitrageurs to correct *overpricing* more quickly, preventing prices from overreacting for non-fundamental reasons and decreasing the frequency and magnitude of extreme *positive* returns. The analysis of the other controls paints a mixed picture. Although higher turnover and a smaller proportion of zero-return weeks (i.e. higher liquidity) increase the frequency of extreme negative returns and a higher turnover increase the frequency of positive returns, we find that higher bid-ask spreads (i.e. lower liquidity and higher transaction costs) do so as well.

These results are different from those in Bris, Goetzmann, and Zhu (2007); Charoenrook and Daouk

(2009) because short selling is found to be associated not only with the magnitude but also with the frequency of extreme returns. Stock returns carry firm-specific risk that is not diversified away, as it happens when the analysis is carried out with aggregate market returns (as in Charoenrook and Daouk 2009). Furthermore, because we have a proxy of short-sales constraints available at the firm level it allows for statistical results that are more powerful, improving upon the country-level proxy based on regulatory information used by Bris, Goetzmann, and Zhu (2007).

Finally, we investigate how the volatility of returns is affected by short-sale constraints, using (i) the variance of below-average returns to capture downside risk, and (ii) the standard deviation of weekly return to measure total volatility. Higher lending supply is associated with less downside risk and total volatility in the main sample (Panel A), but not in Panel B. In addition, higher loan fees are positively related to both downside and total risks. This result is similar to the one reported by Charoenrook and Daouk (2009) and validates Bai, Chang, and Wang (2006)'s model prediction. We also find that total volatility is positively related with high bid-ask spreads and reduced firm size. During the US shorting ban in 2008, bid-ask spreads and volatility indeed rose (e.g. Boehmer, Jones, and Zhang 2009, Kolasinski, Reed, and Thornock 2009), in line with our findings.

Overall, using lending supply and loan fees as proxies for short selling, we conclude that an increase in short-sale constraints is not associated with higher price stability. Furthermore, the imposition of constraints is associated with a decrease in price efficiency. These conclusions are robust to a series of robustness tests, which are discussed in the next section.

D. Accounting for Endogeneity Concerns

Although our findings show that lending supply is a good proxy for short-selling constraints, the previous section does not address the possible endogeneity between our proxies and the dependent variables. For instance, it could be that inefficient stocks drive investors away from the equity lending market, reducing lending supply. We address this by using IV regressions, using the first two lags of lending supply and one lag of loan fees as instruments, with robust standard errors clustered at the firm level.

In Table VII we report the results for the price efficiency measures. Using our instruments to proxy for lending supply does not affect our main conclusions, although the lending supply coefficients are smaller. Loan fees are now statistically positively related to the cross-correlation. We test for instrument's over-identification using Hansen's J statistic and cannot reject the null hypothesis that our instruments satisfy the orthogonality conditions in most of the regressions.

[Table VII and VIII about here]

Table VIII focuses on the characteristics of the distribution of returns. Higher lending supply reduces excess skewness, excess kurtosis, and the frequency of extreme negative and positive returns, but it does not reduce the downside risk or total volatility. Loan fees now have a statistically significant positive impact on skewness and a negative one on both measures of extreme returns. Downside risk and total volatility are still positively related to loan fees, turnover and the bid-ask spread, whereas they are related to firm size. Hansen's J statistic does not reject the null hypothesis for all variables, except skewness and the frequency of extreme positive returns. Overall, our previous conclusions are unchanged.

The country dummies we use as controls in our main regressions do not account for the different slopes across countries. It may be that because different institutional environments can affect how lending supply and lending fees affect the price efficiency and the distribution of returns. In Table IX we test this possibility by adding the cross-products of all explanatory variables with a dummy variable that controls for OECD membership, which is meant to proxy for the level of financial development. Of the 26 countries included in our sample, 8 are not members of the OECD (China, Hong Kong, Israel, Mexico, Singapore, South Africa and South Korea) and these contribute with about 5% of the observations.

[Table IX about here]

Similar to the article by Griffin, Kelly, and Nardari (2009), we do not find significant differences in price efficiency caused by OECD membership, because differences arise from firm characteristics. The impact of lending supply on price efficiency does not depend on OECD membership, the F-test that OECD/non-OECD lending supply parameters are jointly zero rejects the null for all efficiency measures, but we cannot reject the hypothesis that the sum of lending supply parameters for the cross-correlation is zero at the 5% level. The loan fee parameters are mostly insignificant, but this is caused by collinearity, because the joint hypothesis that the fee parameters are zero is rejected for $|VR|$, D1 and D2. In Panel B, we find that OECD members have higher kurtosis but lower downside risk and total volatility than non-OECD countries. The impact of lending supply in OECD countries is larger for excess skewness and smaller for the two measures of kurtosis. For loan fees, the OECD cross-product is significant for kurtosis. In fact, in non-OECD countries a higher loan fee has the effect of decreasing kurtosis. Broadly speaking, these results are similar to those in Table VI.

V. Conclusion

Using a unique dataset with weekly equity lending transactions across 26 countries, we analyze whether short selling constraints reduce price efficiency and affect the magnitude and frequency of crashes, along with the hypotheses drawn from Diamond and Verrecchia (1987); Duffie, Garleanu, and Pedersen (2002); Bai, Chang, and Wang (2006). We use the annual average lending supply and loan fees, computed for each firm in our sample between 2005 and 2008 as proxies of short selling constraints. Unlike loan fees, lending supply does not face the problem of measuring both demand (for example, private information) and supply in the equity lending market (made explicit by Cohen, Diether, and Malloy 2007), thereby providing a novel measure that is directly related to the supply side of the market. Our main contribution is to present evidence that a high level of equity lending supply - and to a lesser extent small loan fees - is associated with an increase in the speed by which information is incorporated into prices.

We show that even if short selling is allowed in a particular country, stocks are still subject to different levels of constraints due to differences in the availability of shares for lending. We improve upon previous work by Bris, Goetzmann, and Zhu (2007); Charoenrook and Daouk (2009) through the introduction of firm-specific measures of short selling constraints. These measures avoid the problem of capturing spurious correlation to other omitted country-specific variables, which is faced by country-level information, such as regulatory constraints or the availability of options.

Firms with limited lending supply and high loan fees have longer delays in responding to market-wide shocks, using measures drawn from Hou and Moskowitz (2005); Bris, Goetzmann, and Zhu (2007); Griffin, Kelly, and Nardari (2009). Larger firms and that are more liquid, and those with higher free-float also tend to have more efficient prices, while those with higher bid-ask spreads tend to be less efficient.

We also study the effect on the distribution of returns through several measures: the skewness and kurtosis of weekly stock returns, the occurrence of extreme negative and extreme positive returns, the downside risk and total volatility. We find that firms with higher lending supply have skewness that is more negative, lower kurtosis, smaller frequency of extreme positive returns, and lower levels of downside risk and total volatility. We do not find robust evidence that it increases the frequency of extreme negative returns. These results do not support the view expressed by regulators that short-sale constraints can stabilize prices.

The conclusions are robust to controls for firm size and several measures of liquidity. We control for endogeneity concerns by additional regressions using an IV approach. We further estimate parameters according to the OECD membership status of a firm's home country to test for differences between developed and non-developed countries, obtaining similar results.

Our study also has certain limitations. First, good estimators of price efficiency and return distribution measures require a minimum estimation period. We are therefore unable to capture the dynamics in short selling within the one-year estimation period, missing many important news events that are short-term in nature and worth exploring on their own (like Karpoff and Lou 2009, Engelberg and Ringgenberg 2010). Second, the issue of causality is always a concern in settings lacking a natural experiment that can be used as an exogenous instrument, such as the 2008 short selling restrictions.

These findings are consistent with previous studies (Boehmer, Jones, and Zhang 2009, Kolasinski, Reed, and Thornock 2009) and are useful to regulators devising short selling regulation. Our results suggest that the imposition of constraints reduces price efficiency and does not achieve the desired objective of stabilizing prices.

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Table I: Stock lending markets around the world

This table shows summary statistics divided by country for firms present in Datastream in 2008. Market cap is the sum of market capitalization in USD billions, and Stocks reports the number of stocks extracted from Datastream. In the "Stocks with lending supply" panel, these firms are matched to equity lending data. MC(%) shows the percentage of firms with lending supply data relative to total local market capitalization, whereas #(%) shows the same as a fraction of the total number of firms in a given country. Avg. supply and St. dev. denote the average lending supply relative to total shares outstanding and the standard deviation for a given year, respectively. The "Stocks with lending transactions" panel contains summary statistics for firms with recorded lending transactions. We report annualized means and standard deviations (σ_{Loan})for the shares lent out as % of market capitalization (Loan(%)). For loan fees we report, the equal-weighted mean (Fee$_{EW}$), the standard deviation (σ_{Fee}), and the size-weighted average (Fee$_{VW}$).

Country	Country Info		Stocks with lending supply				Stocks with lending transactions						
	Market cap	Stocks	MC(%)	#(%)	Avg. supply	St.dev.	MC(%)	#(%)	Loan(%)	σ_{Loan}	Fee$_{EW}$	σ_{Fee}	Fee$_{VW}$
AUSTRALIA	698	407	87	80	15.62	16.51	87	74	6.42	9.88	132	159	33
AUSTRIA	104	53	100	98	10.75	11.41	98	87	3.11	3.94	82	108	71
BELGIUM	190	78	72	88	6.94	8.77	72	81	1.99	4.09	106	116	52
CANADA	1,138	882	81	68	23.62	21.12	76	59	8.08	14.32	104	116	41
DENMARK	131	87	74	84	6.56	7.86	68	76	2.52	4.13	180	155	79
FINLAND	154	91	97	95	8.59	10.00	96	90	2.57	3.45	171	194	53
FRANCE	1,484	350	98	92	6.59	9.44	97	79	3.71	5.86	126	135	53
GERMANY	1,212	443	96	87	9.27	12.05	91	74	4.72	8.87	108	139	44
HONG KONG	898	261	94	86	6.96	6.84	93	75	1.61	2.26	154	157	33
ISRAEL	28	43	90	91	9.02	14.30	90	77	1.82	3.32	110	108	185
ITALY	678	247	82	89	4.96	5.76	82	81	2.18	3.40	134	117	60
JAPAN	3,267	2093	96	95	4.49	5.77	95	87	1.53	3.07	157	142	40
MEXICO	205	45	87	87	7.99	8.03	87	89	1.50	5.06	212	82	149
NETHERLANDS	576	107	69	68	13.95	13.32	69	66	4.12	5.50	89	131	26
NEW ZEALAND	18	33	96	94	5.15	5.93	94	76	1.98	4.12	119	102	61
NORWAY	135	110	95	85	11.92	15.34	93	75	6.28	9.92	146	133	82
PORTUGAL	54	27	96	81	4.28	3.56	96	81	1.87	1.82	135	137	64
SINGAPORE	178	140	69	85	6.81	8.57	65	75	1.52	2.17	185	158	62
SOUTH AFRICA	198	63	89	79	6.03	5.41	82	67	1.80	4.33	49	26	38
SOUTH KOREA	403	170	99	96	4.76	4.97	92	83	1.01	1.19	216	153	116
SPAIN	664	108	88	84	4.78	5.19	87	81	2.48	2.59	213	195	93
SWEDEN	281	187	98	93	8.95	9.76	97	90	2.77	4.37	97	77	74
SWITZERLAND	852	231	94	89	13.02	11.93	93	84	2.91	5.66	50	85	22
THAILAND	94	56	82	89	2.55	2.18	69	71	0.46	0.89	251	140	142
UNITED KINGDOM	1,838	1001	78	76	21.63	19.27	76	67	5.74	10.84	112	130	19
UNITED STATES	11,621	5308	93	81	23.56	20.43	88	78	8.91	13.02	68	161	10
WORLD	27,097	12,621	91	84	15.77	18.20	87	77	5.75	10.60	107	153	30

Table II
Pairwise Correlation of Explanatory Variables

The table shows pairwise correlations of the main explanatory variables based on weekly values between 2005 and 2008 using data from Datastream. To be included in the sample, each firm must have at least 50 weekly return observations, less than 10 zero-return observations, and more than 5 lending observations in a given year. Furthermore, each country must have more than 15 firms in a given year. In Panel A we display the pairwise correlations for the following variables: Supply is the log of annual average lending supply relative to market capitalization, Fee is the annual average of annualized loan fees, and Utilization is the average of total loan amount divided by lending supply. "ADR/GDR" is a dummy variable equal to one if the firm cross-lists in the US or the UK, Mkt. Cap is market capitalization, B/M is the book-to-market ratio, Zero-return weeks is the proportion of zero-return weeks in a given year, Turnover is the sum of weekly dollar trading volume scaled by market capitalization, Free Float is the fraction of shares available to ordinary investors, and Bid-Ask is the weekly closing spread scaled by the closing price. In Panel B, correlations are computed after normalizing variables such that they have zero mean and unit standard deviation in a given country-year.

PANEL A: Raw Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Supply	1									
(2) Fee	-0.42	1								
(3) Utilization	-0.04	0.25	1							
(4) ADR/GDR	0.11	-0.10	0.02	1						
(5) Mkt. Cap	0.53	-0.41	0.02	0.21	1					
(6) B/M	-0.12	0.06	-0.11	-0.02	-0.29	1				
(7) Zero-return weeks	-0.28	0.18	-0.07	0.00	-0.30	0.12	1			
(8) Free Float	0.10	-0.03	-0.06	0.02	0.03	-0.01	0.01	1		
(9) Turnover	0.36	-0.04	0.29	0.05	0.29	-0.15	-0.16	0.07	1	
(10) Bid-Ask	-0.44	0.35	-0.11	-0.09	-0.59	0.19	0.37	-0.07	-0.29	1

PANEL B: Normalized Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Supply	1									
(2) Fee	-0.41	1								
(3) Utilization	0.07	0.25	1							
(4) ADR/GDR	-0.04	-0.02	-0.04	1						
(5) Mkt. Cap	0.11	-0.11	-0.10	0.16	1					
(6) B/M	-0.02	0.02	-0.02	-0.01	-0.02	1				
(7) Zero-return weeks	-0.21	0.17	-0.03	-0.08	-0.08	-0.03	1			
(8) Free Float	0.22	-0.11	-0.01	-0.10	0.06	-0.03	0.11	1		
(9) Turnover	0.44	-0.05	0.33	-0.04	0.03	-0.04	-0.12	-0.21	1	
(10) Bid-Ask	-0.26	0.21	-0.11	-0.03	-0.09	0.02	0.19	0.18	0.24	1

Table III: Descriptive Statistics - Stocks sorted on Lending Supply

The table shows the characteristics of portfolios sorted based on lending supply deciles based on annual averages between 2004 and 2008 using Datastream price data. Each firm must have at least 50 weekly return observations, less than 10 zero return observations and at least 6 lending observations in a given year to be included. Furthermore, each country must have more than 16 firms in a given year. Obs. gives the number of firm-year observations included in each portfolio. μ_{Supply} reports the average weekly lending supply as a fraction of market capitalization. μ_{Fee} represents the average loan fee winsorized at 0.5%, whereas σ_{Fee} denotes the standard deviation for each decile. Columns N_S and N_L show, the average number of weeks with lending supply and lending transactions, respectively. Util reports the average dollar value of lending transactions scaled by available supply. Size(bi) shows the average market capitalization in billions of US dollars. D_{DR} shows the percentage of stocks with an ADR or GDR outside their parent country.

Decile	Obs.	μ_{Supply}	μ_{Fee}	σ_{Fee}	N_S	N_L	Util	Size (bi)	D_{DR}
Low Supply	1,906	0.00	0.73	1.99	45	30	0.27	0.68	0.04
2	1,908	0.01	0.64	1.70	46	35	0.20	1.38	0.04
3	1,906	0.03	0.56	1.69	45	38	0.20	1.25	0.05
4	1,907	0.04	0.46	1.37	45	40	0.21	1.45	0.05
5	1,909	0.06	0.38	1.32	45	41	0.22	1.69	0.04
6	1,907	0.08	0.32	1.06	44	42	0.23	3.35	0.03
7	1,908	0.10	0.26	0.84	42	41	0.22	7.79	0.04
8	1,906	0.12	0.20	0.64	41	40	0.20	8.02	0.04
9	1,908	0.14	0.19	0.73	42	41	0.22	5.69	0.04
High Supply	1,906	0.18	0.17	0.68	43	42	0.24	3.01	0.04
Total	19,071	0.08	0.39	1.47	44	39	0.22	3.43	0.04

Table IV
Determinants of Lending Supply and Loan Fees

The table estimates lending supply, loan fees and loan utilization as a function of firm's characteristics between 2004 and 2008. Each firm-year pair must have at least 50 weekly return observations, and less than 10 weeks with zero returns, and belong to a country with more than 15 companies. Ln(Supply) is the log of annual average lending supply relative to market capitalization, Fee is the annual average of annualized loan fees and Util is the average of total loan amount divided by lending supply. Explanatory variables are as follows: a dummy for whether the firm cross-lists in the US or the UK, B/M is the log of the book-to-market ratio, Market Cap is the log of market capitalization, Zero-return weeks is the proportion of zero-return weeks in a given year, Turnover is the annual total of daily share volume divided by market capitalization, Free Float is the fraction of total shares available to ordinary investors, and Bid-Ask is the closing spread scaled by price. Price, volume and free float data are obtained from Datastream. Regressions include country and year dummies and standard errors are double clustered at the firm and year levels as in Thompson (2009). Standard deviations are reported in brackets and significance levels are indicated as follows: **=significant at the 10% percent level; *=significant at the 5% percent level; +=significant at the 1% level.

			PANEL A: Main Sample			**PANEL B: With B/M & Free Float**		
	Mean	St.dev.	Ln(Supply)	Fee	Util	Ln(Supply)	Fee	Util
ADR or GDR	0.07	0.26	0.062	-0.106	0.027	0.063	-0.267	0.023
			[0.084]	[0.087]	[0.013]*	[0.093]	[0.074]+	[0.014]
B/M	-0.65	0.71				0.113	-0.098	-0.019
						[0.033]+	[0.035]+	[0.008]*
Market Cap	-0.39	1.64	0.241	-0.303	-0.014	0.232	-0.250	-0.010
			[0.045]+	[0.031]+	[0.003]+	[0.039]+	[0.024]+	[0.003]+
Zero-return weeks	0.01	0.02	-9.253	5.900	-0.438	-8.294	-1.518	-1.009
			[0.635]+	[1.751]+	[0.173]*	[0.739]+	[1.128]	[0.227]+
Turnover	0.30	0.41	0.532	0.414	0.173	0.539	0.379	0.147
			[0.066]+	[0.038]+	[0.015]+	[0.083]+	[0.050]+	[0.019]+
Free Float	0.69	0.24				0.556	-0.181	-0.053
						[0.080]+	[0.104]**	[0.019]+
Bid-Ask	0.28	0.67				-0.097	0.066	-0.015
						[0.037]+	[0.033]*	[0.006]*
Constant			-4.234	1.665	0.074	-3.896	0.841	0.052
			[0.020]+	[0.017]+	[0.001]+	[0.042]+	[0.099]+	[0.021]*
Mean(Dep. Var)			-3.86	1.09	0.24	-3.86	1.16	0.24
StDev(Dep. Var)			1.49	1.35	0.23	1.49	1.37	0.23
Obs.			19,071	19,071	18,560	9,959	9,959	9,794
Firms			7,699	7,699	7,699	7,696	7,696	7,696
R^2			0.40	0.20	0.14	0.44	0.24	0.14
Country-Year dummies			Yes	Yes	Yes	Yes	Yes	Yes

Table V: Equity Lending Market and Price Efficiency Measures

The table uses lending supply and loan fees in relation to price efficiency measures from 2005 to 2008. Each firm-year pair needs at least 50 weekly return observations and fewer than 10 weeks with zero-returns. A country must have more than 15 companies to be included. All variables are normalized to have zero mean and unit standard deviation in a given country-year. The dependent variables are: ρ^{Cross} is the cross-correlation between firm returns and lagged local index returns, $|VR|$ is the variance ratio, defined as the absolute value of the variance of monthly returns divided by 4 times the variance of weekly returns, less one; D1 and D2 proxy for price delay as in Hou and Moskowitz (2005). The explanatory variables in Panel A are: Supply is lending supply relative to market cap, Fee is the annualized loan fee, Market Cap is market capitalization, ADR/GDR is a dummy for whether the firm cross-lists in the US or the UK, B/M is the book-to-market ratio, Zero-return weeks, Turnover is total turnover, Free Float is the fraction of shares available to ordinary investors, and Bid-Ask is the closing spread scaled by price. Panel B excludes B/M ratio, Free Float and the bid-ask spread. Regressions include country and year dummies and standard errors are double clustered at the firm and year levels as in Thompson (2009). Standard deviations are reported in brackets, and the significance levels are as follows: **=significant at the 10% percent level; *=significant at the 5% percent level; += 1% level.

Panel A: Main Sample

	ρ^{Cross}	$\|VR\|$	D1	D2
Supply	-0.100	-0.060	-0.097	-0.080
	[0.047]*	[0.019]$^{+}$	[0.015]$^{+}$	[0.024]$^{+}$
Fee	0.015	0.014	0.000	-0.021
	[0.020]	[0.004]$^{+}$	[0.009]	[0.006]$^{+}$
ADR or GDR	0.083	0.146	0.080	-0.034
	[0.119]	[0.104]	[0.054]	[0.026]
Market Cap	-0.206	0.032	-0.336	-0.188
	[0.029]$^{+}$	[0.031]	[0.017]$^{+}$	[0.027]$^{+}$
Zero-return weeks	0.046	0.032	0.074	0.026
	[0.005]$^{+}$	[0.010]$^{+}$	[0.015]$^{+}$	[0.011]*
Turnover	0.034	0.009	-0.008	0.020
	[0.035]	[0.023]	[0.013]	[0.033]
Bid-Ask	0.019	0.080	0.148	0.059
	[0.013]	[0.024]$^{+}$	[0.046]$^{+}$	[0.022]$^{+}$
Constant	-0.005	-0.008	-0.004	0.002
	[0.007]	[0.006]	[0.003]	[0.002]
Obs.	19,071	19,071	19,071	19,071
Firms	8,226	8,226	8,226	8,226
R^2	0.08	0.01	0.26	0.07

Panel B: Including B/M & Free Float Data

	ρ^{Cross}	$\|VR\|$	D1	D2
Supply	-0.077	-0.059	-0.087	-0.060
	[0.035]*	[0.018]$^{+}$	[0.017]$^{+}$	[0.032]**
Fee	0.011	0.000	-0.003	-0.007
	[0.025]	[0.006]	[0.014]	[0.017]
ADR or GDR	0.044	0.087	0.073	-0.018
	[0.128]	[0.076]	[0.096]	[0.092]
Market Cap.	-0.172	0.044	-0.307	-0.206
	[0.034]$^{+}$	[0.040]	[0.019]$^{+}$	[0.031]$^{+}$
Zero-return weeks	0.069	0.029	0.103	0.059
	[0.007]$^{+}$	[0.018]	[0.020]$^{+}$	[0.024]*
Turnover	0.038	0.006	-0.012	0.027
	[0.039]	[0.034]	[0.009]	[0.036]
Bid-Ask	0.059	0.058	0.224	0.111
	[0.022]$^{+}$	[0.030]**	[0.028]$^{+}$	[0.024]$^{+}$
Free Float	-0.035	0.056	-0.019	-0.021
	[0.007]$^{+}$	[0.007]$^{+}$	[0.005]$^{+}$	[0.007]$^{+}$
B/M	0.008	0.031	-0.030	-0.048
	[0.027]	[0.008]$^{+}$	[0.019]	[0.013]$^{+}$
Constant	-0.032	0.119	0.319	-0.086
	[0.019]**	[0.005]$^{+}$	[0.015]$^{+}$	[0.009]$^{+}$
Obs.	9,959	9,959	9,959	9,959
Firms	4,169	4,169	4,169	4,169
R^2	0.07	0.01	0.27	0.09

Table VI
Equity Lending Market & Characteristics of Stock Return Distribution

The table looks at how lending supply and loan fees are related to the characteristics of the stock return distribution from 2005 to 2008. Each firm-year pair needs at least 50 weekly return observations and fewer than 10 weeks with zero-returns. A country must have more than 15 companies to be included. All variables are normalized to have zero mean and unit standard deviation in a given country-year. The dependent variables are: Skewness and Kurtosis of weekly stock returns, Exc(Skew) and Exc(Kurt) are based on the residuals of a local market-model regression, Down (Up) is the fraction of returns two standard deviations below (above) the previous year's average, Down Risk is the variance of weekly below-average returns, and Vol is the standard deviation of weekly returns. Supply is lending supply relative to market cap, Fee is the annualized loan fee, Market Cap is market capitalization, ADR/GDR is a dummy for whether the firm cross-lists in the US or the UK, Zero-return weeks, Turnover is total turnover, and Bid-Ask is the closing spread scaled by price. Panel B includes B/M and Free Float data, defined as the fraction of shares available to ordinary investors. Regressions include country and year dummies and standard errors are double-clustered at the firm and year levels as in Thompson (2009). The intercepts are not reported due to space constraints. Standard deviations are reported in brackets, and the significance levels are as follows: **=significant at the 10% percent level; *=significant at the 5% percent level; += significant at the 1% level.

Panel A: Main Sample

	Skew	Exc(Skew)	Kurt	Exc(Kurt)	Down	Up	Down Risk	Vol
Supply	-0.059	-0.098	-0.067	-0.027	-0.001	-0.047	-0.019	-0.043
	[0.019]$^{+}$	[0.015]$^{+}$	[0.017]$^{+}$	[0.012]*	[0.016]	[0.007]$^{+}$	[0.010]*	[0.014]$^{+}$
Fee	0.020	0.015	0.014	0.018	-0.041	-0.006	0.111	0.157
	[0.008]*	[0.006]$^{+}$	[0.008]**	[0.007]*	[0.011]$^{+}$	[0.005]	[0.018]$^{+}$	[0.023]$^{+}$
ADR or GDR	0.081	0.062	0.024	0.027	-0.041	0.059	0.131	0.175
	[0.028]$^{+}$	[0.055]	[0.044]	[0.043]	[0.119]	[0.082]	[0.029]$^{+}$	[0.039]$^{+}$
Market Cap.	-0.007	0.032	-0.098	-0.092	0.048	0.003	-0.251	-0.255
	[0.022]	[0.016]*	[0.046]*	[0.022]$^{+}$	[0.034]	[0.035]	[0.018]$^{+}$	[0.018]$^{+}$
Zero-return weeks	0.038	0.039	0.097	0.081	-0.038	-0.010	-0.023	-0.023
	[0.022]**	[0.020]**	[0.025]$^{+}$	[0.026]$^{+}$	[0.010]$^{+}$	[0.022]	[0.014]**	[0.021]
Turnover	-0.019	-0.024	0.083	0.103	0.100	0.064	0.333	0.383
	[0.021]	[0.009]$^{+}$	[0.022]$^{+}$	[0.009]$^{+}$	[0.045]*	[0.031]*	[0.018]$^{+}$	[0.018]$^{+}$
Bid-Ask	-0.017	-0.033	0.013	0.008	0.114	0.064	0.177	0.225
	[0.031]	[0.024]	[0.026]	[0.023]	[0.040]$^{+}$	[0.031]*	[0.026]$^{+}$	[0.022]$^{+}$
Obs.	19,071	19,071	19,071	19,071	18,699	18,699	19,071	19,071
Firms	8,226	8,226	8,226	8,226	8,226	8,226	8,226	8,226
R^2	0.07	0.01	0.01	0.04	0.02	0.02	0.01	0.21

Panel B: Panel B: Including B/M & Free Float Data

	Skew	Exc(Skew)	Kurt	Exc(Kurt)	Down	Up	Down Risk	Vol
Supply	-0.064	-0.098	-0.045	-0.022	-0.009	-0.034	0.017	-0.003
	[0.017]$^{+}$	[0.011]$^{+}$	[0.013]$^{+}$	[0.012]**	[0.025]	[0.006]$^{+}$	[0.018]	[0.017]
Fee	0.014	0.010	0.030	0.031	-0.029	0.026	0.083	0.111
	[0.016]	[0.014]	[0.011]$^{+}$	[0.013]*	[0.004]$^{+}$	[0.022]	[0.019]$^{+}$	[0.019]$^{+}$
ADR or GDR	0.045	0.036	0.014	0.028	-0.007	0.052	0.067	0.079
	[0.059]	[0.083]	[0.068]	[0.070]	[0.096]	[0.063]	[0.046]	[0.054]
B/M	0.028	0.035	-0.038	-0.034	0.004	0.115	-0.063	-0.052
	[0.022]	[0.018]**	[0.019]**	[0.021]	[0.037]	[0.037]$^{+}$	[0.055]	[0.052]
Market Cap.	-0.015	0.003	-0.102	-0.082	0.065	0.035	-0.206	-0.214
	[0.022]	[0.016]	[0.045]*	[0.033]*	[0.048]	[0.064]	[0.020]$^{+}$	[0.016]$^{+}$
Zero-return weeks	0.052	0.054	0.141	0.128	-0.046	-0.041	-0.054	-0.066
	[0.037]	[0.036]	[0.033]$^{+}$	[0.035]$^{+}$	[0.007]$^{+}$	[0.012]$^{+}$	[0.019]$^{+}$	[0.016]$^{+}$
Turnover	-0.012	-0.004	0.067	0.093	0.126	0.073	0.314	0.366
	[0.018]	[0.010]	[0.010]$^{+}$	[0.016]$^{+}$	[0.055]*	[0.034]*	[0.027]$^{+}$	[0.044]$^{+}$
Free Float	0.014	0.029	-0.012	-0.016	0.008	0.025	-0.049	-0.046
	[0.013]	[0.016]**	[0.008]	[0.007]*	[0.016]	[0.019]	[0.008]$^{+}$	[0.008]$^{+}$
Bid-Ask	-0.023	-0.052	0.033	0.028	0.119	0.060	0.137	0.161
	[0.043]	[0.035]	[0.028]	[0.024]	[0.049]*	[0.038]	[0.030]$^{+}$	[0.018]$^{+}$
Obs.	9,959	9,959	9,959	9,959	9,599	9,599	9,959	9,959
Firms	4,169	4,169	4,169	4,169	4,169	4,169	4,169	4,169
R^2	0.09	0.01	0.01	0.05	0.03	0.02	0.02	0.19

Table VII

Robustness Tests: Instrumental Variables & Price Efficiency Measures

The table uses lending supply and loan fees are shows their relation to price efficiency measures from 2005 to 2008, with two lags of lending supply and one lag of loan fees as instruments. Each firm-year pair needs at least 50 weekly return observations and fewer than 10 weeks with zero-returns. A country must have more than 15 companies to be included in the sample. All variables are normalized to have zero mean and unit standard deviation in a given country-year. The dependent variables are the following: ρ^{Cross} is the cross-correlation between firm returns and lagged local index returns, $|VR|$ is the variance ratio, defined as the absolute value of the variance of monthly returns divided by 4 times the variance of weekly returns, less one; D1 and D2 are proxies of price delay proposed by Hou and Moskowitz (2005). The explanatory variables are: $\widehat{\text{Supply}}$ is the lending supply relative to market capitalization predicted by our set of instruments in the first-stage regressions, $\widehat{\text{Fee}}$ is the annualized loan fee estimated in the first-stage regressions, ADR/GDR is a dummy for whether the firm cross-lists in the US or the UK, Market Cap is market capitalization, Zero-return weeks, Turnover is total turnover, and Bid-Ask is the closing bid-ask spread scaled by price. Hansen's J Test value is the p-value of Hansen's test of instrument over-identification. Standard deviations are reported in brackets and significance levels are as follows: **=significant at the 10% percent level; *=significant at the 5% percent level; += 1% level.

	ρ^{Cross}	$\|VR\|$	D1	D2
$\widehat{\text{Supply}}$	-0.052	-0.051	-0.072	-0.054
	[0.015]$^{+}$	[0.015]$^{+}$	[0.013]$^{+}$	[0.016]$^{+}$
$\widehat{\text{Fee}}$	0.066	0.003	0.009	-0.004
	[0.018]$^{+}$	[0.020]	[0.018]	[0.017]
ADR or GDR	0.098	0.136	0.099	-0.010
	[0.043]*	[0.047]$^{+}$	[0.042]*	[0.047]
Market Cap.	-0.192	0.034	-0.333	-0.187
	[0.013]$^{+}$	[0.013]$^{+}$	[0.012]$^{+}$	[0.014]$^{+}$
Zero-return weeks	0.052	0.037	0.080	0.039
	[0.011]$^{+}$	[0.014]$^{+}$	[0.011]$^{+}$	[0.012]$^{+}$
Turnover	0.022	0.001	-0.008	0.012
	[0.010]*	[0.011]	[0.010]	[0.010]
Bid-Ask	0.045	0.091	0.187	0.074
	[0.014]$^{+}$	[0.014]$^{+}$	[0.016]$^{+}$	[0.014]$^{+}$
Constant	0.008	-0.005	0.006	-0.008
	[0.015]	[0.015]	[0.013]	[0.015]
Obs.	14,580	14,580	14,580	14,580
Firms	6,519	6,519	6,519	6,519
R^2	0.08	0.01	0.26	0.07
Hansen's J Test	0.02	0.47	0.16	0.10

Table VIII

Robustness Tests: Instrumental Variables and Characteristics of Stock Return Distribution

The table uses lending supply and loan fees in relation to characteristics of the stock return distribution from 2005 to 2008, with two lags of lending supply and one lag of loan fees as instruments. Each firm-year pair needs at least 50 weekly return observations and fewer than 10 weeks with zero-returns. A country must have more than 15 companies to be included in the sample. All variables are normalized to have zero mean and unit standard deviation in a given country-year. The dependent variables are: Skewness and Kurtosis of weekly stock returns, Exc(Skew) and Exc(Kurt) are based on the residuals of a local market-model regression, Down (Up) is the fraction of returns two standard deviations below (above) the previous year's average, Down Risk is the variance of negative weekly returns in a year, and Vol is the standard deviation of weekly returns. The explanatory variables are: $\widehat{\text{Supply}}$ is the lending supply relative to market capitalization predicted by our set of instruments in the first-stage regressions, $\widehat{\text{Fee}}$ is the annualized loan fee estimated in the first-stage regressions, ADR/GDR is a dummy for whether the firm cross-lists in the US or the UK, Market Cap is market capitalization, Zero-return weeks, Turnover is total turnover, and Bid-Ask is the closing bid-ask spread scaled by price. Hansen's J Test reports the p-value of Hansen's test of instrument over-identification. All regressions include country and year dummies and standard errors are clustered at the firm level as in Thompson (2009). Standard deviations are reported in brackets and significance levels are as follows: **=significant at the 10% percent level; *=significant at the 5% percent level; += 1% level.

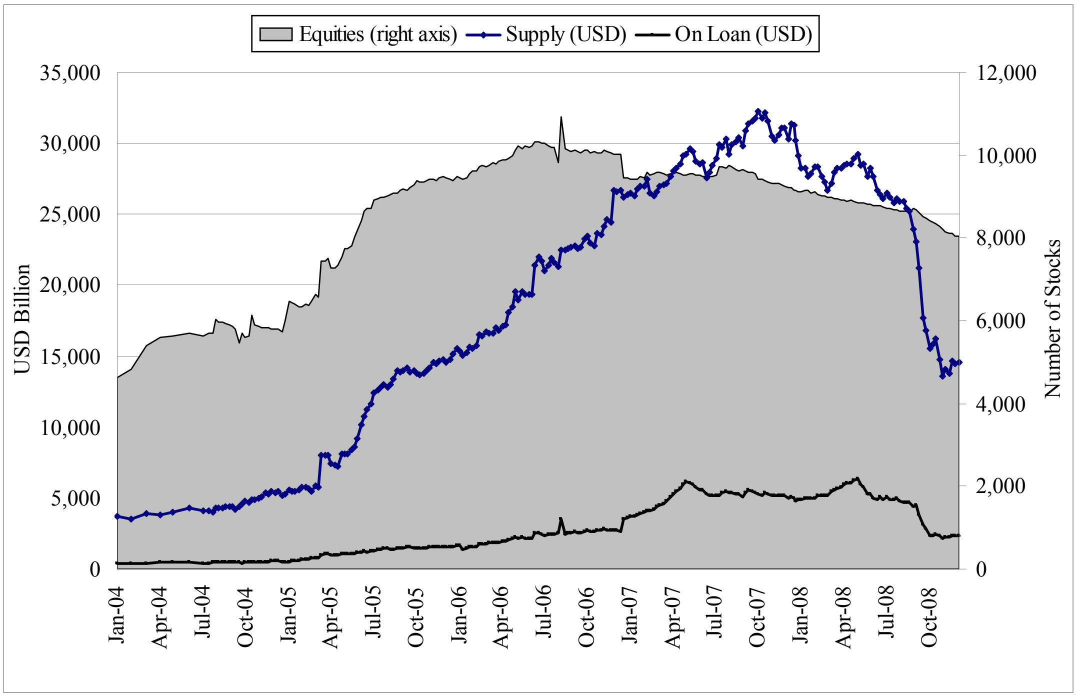
	Skew	Exc(Skew)	Kurt	Exc(Kurt)	Down	Up	Down Risk	Vol
$\widehat{\text{Supply}}$	-0.021	-0.076	-0.014	0.031	-0.029	-0.069	-0.010	-0.019
	[0.015]	[0.015]$^{+}$	[0.014]	[0.015]*	[0.014]*	[0.013]$^{+}$	[0.016]	[0.016]
$\widehat{\text{Fee}}$	0.039	0.044	-0.026	-0.020	-0.147	-0.101	0.111	0.172
	[0.020]**	[0.019]*	[0.019]	[0.019]	[0.019]$^{+}$	[0.017]$^{+}$	[0.020]$^{+}$	[0.021]$^{+}$
ADR or GDR	0.035	0.022	0.002	0.009	-0.032	0.024	0.157	0.182
	[0.042]	[0.042]	[0.052]	[0.053]	[0.038]	[0.037]	[0.047]$^{+}$	[0.046]$^{+}$
Market Cap.	-0.012	0.038	-0.115	-0.116	0.032	-0.004	-0.273	-0.274
	[0.013]	[0.013]$^{+}$	[0.012]$^{+}$	[0.012]$^{+}$	[0.012]$^{+}$	[0.011]	[0.013]$^{+}$	[0.013]$^{+}$
Zero-return weeks	0.054	0.056	0.123	0.102	-0.054	-0.031	0.005	0.016
	[0.016]$^{+}$	[0.015]$^{+}$	[0.019]$^{+}$	[0.018]$^{+}$	[0.012]$^{+}$	[0.009]$^{+}$	[0.014]	[0.015]
Turnover	-0.043	-0.052	0.069	0.096	0.132	0.078	0.333	0.368
	[0.012]$^{+}$	[0.012]$^{+}$	[0.014]$^{+}$	[0.015]$^{+}$	[0.014]$^{+}$	[0.011]$^{+}$	[0.022]$^{+}$	[0.023]$^{+}$
Bid-Ask	-0.035	-0.053	0.048	0.038	0.160	0.100	0.197	0.243
	[0.016]*	[0.014]$^{+}$	[0.016]$^{+}$	[0.015]*	[0.016]$^{+}$	[0.012]$^{+}$	[0.017]$^{+}$	[0.019]$^{+}$
Constant	0.024	0.006	-0.003	0.003	-0.006	-0.001	0.016	0.034
	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]	[0.014]	[0.013]*
Obs.	14,580	14,580	14,580	14,580	14,281	14,281	14,580	14,580
Firms	6,519	6,519	6,519	6,519	6,224	6,224	6,519	6,519
R^2	0.01	0.01	0.04	0.02	0.01	0.00	0.22	0.31
Hansen's J Test	0.00	0.09	0.42	0.11	0.04	0.07	0.59	0.22

Table IX: Robustness Test: OECD Membership

The table uses lending supply and loan fees in relation to price efficiency measures, testing for the differential impact between OECD and non-OECD members from 2005 to 2008. D_{OECD} equals 1 if a country belongs to the OECD and 0 otherwise. In Panel A, we have price efficiency measures: ρ^{Cross} is the cross-correlation between the firm's returns and lagged local-index returns, $|VR|$ is the variance ratio, defined as the absolute value of the variance of monthly returns divided by 4 times the variance of weekly returns, less one; and D1 and D2 are proxies of price delay proposed by Hou and Moskowitz (2005). In Panel B, we have the following characteristics of the distribution of stock returns: Skewness and Kurtosis of weekly stock returns, Exc(Skew) and Exc(Kurt) are based on the residuals of a local market-model regression, Down (Up) is the fraction of returns two standard deviations below (above) the previous year's average, Down Risk is the variance computed from weekly below-average returns in a given year, and Vol is the standard deviation of weekly returns. The explanatory variables are: Supply is lending supply relative to market cap, Fee is the annualized loan fee, ADR/GDR is a dummy for whether the firm cross-lists in the US or the UK, Market Cap is market capitalization, Zero-return weeks, Turnover is total turnover, and Bid-Ask is the closing spread scaled by price. Regressions include country and year dummies and we only report coefficients for lending supply, loan fees and the OECD membership dummy. Standard errors are double clustered at the firm and year levels as in Thompson (2009). We report p-values of two F-tests for the parameters for lending supply and loan fee: $\beta_i + D_{OECD} * \beta_i = 0$, and $\beta_i = D_{OECD} * \beta_i = 0$. Standard deviations are reported in brackets, and the significance levels are as follows: **=significant at the 10% percent level; *=significant at the 5% percent level; += 1% level.

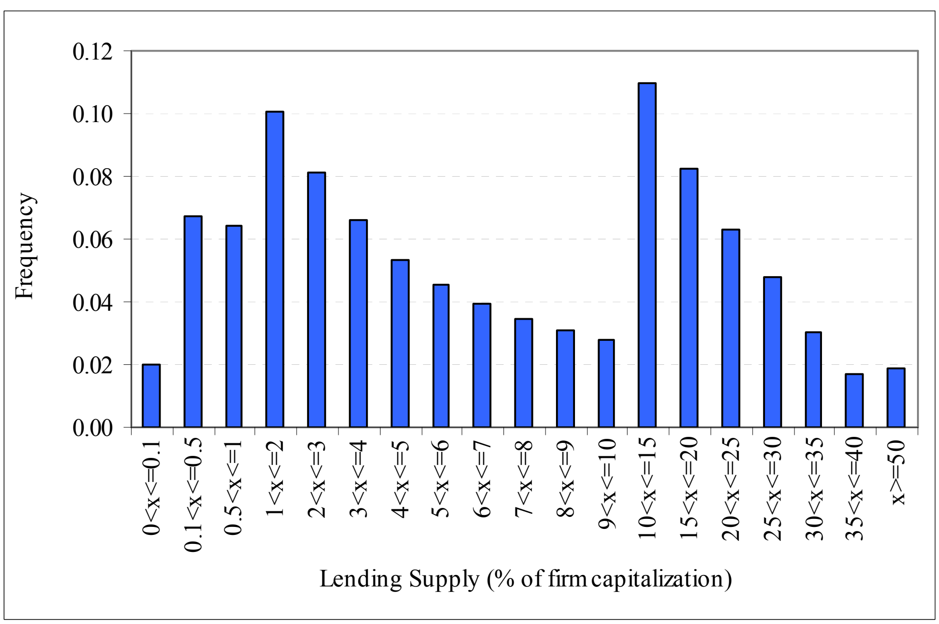
	Panel A: Price Efficiency				Panel B: Return Distribution Characteristics							
	ρ^{Cross}	$\|VR\|$	D1	D2	Skew	Exc(Skew)	Kurt	Exc(Kurt)	Down	Up	Down Risk	Vol
D_{OECD}	-0.005	0.024	-0.057	-0.086	0.056	0.040	0.108	0.127	0.089	0.063	-0.126	-0.156
	[0.113]	[0.064]	[0.135]	[0.141]	[0.099]	[0.075]	[0.052]*	[0.054]*	[0.145]	[0.080]	[0.046]$^{+}$	[0.055]$^{+}$
Supply	-0.123	0.027	-0.055	-0.015	-0.029	-0.051	-0.099	-0.110	-0.022	-0.037	-0.048	-0.049
	[0.017]$^{+}$	[0.017]	[0.031]**	[0.035]	[0.007]$^{+}$	[0.020]$^{+}$	[0.009]$^{+}$	[0.017]$^{+}$	[0.055]	[0.052]	[0.029]	[0.039]
$D_{OECD} * Supply$	0.026	-0.096	-0.046	-0.076	-0.034	-0.051	0.032	0.088	0.022	-0.010	0.032	0.008
	[0.054]	[0.011]$^{+}$	[0.045]	[0.028]$^{+}$	[0.024]	[0.027]**	[0.017]**	[0.017]$^{+}$	[0.074]	[0.052]	[0.030]	[0.038]
Fee	-0.006	-0.042	-0.030	-0.040	-0.031	-0.025	-0.039	-0.039	-0.087	-0.066	0.014	0.019
	[0.020]	[0.020]*	[0.014]*	[0.030]	[0.041]	[0.046]	[0.023]**	[0.030]	[0.016]$^{+}$	[0.048]	[0.018]	[0.034]
$D_{OECD} * Fee$	0.023	0.060	0.033	0.019	0.054	0.042	0.056	0.060	0.049	0.066	0.105	0.149
	[0.041]	[0.019]$^{+}$	[0.014]*	[0.034]	[0.046]	[0.051]	[0.020]$^{+}$	[0.030]*	[0.030]	[0.050]	[0.015]$^{+}$	[0.021]$^{+}$
Obs.	19,071	19,071	19,071	19,071	19,071	19,071	19,071	19,071	18,699	18,699	19,071	19071
Firms	7,740	7,740	7,740	7,740	7,740	7,740	7,740	7,740	7,740	7,740	7,740	7740
R^2	0.08	0.02	0.26	0.07	0.01	0.01	0.04	0.03	0.02	0.01	0.22	0.31
Test: Sum(Supply)=0	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.99	0.00	0.06	0.00
Test: All Supply=0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.06	0.01
Test: Sum(Fee)=0	0.42	0.00	0.72	0.00	0.01	0.02	0.02	0.00	0.01	0.92	0.00	0.00
Test: All Fee=0	0.28	0.00	0.05	0.00	0.04	0.03	0.00	0.00	0.00	0.34	0.00	0.00

Figure 1. Equity Lending Market Database Coverage



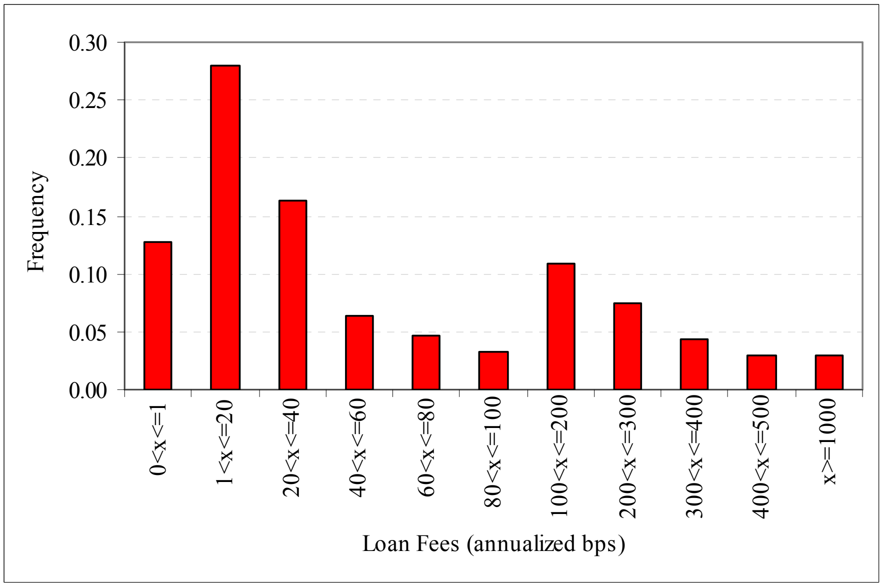
shows the aggregate figures of the global equity lending market from January 2004 to December 2008. The right axis represents the number of different stocks and the left axis the total lending supply (Supply) and the total value of shares on loan (On Loan) in billions of US dollars.

Figure 2. Distribution of Lending Supply (% of Firm Capitalization)



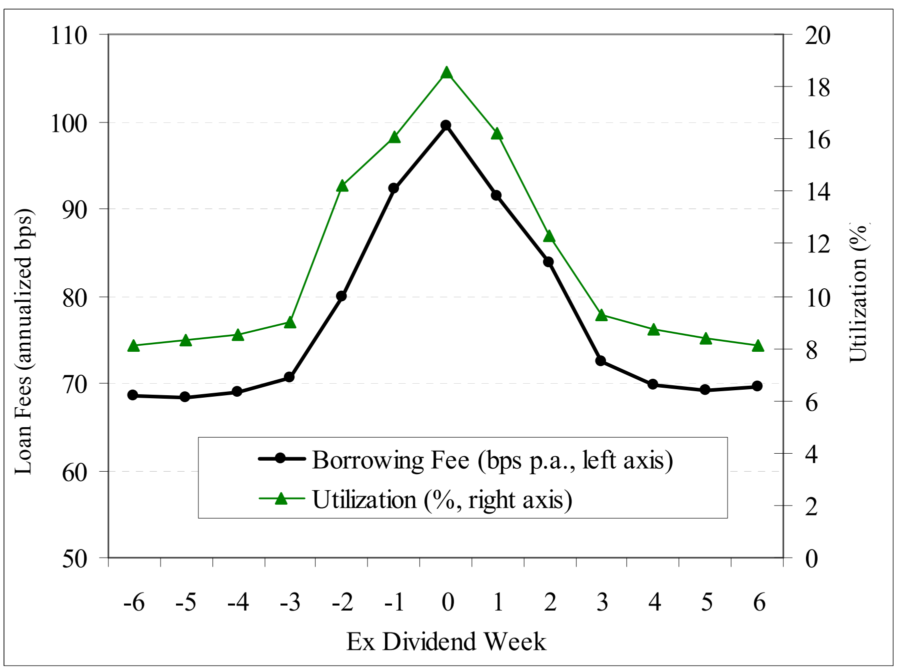
The figure shows the distribution of supply as a percentage of firm size between January 2004 and December 2008. The vertical axis contains the frequency of firms with average weekly lending supply in each interval displayed in the horizontal axis.

Figure 3. Distribution of Loan Fees



This figure shows the distribution of the average weekly value-weighted loan fees in basis points per year between January 2004 and December 2008. The vertical axis contains the frequency of firms with loan fees in the interval reported in the horizontal axis.

Figure 4. Loan Fees and Loan Utilization around Dividend Payments



This figure shows loan fees and lending volume around dividend payments. Between January 2004 and December 2008 we compute the average loan fee and lending utilization for each firm during a six-week period around the ex-dividend dates. Information on firms and ex-dividend dates are taken from Datastream.