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The Twilight Zone: OTC Regulatory Regimes and Market Quality

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Abstract

We analyze a comprehensive sample of more than 10,000 U.S. OTC stocks. We provide much needed descriptive evidence on this market and show that the OTC market is a large, diverse, and dynamic trading environment with a rich set of regulatory and disclosure regimes, comprising venue rules and state laws beyond SEC regulation. We also exploit the institutional richness of the OTC market and analyze two key dimensions of market quality, liquidity and crash risk, across firms and regulatory regimes. We find that OTC firms that are subject to stricter regulatory regimes and disclosure requirements have higher market quality (higher liquidity and lower crash risk). Our analysis points to an important trade-off in regulating the OTC market and protecting investors: Lowering regulatory requirements (e.g., for disclosure) reduces the compliance burden for smaller firms, but it also reduces market quality.

JEL classification: G14, G15, G30, K22, M41, M48

Key Words: *Securities Regulation, Disclosure, Liquidity, Crash Risk, Blue Sky Laws, Pink Sheets, Bulletin Board, JOBS Act*

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1. Introduction

Aside from its highly regulated traditional exchanges, the U.S. has a large OTC market offering less investor protection, in which over 8,000 domestic stocks were publicly traded in 2010. For over 4,500 of these stocks, the issuer was not an SEC registrant required to provide regular disclosure filings. OTC firms exempt from federal securities laws are often referred to as "dark." However, these firms are subject to state corporate and state securities laws as well as trading venue rules requiring disclosures. Thus, it is more accurate to characterize the OTC market as a "twilight zone" with many different regulatory regimes. At present, there is little research on this market. This study sheds light on this multi-faceted market, its regimes and their effects on market quality.

A core objective of regulation in securities markets is to ensure market integrity and investor protection (e.g., Goshen and Parchomovsky, 2006; Mahoney, 2009). In pursuing this objective, regulators often impose disclosure requirements on firms. However, regulators face a trade-off between their desire to create a viable market with low disclosure burdens for small firms and their charter to ensure market integrity and to protect investors. This trade-off is particularly pertinent in the OTC market, being populated by small firms, and also featured prominently in the discussion about the 2012 JOBS Act.[1] This Act intended to lower the regulatory burden on small growth firms to improve their access to public capital markets and secondary market liquidity. One of its key provisions provides more generous exemptions for SEC registration. The result is that more firms can sell their securities to the public, yet remain outside of the protections of SEC registration and disclosure requirements. It is therefore important to study other regulatory regimes beyond SEC registration as well as the role of SEC disclosure requirements in the OTC market.

[1] See, e.g., Coates' (2011) testimony before the Senate Subcommittee. There has also been substantial debate about the regulatory burden facing smaller firms after the 2002 Sarbanes-Oxley Act (see Coates and Srinivasan, 2014).

Thus, we pursue two distinct goals with this paper. First, we provide much needed descriptive evidence on the broad cross-section of firms trading in different OTC market venues, for instance, with respect to entry, survival, venue changes, reporting status and trading activity. To this end, we compile and examine a comprehensive sample of stocks trading in the venues that comprise the OTC market. Second, we analyze the effect of OTC regulatory regimes on market quality. We focus on two key aspects of market quality: liquidity and crash risk, which are both closely linked to the aforementioned objective of securities regulation. Concerns about market integrity could result in lower investor participation and impair liquidity (e.g., Guiso et al., 2008). Yet, liquidity provision is a primary purpose of securities markets. Similarly, opacity and market manipulation can increase risks to investors, e.g., by making stocks more prone to crashes (Jin and Myers, 2006), which could hurt trust in the market's integrity and, in turn, lower investor participation.

The OTC market had three trading venues during our sample period: the Bulletin Board, the Pink Sheets and the Grey Market. Bulletin Board firms had to file with the SEC since the Eligibility Rule in 1999. The other venues did not require SEC registration. However, until the JOBS Act, any publicly traded firm with more than $10 million in assets and more than 500 record holders had to file with the SEC.[2] Thus, firms trading in the Pink Sheets or the Grey Market may be SEC filers that have to provide regular disclosure. For SEC registrants, federal law preempts state securities regulation and hence sets the relevant rules. For non-registrants, state securities laws (also called "blue sky" laws) require registration, which in most states amounts to a "merit review" of the issuer. State securities laws apply at the trade level, i.e., in every state where a firm sells securities to the public, as well as in the issuer's home state. There is little research on the capital-

[2] Rule 12g5-1, Securities and Exchange Act of 1934. Note that record holders are not beneficial shareholders. Many shares are held in street name by financial institutions, in which case the latter is the holder of record.

market effects of state securities regulation.[3]

An important way in which firms can comply with state securities laws is to use the so-called "manual exemption." In 41 states and the District of Columbia, issuers are exempt from registration and "blue-sky compliant" if they appear in a nationally recognized securities manual. The providers of such manuals (e.g., Mergent, Standard & Poor's) perform a basic review of documents supplied by issuers, e.g., examine business description, corporate history and financial statements. Manuals are published annually but frequent updates are available via print media and email. We are not aware of any research on the effects of securities manual coverage on market quality.

In addition to federal and state regulation, there are venue-based regimes. Aside from the Eligibility Rule for the Bulletin Board, the Pink Sheets market operator (now called OTC Markets Group) introduced several tiers and information labels in 2007, differentiating firms for which current, limited and no information is available. It also created a "Caveat Emptor" label to flag firms with public interest or fraud concerns. All tier designations and labels are monitored by the OTC Markets Group and revised as firms' information status changes. Again, there is limited research on venue-based disclosure regimes (e.g., Bushee and Leuz, 2005; Jiang et al., 2015).

Our sample consists of 10,583 domestic firms that trade in the OTC market between 2001 and 2010 and are incorporated in the U.S., mostly in Delaware, Nevada, and Florida. The OTC market consists primarily of micro-cap stocks spanning a broad set of industries. The average market value is about $52 million, but it is skewed by a few large firms with a capitalization exceeding $1 billion. Most firms have a market value below $20 million. The median share price is $1.01 consistent with OTC firms being called "penny stocks." About 17% of the sample firms enter the OTC market

[3] An exception is Agrawal (2013) who analyzes investor protection and corporate policy around the introduction of state securities regulation, which predates the SEC regime. State regulators have been protecting investors from fraud and abusive sales practices since the first "blue sky" law in Kansas in 1911 (e.g., Macey and Miller, 1991).

because they delist from the traditional exchanges ("fallen angels"). In addition, over 3,400 "new" firms appear in the OTC market between 2001 and 2010 without a prior exchange listing. The latter finding is striking in light of the recent dearth of U.S. IPOs (e.g., Gao et al., 2013; Doidge et al., 2015). However, less than 9% of the new OTC firms eventually trade up to the exchanges during our sample period.[4] Hence, our analysis shows that the OTC market is not a breeding ground for growth firms that eventually graduate to the traditional exchanges. At the same time, most OTC stocks survive for long periods, even those delisted from the exchanges. The five-year survival rate is between 60% and 90%, and the median firm is quoted for 8.75 years. Thus, the OTC market is more than an interim home for firms that are on their way out of the public markets.

The stock return over the sample period is negative for a majority of OTC firms. At the same time, average monthly volatility is more than twice as high as the volatility of NASDAQ Small Cap stocks. In addition, a substantial fraction of OTC stocks exhibit episodes of extreme returns over the sample period (e.g., returns above 100% or below -95%). These findings are consistent with Ang et al. (2013) and Eraker and Ready (2015). In general, trading activity is much lower than on the traditional exchanges. On average, the proportion of trading days is 40% across all firm-months in the OTC market and, on days with trading, the average daily volume is only around $37,000. But, as with other characteristics, there is substantial heterogeneity in the cross-section. For example, about 10% of OTC stocks trade almost every day, while a quarter of them have zero volume on 95% of trading days.

After this characterization of the OTC market, we analyze how OTC regulatory regimes relate to market liquidity and crash risk, both in the cross-section and around regime changes. An

[4] One of these firms is NASDAQ, which traded on the Bulletin Board between 2002 and 2005. We describe the NASDAQ case along with various other examples in Appendix 2. Trading up to the exchanges is most common for banks, pharmaceuticals, biotech & health care firms, and oil & gas producers.

extensive body of theory relates market liquidity to information asymmetry and adverse selection in stock markets (e.g., Copeland and Galai, 1983; Glosten and Milgrom, 1985; Kyle, 1985; Easley and O'Hara, 1987; Admati and Pfleiderer, 1988; Diamond and Verrecchia, 1991). Similarly, information asymmetry between insiders and outsiders coupled with opacity about firm fundamentals is linked to negatively skewed returns and crash risk (Jin and Myers, 2006; Hutton et al., 2009).[5] Based on these theories, we expect regulatory regimes that enhance disclosure and hence reduce information asymmetries to increase liquidity and reduce crash risk.

We use principal component analysis to construct proxies for liquidity and crash risk based on two variables for each measure. As input variables for our liquidity proxy, we use the proportion of zero-return days and share turnover. For crash risk, we follow Chen et al. (2001) and Hutton et al. (2009) by using the negative skewness of returns and a binary indicator that captures a decline in the stock price of 95% or more. To validate these proxies, we provide evidence that our liquidity proxy is highly correlated with other commonly used liquidity measures, and that our crash risk proxy increases when firms are subject to pump-and-dump schemes.

Starting with trading venue regressions, we find lower market liquidity and higher crash risk in the OTC market than on the traditional exchanges. Moreover, both market quality proxies change monotonically when moving from the Bulletin Board to the Pink Sheets to the Grey Market. The decline in liquidity and increase in crash risk are consistent with a ranking of these venues in terms of their regulatory strictness and disclosure requirements. Next, we show that OTC firms that have to file 10-Ks and 10-Qs with the SEC have higher market liquidity and lower crash risk. These results hold with firm fixed effects and, additionally, propensity matched SEC and non-SEC filers.

[5] Other mechanisms, such as short-sale constraints, can independently or in conjunction with opacity about fundamentals contribute to negative skewness and crash risk (e.g., Hong and Stein, 2003). See also Campbell and Hentschel (1992) and Kirschenheiter and Melumad (2002).

Similarly, OTC firms that are covered in Mergent's or Standard & Poor's securities manuals exhibit higher liquidity and lower crash risk, though the latter relation is not robust to firm fixed effects. At a minimum, the results show that investors recognize differences in the information regimes across OTC stocks and trading venues. As the assignment of firms to OTC regimes can depend on firm choices, we exploit venue transitions, ticker changes tied to changes in SEC filing status, and differential regulatory oversight for financial institutions to provide evidence that the results are likely attributable to the trading venues, required SEC disclosures and manual inclusion, rather than endogeneity stemming from selection, changes in firm fundamentals or reverse causality.

Next, we analyze the effects of differences in states' blue sky laws. As state securities laws generally rely on merit reviews by state regulators, the mechanism by which they affect markets is less clear than in the case of federal securities laws, which are based on a disclosure doctrine. Firms' registration filings with the state regulators are generally not easily accessible. Hence, the information contained in these filings is unlikely to directly contribute to an increase in market liquidity or a decrease in opacity-induced crash risk. However, merit reviews by state securities regulators could have an indirect effect on market quality, e.g., by encouraging firms to satisfy blue sky laws via the manual exemption and hence manual disclosure or by screening out firms for which concerns about adverse selection and investor protection are more severe. Consistent with this notion, we find that market liquidity is higher for firms located in states with tougher merit review regimes. The results for crash risk, however, are statistically and economically insignificant. To increase our confidence that the liquidity results are indeed related to differences in state securities regulation, we show that the results are stronger in states that do not allow manual publication to substitute for state registration and merit review. We also exploit changes in firms' headquarters and show that the results continue to hold with firm fixed effects.

Turning to venue-based regulation in the Pink Sheets, we analyze whether firms in better information tiers exhibit higher market liquidity and lower crash risk, as our earlier discussion of theory would predict. Using firm fixed effects, we find that market liquidity (crash risk) increases (decreases) monotonically from the lowest to the highest Pink Sheets tier. The Caveat Emptor label for stocks with investor protection concerns is associated with lower liquidity and higher crash risk. To further tighten identification, we again exploit differential regulatory oversight for financial and non-financial firms, and find that the results are present only for the less regulated non-financials. This is consistent with the results being attributable to the Pink Sheets information tiers. Furthermore, we exploit four regulatory changes in the Pink Sheets in order to perform a within-firm, difference-in-differences analysis relative to the Bulletin Board. We show that market liquidity (crash risk) increases (decreases) as the regulatory regime in the Pink Sheets becomes stricter. Following the implementation of these regulatory changes, market quality in the Pink Sheets has essentially caught up with that in the Bulletin Board.

Our paper makes several contributions to the literature. First, our study paints the most complete picture of the U.S. OTC market to date. We create a novel dataset that allows us to make distinctions within the OTC market in terms of trading venue, reporting status and regulatory regimes. We provide extensive descriptive statistics on industry, location, state of incorporation, market entry, survival, trading venue changes, and trading activity. Such descriptive evidence is important considering how little is known about this market and its regulatory regimes.

Second, we examine federal-, state-, and venue-specific regulatory regimes in the OTC market and provide evidence on the link between these regimes and market quality. The OTC market is often viewed as unregulated and populated by dark firms when in fact it is a thicket of regulatory regimes. We exploit this institutional richness to show that market quality increases with stricter

disclosure regulation and regulatory oversight. As such, our analysis points to an important trade-off in regulating the OTC market and protecting investors: While lowering regulatory requirements (e.g., for disclosure) reduces the compliance burden for smaller firms, it also significantly reduces market liquidity and increases crash risk for investors.

Two important papers, Ang et al. (2013) and Eraker and Ready (2015), also examine the OTC market. Their analyses focus on asset pricing, stock returns, and investor preferences.[6] Our study complements these studies by focusing on market quality and its link to previously unavailable trading venue and regulatory distinctions for a much broader cross-section of firms. We provide a novel crash risk analysis. Moreover, our liquidity analysis contributes to a more nuanced understanding of investor behavior in the OTC market suggesting that investors recognize regulatory and information differences across regimes and trade (or abstain) accordingly.

Our paper is also related to the international literature on legal institutions, investor protection and equity market development, starting with La Porta et al. (1997, 1998). Work in this literature demonstrates that disclosure requirements exhibit significant associations with other institutional factors (e.g., investor protection, rule of law) and with various market outcomes (e.g., cost of capital, size of the equity market, IPO activity, and market liquidity).[7] However, the focus is on countries' main equity markets, which have extensive disclosure requirements and are populated by much larger firms than those in our sample. Our findings from a much more opaque market are therefore of relevance to the regulatory regimes of countries' markets for younger firms.

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[6] There are a few other OTC market studies (Luft et al., 2001; Luft and Levine, 2004; Bushee and Leuz, 2005; Marosi and Massoud, 2007; Leuz et al., 2008; Bollen and Christie, 2009; Jiang et al., 2015). These studies have specific or smaller OTC samples, cover specific events and/or do not make venue and reporting status distinctions.

[7] See e.g., Hail and Leuz (2006), La Porta et al. (2006), Lang et al. (2012). See also Karolyi (2015) for an overview. As these studies rely mostly on cross-country variation, the identification of particular institutional factors (e.g., the disclosure regime) is limited, and our results could not be inferred from these papers.

Lastly, we provide novel evidence on institutions in the OTC market, including state merit reviews, manual exemptions, manual publications as well as Pink Sheets information tiers. Very little is known about these institutions, yet they govern trading for several thousand U.S. publicly traded stocks that are not covered by federal securities laws at some point during our sample period.

2. Regulatory regimes in the OTC market

In this section, we introduce the regulatory regimes for securities trading in the OTC market during our sample period (see Figure 1 and Appendix 1 for further institutional details).

2.1 OTC trading venues: Bulletin Board, Pink Sheets and Grey Market

The Penny Stock Act of 1990 mandated that the SEC create an electronic system for the OTC market that displays quotes and last-sale information. The Bulletin Board (BB) opened in June 1990 and is currently operated and regulated by FINRA. It is an electronic quotation system that transmits real-time dealer quotes, trade prices and volume information to subscribing FINRA market makers. The BB does not have minimum size or corporate governance requirements. A series of changes were made to the BB during the 1990s, culminating in the 1999 Eligibility Rule (Bushee and Leuz, 2005). This rule states that issuers of securities traded on the BB have to file financial information with the SEC or other regulatory authorities for banking or insurance. Therefore, all our BB firms are expected to provide disclosures to the SEC or other regulators.

The second venue in the OTC market is widely known as the Pink Sheets, which are operated by the OTC Markets Group.[8] The Pink Sheets compete with the BB by providing an electronic real-time quotation and execution system for all OTC securities. In addition to firms that do not file

[8] The market was first established in 1913 as the National Quotation Bureau (NQB). For decades, the NQB reported stock quotations via the paper-based Pink Sheets. The NQB changed its name to Pink Sheets LLC in 2000, to Pink OTC Markets in 2008, and adopted its current name, OTC Markets Group, in 2010. We use the term "Pink Sheets" as the market went by this name for most of our sample period and "Pink" is still used for one market segment.

with the SEC and hence cannot be quoted on the BB due to the Eligibility Rule, virtually all BB securities are also quoted and traded on the OTC Markets Group's platform.[9] For this reason, OTC securities in the two venues essentially have the same trading mechanism.

In August 2007, the Pink Sheets introduced a tier system to indicate the levels of financial disclosure for companies quoted on its platform. This system was revised in 2010. It distinguishes OTCQB and OTCQX firms, which are subject to SEC or equivalent regulatory reporting requirements (and more), from OTC Pink firms, which have no SEC or equivalent reporting requirements. Firms in the latter category are further divided into three tiers, Pink Current, Pink Limited and Pink No Information, based on the level and timeliness of the information they provide to investors (see Appendix 1.1 for more details). The Pink Sheets also apply a Caveat Emptor label and block quotes on its website when there are investor protection concerns about a company.

Finally, the Grey Market contains firms that are not quoted in any market, i.e., no bid and ask prices are available. Trades in Grey Market stocks are made by broker-dealers and reported to their Self-Regulatory Organization (SRO), and the SRO in turn distributes this information.

2.2 Rules for quoting and trading OTC securities

In order to quote and trade non-reporting OTC securities, broker-dealers have to rely on Rule 15c2-11 of the 1934 Exchange Act. This rule prescribes information review and maintenance requirements for broker-dealer firms that publish quotations. Specifically, the rule prohibits a broker-dealer from quoting unless it has obtained and reviewed current information about the issuer that the broker-dealer believes is accurate and obtained from a reliable source.

Such information can be a prospectus for a SEC registered security; an offering circular, the most recent annual report as well as any quarterly report that has been filed after the annual report.

[9] By October 2010, our dataset contains only eight BB securities that are not also quoted in the Pink Sheets.

Moreover, the broker-dealer shall keep this information "reasonably" current, and make this information "reasonably" available to a potential investor upon request. A broker-dealer may initiate or resume quotations for an OTC security by filing Form 211 with FINRA.[10] Rule 15c2-11 also includes a piggy-back exemption stating that a broker-dealer may begin quoting a security without filing Form 211, provided another dealer has been publishing quotations for the security with some frequency over the last 30 days. Hence, only one broker-dealer needs to file Form 211 for a particular security. Importantly, as broker-dealers can subsequently piggy-back on their own quotations, non-reporting OTC firms do not have to provide regular disclosures to broker-dealers.

2.3 Further OTC market regulation: State registration and manual exemption

The Securities Act of 1933 requires that securities offered or sold to the public in the U.S. are registered with the SEC. In addition, the Exchange Act of 1934 requires the firm to file reports with the SEC on a continuing basis unless the firm falls below certain size and ownership thresholds.[11] Issuers can avoid registering securities with the SEC by issuing securities under one of several exemptions for limited circulation offerings.[12] As long as an issuer using one of these exemptions does not surpass the Exchange Act size and ownership thresholds, it does not have to file reports with the SEC. These firms nevertheless face state laws and venue-based rules on examinations of issuers, financial reporting and secondary trading. This section briefly describes state securities laws (also called blue sky laws). Appendix 1.2 provides further details.

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[10] The form certifies that the broker-dealer has satisfied all applicable requirements of SEC Rule 15c2-11 and the filing and information requirements of NASD Rule 6640. Rule 15c2-11 also contains an exception for quotations representing a customer's unsolicited orders or indications of interest, provided there are adequate records.

[11] A firm is exempt from SEC registration if it has fewer than 300 shareholders of record, or it has fewer than 500 shareholders of record and less than $10 million in total assets for each of its last three fiscal years. The JOBS Act of 2012, which became effective after our sample period, raises the threshold to 2000 record holders and excludes employees and investors that obtain shares via crowd-funding from the definition.

[12] Examples are Rule 144A; Regulation S; the intrastate offering exemption (Section 3(a)(11)); Regulation A (Section 3(b)); Regulation D (Rule 504, 505, and 506) and the accredited investor exemption.

State securities laws require registration of offers, sales of securities and of brokers and investment advisors. Most states also assign liability for securities fraud. Historically, states examined applications for registration, i.e., conducted merit reviews, to determine whether or not to allow securities to be sold in the state. However, federal regulation exempts so called "federally covered securities," i.e., stocks of SEC registrants that are listed on national exchanges, from merit reviews. As a result, merit reviews apply primarily to non-reporting OTC firms' securities.

To register with the state, applicants have to provide information to the state regulator similar to what is required for registration under the 1933 Act. State securities registrations are usually valid for one year only, and many states require the issuer to update the offering information (prospectus including financial statements) periodically. However, while the information filed with the state securities regulator is used in the merit review, it is typically not made publicly available in the way SEC filings are made available on EDGAR.[13] Anecdotal evidence suggests that it is difficult to obtain registration filings even by visiting the state securities regulators' offices in person. In fact, less than half the states require that investors be furnished with a prospectus; even fewer jurisdictions specify that the distributed prospectus should include recent financial statements.

As long as the state securities registration is effective, secondary trading of the security is allowed, provided the trades involve only residents of states where the security is registered. In other words, if a trade involves investors from two states, the security has to be registered in *both* states for the trade to be legal. In addition, issuers are typically required to register in the state of their headquarters (home-state registration). Issuers have to renew their state securities registration(s) on a regular basis for secondary trading to continue.

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[13] In addition, state corporation laws can require firms to provide financial statements to its owners on a regular basis or upon request. However, these laws apply at the level of the record holder and hence, to our understanding, do not lead to disclosure to beneficial owners or prospective shareholders. See Appendix 1.3 for more details.

The requirement to maintain effective registrations in multiple states is a cumbersome way to support secondary trading. Thus, issuers may seek to qualify for one of the exemptions to state securities registration (see Appendix 1.2). Perhaps the most effective way for a firm to obtain an exemption from registering its securities in each state where investors may reside is to be included in a nationally recognized securities manual (Manual Exemption). The firm furnishes the providers of manuals with information and pays an initial and maintenance listing fee. In turn, the providers of manuals perform a basic review of a company's business and its financial statements, and publish this information in a standardized form. The two most prominent manuals are Mergent's (previously Moody's) Manual and Standard & Poor's Corporation Records. 42 jurisdictions explicitly recognize these two manuals when granting exemption from state securities registration.

2.4 OTC regulatory regimes and firm choice

Before turning to our empirical analysis, it is important to discuss the role of firm choice. We begin by highlighting that OTC firms do not necessarily choose their regulatory regime and/or trading venue. For instance, SEC reporting is mandatory and determined by firm size and number of record holders. OTC market makers, not the firm, choose the trading venue in which the stock is quoted. The tiers and labels in the Pink Sheets are determined and assigned by the OTC Markets Group. The fact that in many cases the assignment to a regulatory regime is determined not by the firm but by external parties mitigates concerns about selection on firm fundamentals. But firm choices can still influence or determine the applicability of certain regulatory regimes. For instance, a firm that does not file with the SEC cannot be quoted on the OTC Bulletin Board. The state of

headquarters matters for home state registration under the blue sky laws. Inclusion in a manual is a firm's decision.[14]

Thus, our analysis of the link between the various OTC regulatory regimes and market quality faces a number of identification challenges, as most regulatory analyses do. We recognize these challenges and, in response, provide additional tests for each regulatory regime that considerably tighten identification. We acknowledge, however, that it is difficult to estimate the causal effects of the regimes and that the results need to be interpreted cautiously.

3. Data and sample

Our sample is based on two data sources: a proprietary dataset provided by NASDAQ and Datastream. The NASDAQ dataset includes the venue history of all equity securities that traded in the OTC market or the NASDAQ Small Cap Market (SCM) at some point during the period January 2001 through October 2010.[15] Datastream provides capital market data (e.g., stock prices and returns, market values, trading volume) and industry information for a large set of equity securities around the world.[16] We match the NASDAQ venue history and Datastream via the security identifier CUSIP and/or the company name, resulting in an initial sample of 16,965 firms. We eliminate firms that are incorporated outside the United States or file Form 20-F with the SEC as different regulations may apply. Furthermore, we exclude REITs and firms whose securities are very rarely traded (see Table 1, Panel A, for details). Our final sample consists of 10,803 firms.

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[14] The choice between regulatory regimes has been modeled in Shleifer and Wolfenzon (2002) and Doidge et al. (2004), albeit in a different context. The basic idea is that stricter securities regulation and disclosure requirements reassure outsiders by providing a form of bonding, which makes it easier for firms to raise external finance. But not all firms opt for such bonding because stricter regulation also reduces the private benefits to insiders. Thus, firms with fewer growth opportunities and lower external financing needs might prefer to stay more opaque.

[15] The NASDAQ dataset comprises the full venue history of each security it covers. This feature enables us to identify firms that trade up to ("rising stars") or down from ("fallen angels") the traditional exchanges.

[16] Datastream also offers information on trading venues. However, the item is static and, thus, does not allow us to identify a venue history, including potential switches between venues.

Since the NASDAQ venue history distinguishes only between the Bulletin Board (BB) and all other segments (NBB) within the OTC market, we collect information on specific OTC segments using two additional proprietary datasets provided by the OTC Markets Group. The first dataset (PS venue history) allows us to identify firms that are dually quoted on the BB and Pink Sheets and to distinguish Grey Market and Pink Sheets firms within the NBB. However, the PS venue history covers a shorter period (February 2003 to October 2010) and includes fewer firms during this period than the NASDAQ venue history (about 60% of BB/NBB). The second dataset (PS tier history) enables us to disaggregate the NBB into several information tiers (Pink Current Information, Pink Limited Information and Pink No Information) and to identify firms flagged as Caveat Emptor. The PS tier history also covers a shorter time period (October 2007 to October 2010) and includes only a subset of firms in the NASDAQ venue history (about 50% of NBB).

We use directEDGAR to retrieve 10-K and 10-Q filings by our sample firms during the sample period in order to develop a precise SEC filing history for each firm. We also use directEDGAR to identify the state of headquarters (SoHqt) and the state of incorporation (SoInc) for SEC filers. For non-filing firms, we gather SoHqt/SoInc details from a proprietary NASDAQ dataset that includes issuer profiles for most of the firms in our sample. For non-filing firms that are not covered by the NASDAQ issuer profiles, we attempt to gather SoHqt/SoInc information manually (e.g., from the website of the OTC Markets Group).[17] Finally, we use Mergent's Manuals (yearly company lists from 2001 to 2010) as well as Standard & Poor's Corporation Records (half-yearly company lists from 2003 to 2010) to identify firms that are covered in the two key securities manuals.

[17] We were not able to identify SoHqt (SoInc) information through directEDGAR, the NASDAQ issuer profiles or manual collection for 374 or 3.5% (254 or 2.4%) of our sample firms.

Our data collection process results in a dataset that comprises 955,716 firm-month observations over the period January 2001 through October 2010.[18]

4. Descriptive analysis

4.1. Sample groups

Table 1, Panel B, classifies our sample into various groups with similar venue histories. 10,583 firms trade in the OTC market at some point. The remaining 220 firms trade in NASDAQ's small cap segment throughout; they serve as a benchmark (*NASDAQ SCM*). The vast majority (77%) of the OTC sample firms remain in the OTC market throughout, either from January 2001 onwards (*In OTC only (start in 2001)*: 5,016 firms) or as new firms that enter the sample after January 2001 (*New firms (remain in OTC)*: 3,134 firms). 1,787 firms (17%) trade down from the traditional exchanges to the OTC market (*Fallen angels (from exchange)*). Only 646 firms (6%) trade up from the OTC market to the traditional exchanges (*Rising stars (start in 2001)*: 370 firms; *Rising stars (new firms)*: 276 firms). Untabulated statistics show that the number of "new" firms that enter the OTC market each year without any prior listing is between 300 and 500 for most of the sample period, declining to about 100 after the financial crisis in 2008. This evidence on new firms is in contrast to the drop in IPOs on traditional U.S. exchanges starting in the early 2000s (e.g., Gao et al., 2013; Doidge et al., 2015).

Table 1, Panel C, shows that 78% of the OTC sample (8,307 of 10,583 firms) files 10-Ks and 10-Qs with the SEC at some point during the sample period. The column *Fraction SEC filing while in OTC* shows that, while many *Fallen angels* tend to stop filing with the SEC after trading down to the OTC market (fraction of SEC filings: 43%), the vast majority of *Rising stars* already register

[18] However, most of the analyses are based on fewer observations due to missing information or sample filters. We truncate all capital market variables at the top and bottom 1% unless the variable is naturally bounded or logged.

with the SEC before trading up to the exchange (fraction SEC filing: more than 85%). Half of the OTC sample (5,246 firms) is included in securities manuals in at least one year. While in the OTC, *Fallen angels* appear in securities manuals relatively more often than any other sample group. Only 2,126 firms (20%) are completely dark over the entire sample period, i.e., they never file with the SEC and never appear in the two securities manuals. Since trading venues outside the NBB require SEC filings, firms that are classified as *Rising stars* or *Fallen angels* cannot be completely dark.

In the Internet Appendix, we break down each sample group by industry, state of headquarters and state of incorporation (see section IA.1). Financial firms represent the largest group (3,242 firms or 31% of the OTC sample). Firms from industries that face high fundamental uncertainty (e.g., information technology) are relatively frequent in the *Rising stars* and *Fallen angels* groups. While almost 60% of the OTC firms are incorporated in Delaware or Nevada, their headquarters tend to cluster in larger states (e.g., California, Florida, New York and Texas). In fact, 74% of the OTC firms choose to incorporate in a state that is different from their state of headquarters.

In Appendix 2, we provide an example of a typical firm in each of the OTC sample groups, giving details on its main business, corporate evolution, trading and reporting history.

4.2. Survival statistics and trading venue transitions

Table 2 presents descriptive statistics on firm entries to and exits from the OTC market and our sample (Panel A), venue transitions (Panel B) and stock price crashes (Panel C). Panel A shows that 66% (71%) of the OTC firms are part of the sample at the beginning (end) of the sample period in January 2001 (October 2010). This means that 34% of the OTC firms enter the sample later, either as new firms or fallen angles, while 29% are removed from the OTC market prior to the end of the sample period. As expected, the attrition rate is relatively low among new OTC firms. For

example, while only 14% in the *New firms (remain in OTC)* category fail to survive until the end of the sample period, this proportion is more than twice as high (at 34%) in the *In OTC only (start in 2001)* category. The *Fallen angels (from exchange)* category experiences the highest attrition rate (46%), which is not surprising given that these firms often delist from the exchanges due to financial difficulties (see also Harris et al., 2008; Macey et al., 2008).

In Panel B, we track trading venue changes for the sample firms over three different five-year windows starting in June 2001, June 2003 and June 2005, respectively. Very few NBB firms trade up to the BB or the traditional exchanges. For example, of the 3,788 firms on the NBB as of June 2003, only 7% (1%) are trading on the BB (on a traditional exchange) in June 2008; 76% of the firms continue to trade on the NBB, while 15% have been removed from the OTC market. BB firms are also unlikely to trade up. For example, of 2,688 BB firms as of June 2005, only 6% trade on a traditional exchange in June 2010, with 42% still trading on the BB, 36% demoted to the NBB, and 16% having exited the OTC market. Taken together, this evidence suggests that venue changes in the OTC market are not uncommon but typically involve transitions to lower ranked venues.

Panel B shows that over 75% of the OTC firms "survive" for more than five years, in that they continue to be quoted. However, it is possible that firms crash and essentially die, yet continue to trade as shells. To explore this possibility, Panel C tracks the incidence of what we label a *Crash* over the same five-year windows.[19] Firms are flagged as having crashed if they experience (i) a cumulative monthly return of -95% at some point during the five-year window and (ii) subsequently have a stock price below 0.01 USD for at least six months. Depending on the time period, between 12% and 27% of NBB firms experience such a *Crash* in the subsequent five years. The proportion

[19] Panel C analyzes sample firms that are not flagged as having crashed at the beginning of the tracking period. The number of firms in Panel C is therefore lower than in Panel B.

of crashes is slightly lower for BB firms (between 10% and 17%). Thus, even with this stricter definition of survival, the majority of OTC firms survive for more than five years.

4.3. Market-based firm characteristics and trading activity

We present descriptive statistics for a variety of market-based firm characteristics in the Internet Appendix (see section IA.2). The average (median) company in the OTC sample has a market value of about $52 million ($17 million) and a stock price of $6.81 ($1.01). While firms in the *Rising stars* groups tend to be larger (median market cap of more than $100 million), most firms that start and remain in the OTC market have fairly low market values (median of about $7 million). The stock performance of firms in the OTC market is negative on average (over the entire sample period) but varies considerably across sample groups (e.g., *Fallen angels* vs. *Rising stars*). In addition, each sample group contains firms with positive and sometimes extremely high stock returns (see also Figure 3).[20] The volatility of monthly stock returns in the OTC sample is very high (e.g., a median of 37% per month versus 12% for benchmark firms on *NASDAQ SCM*). In summary, OTC firms tend to be small, have low stock prices (consistent with the penny stock label), and lottery-like payoffs, that is, negative average but sometimes extremely positive stock returns, and high return volatility. There is substantial variation in these characteristics, both within and across OTC sample groups.

Section IA.3 in the Internet Appendix provides statistics on trading activity by trading venue. In contrast to the statistics discussed thus far, we perform this analysis at the firm-month level (and not at the firm level). Across all firm-months in the OTC market (i.e., BB and NBB), the mean (median) proportion of trading days is about 40% (29%). On days with trading activity, the mean

[20] The statistics in Table IA.2 are based on firm-level log returns, whereas Figure 3 shows the distribution of discrete returns at the firm-year level.

(median) daily trading volume is about $37,000 ($2,500). There is again considerable variation, with 10% of OTC stocks being traded almost every day and others hardly at all.

4.4. Market quality proxies

To examine how regulatory regimes in the OTC market are related to market quality, we focus on two key characteristics of market quality: liquidity and crash risk. We use two variables to measure each characteristic and then combine them into two summary proxies.

Given the low levels of trading activity in the OTC markets, we use the proportion of zero return days as proposed by Lesmond et al. (1999) and share turnover following Ibbotson et al. (2012) as input variables for the liquidity proxy. The proportion of zero return days is the fraction of trading days in a given month with zero returns. Share turnover is the average number of shares traded per day divided by the average number of shares outstanding in a given month. The liquidity proxy is the first principal component of these two variables, both measured over the current month (t). Higher (less negative) values of this proxy indicate greater market liquidity. In section IA.4 of the Internet Appendix, we validate our liquidity proxy by showing that it is highly correlated with two other liquidity measures that are commonly used in the literature (i.e., price impact and bid-ask spread) but not as frequently available for our sample. We also check that differences in free float do not unduly influence the measurement of share turnover.

For the (future) crash risk proxy, we follow Chen et al. (2001) and Hutton et al. (2009) by using the negative skewness of returns and a dummy variable capturing large negative returns as input variables. The negative skewness of returns is the negative coefficient of skewness, i.e., the negative of the third moment of daily returns divided by the standard deviation of daily returns

raised to the third power. The dummy variable indicates a cumulative return below -95%.[21] The crash risk proxy is the first principal component of these two variables, both measured over rolling three-month windows that include the current month and two subsequent months (t to t+2). Higher values of this proxy imply higher future crash risk. We also validate this proxy by providing evidence that it increases significantly when OTC firms are subject to pump-and-dump schemes (see section IA.4 in the Internet Appendix).

Table 3 reports descriptive statistics on both proxies and their input variables by trading venue. These statistics are computed using pooled data at the firm-month level. Liquidity (crash risk) tends to be higher (lower) in venues with stricter regulatory and disclosure regimes. For instance, the median values of both proxies for the BB are between those for the Grey Market and the NASDAQ Small Cap market. The association between the strength of OTC market regimes and market quality is analyzed in the remainder of the paper.

5. Regression analysis of market quality

5.1. Trading venues

In this section, we use multiple regressions to test whether market quality varies systematically across OTC trading venues. We hypothesize that market quality increases with the strength of the regulatory and disclosure regime of the trading venue. Figure 2 illustrates that the strength of the venue regulation increases as firms move from the Grey Market to traditional exchanges. We therefore expect market quality to be the highest for the traditional stock exchanges and lowest for the Grey Market. Table 4 reports the results. The analyses are based on either the full sample as described in Table 1 (NASDAQ venue history; January 2001 to October 2010) or a subsample

[21] We compute the input variables of the crash risk proxy based on log returns because discrete returns exhibit extreme outliers (see Figure 3). The use of log returns is also consistent with Chen et al. (2001).

based on the PS venue history (February 2003 to October 2010), for which we can separate Pink Sheets and Grey Market firms within the NBB. All regressions are estimated at the firm-month level, and include year-month and either industry or firm fixed effects.

The key variables in these regressions are the trading venue indicators: *Pink Sheets*, *BB*, *SCM* and *Exchange*. The omitted categories capture the least regulated trading venues (NBB firms when using the full sample or firms trading solely on the Grey Market when using the PS venue history). We include lagged *Log(Market value)* and lagged *Return volatility* as control variables in the market liquidity regressions. For the crash risk regressions, we follow Chen et al. (2001) and include lagged *Log(Market value)*, lagged *Return volatility*, lagged *Share turnover* and lagged *Cumulative return* as controls. In addition, all regressions include price-level dummy variables that indicate whether the lagged stock price is below $0.01, $0.10 or $1.00, respectively. The t-statistics in these and all subsequent regression models are based on standard errors clustered by firm.

To address potential concerns about reverse causality, we impose sample filters eliminating observations shortly before trading venue transitions. Specifically, for the liquidity regressions, we exclude the month in which firms change trading venues. For the crash risk regressions, we impose a stricter filter to account for the longer estimation window for the crash risk proxy (i.e., we exclude the month of, and the six months before, venue changes).

Table 4, Panel A, presents the analysis for the liquidity proxy. The estimated coefficients on the trading venue indicators are positive and highly significant in all specifications. Thus, the omitted categories (NBB firms and Grey Market firms, respectively) contain the least liquid stocks. Furthermore, the coefficient estimates increase monotonically as the venues' information regimes become stronger, i.e., they are lowest for *Pink Sheets*, larger for *BB* and largest for *SCM* and *Exchange*. The magnitudes of the coefficients are also economically meaningful. For example, the

coefficient estimates on *BB* in the full sample regressions (0.238 and 0.246) are more than one-third of the standard deviation of the liquidity proxy of 0.689 (not tabulated; Table 3 shows descriptive statistics by trading venue). The results are similar when we include firm instead of industry fixed effects, mitigating concerns about omitted variables and suggesting that unobserved firm-level heterogeneity has a limited effect on the association between trading venue and market liquidity. The coefficients on the control variables are significant and have the expected signs.

Table 4, Panel B, presents the analysis for crash risk. The venue coefficients are again highly significant with the expected signs and relative magnitudes in all specifications. That is, crash risk decreases as the information regime of the trading venue strengthens, after controlling for market value, return volatility, stock performance, and share turnover. As with the liquidity proxy, the coefficient estimates are economically sizeable. For example, even the smallest coefficient estimate on *BB* (-0.096 in the first specification) corresponds to one-fifth of the standard deviation of the crash risk proxy in the full sample (0.493, not tabulated). The results are similar when using firm instead of industry fixed effects, mitigating concerns about omitted time-invariant characteristics. The coefficients on the control variables are broadly consistent with Chen et al. (2001).

To further tighten identification, we study the monthly changes in market quality in a short window from 6 months before through 6 months after the date of a firm's transition from one trading venue to another. As this analysis requires a market quality variable that can be measured over short intervals, we focus on liquidity and map out the liquidity response by estimating a separate coefficient for each month in event time, while including year-month and transition fixed effects. The results are reported in the Internet Appendix (see section IA.5). We find that liquidity increases (declines) significantly right around the transition month when firms move to a trading venue with a stronger (weaker) information regime. The effect is fairly sharp and there is little

evidence of pre-transition trends in liquidity, which we would have expected to see with reverse causality. This supplementary analysis supports the interpretation that informational and regulatory differences across trading venues drive the results in Table 4. The subsequent analyses dig deeper into the associated regulatory regimes.

5.2. SEC filings and securities manuals

Next, we examine the relation between firms' disclosure status and market quality, while controlling for venue differences. Figure 2 illustrates the increasing level of disclosure, moving from state securities laws to SEC registration. Specifically, we analyze SEC filings and a firm's inclusion in two prominent securities manuals (Mergent's Manuals and S&P Corporation Records). Both types of disclosure provide basic but important financial information to investors that otherwise is not readily available (see section 2). Table 5 reports the regression results.

The analyses are based on the NASDAQ venue history and include observations from all venues or from the NBB only (i.e., Pink Sheets and Grey Market). All regressions are estimated at the firm-month level and include year-month and either industry or firm fixed effects. The key variables of interest in these regressions are the dummy variables *SEC* and *Manual*. *SEC* is equal to one for firms that provide 10-Ks and 10-Qs to the SEC, and zero otherwise. All firms outside the NBB are SEC registrants by definition, that is, *SEC* equals zero only for those firms in the Pink Sheets or the Grey Market that do not file with the SEC. *Manual* is equal to one for firms that are included in either Mergent's Manual or the Standard & Poor's Corporation Records in a given year, and zero otherwise. In addition, and consistent with the analyses in the previous section, we include trading venue indicators, lagged control variables and price-level controls. As in the venue

regressions, we eliminate the month when disclosure changes from the liquidity regressions and the preceding six months from the crash risk regressions.

We estimate regressions based on the full sample, but also provide results for a propensity-matched sample to mitigate concerns that the results are driven by changes in (observable) firm characteristics, rather than disclosure regime changes. We perform the matching at the half-year level without replacement and match on *Manual* (*SEC*), respectively, using *SEC* (*Manual*), lagged market value, lagged return volatility and lagged stock price, as well as industry, state of headquarters and half-year indicators.

In Table 5, Panel A, we present results for liquidity. The estimated coefficients on *SEC* and *Manual* are positive and statistically significant in all specifications, with industry or firm fixed effects. The latter specifications control for any time-invariant heterogeneity across firms. We also estimate regressions for a propensity-matched sample, and still find significant, albeit slightly smaller coefficients. The results indicate that firms that file with the SEC and/or are included in at least one of the securities manuals exhibit higher market liquidity. The magnitudes are economically meaningful. Both the coefficient estimates on *SEC* and *Manual* imply a liquidity difference equal to about 7% of the standard deviation of the liquidity factor of 0.690 in the regression sample (not tabulated). Using the two input variables of the liquidity factor (i.e., the proportion of zero return days and share turnover) to gauge the economic magnitudes, we find that reporting to the SEC or inclusion in a manual implies an increase in liquidity of roughly 5% to 10% relative to average liquidity in the sample (not tabulated).

In Table 5, Panel B, we present results for crash risk. The coefficient estimate on *SEC* is negative and statistically significant in all specifications, indicating that firms filing with the SEC exhibit lower crash risk. The results tend to become stronger when including firm instead of

industry fixed effects and when using a propensity matched sample. Manual inclusion is also associated with significantly lower crash risk when we include industry fixed effects. However, this association becomes insignificant with firm fixed effects. When they are statistically significant, the coefficient estimates are also economically meaningful. For example, the coefficient on *SEC* in the full sample specification with industry fixed effects implies a crash risk difference between filers and non-filers equal to 14% of the standard deviation of crash risk of 0.492 (not tabulated), and would move a firm that is in the 30th percentile of crash risk to the median (not tabulated).

In the Internet Appendix, we provide several analyses to tighten identification and corroborate the interpretation that the results are attributable to SEC filings and manual inclusion. First, we exploit the fact that the Bulletin Board (BB) adds an "E" suffix to a firm's ticker to flag to the market that the firm is delinquent in its SEC reporting. Hence, the ticker suffix is a timely indicator of a firm's reporting status tied only to SEC reporting. In section IA.6, we show that firms that are flagged as being delinquent in their SEC reporting experience an immediate drop in liquidity as well as an immediate increase in future crash risk. These effects are stronger for firms that never return to SEC compliance and weaker for firms that are only temporarily non-compliant in their SEC reporting, precisely as one would expect if SEC reporting drives the deterioration in market quality.

Second, we exploit the fact that banks and insurance companies are required to provide disclosures to their respective regulators and are subject to separate oversight. We therefore expect SEC filings and manual inclusion to have smaller market quality effects for financial firms. As reported in section IA.7, our results are in line with this expectation. Finally, in section IA.11, we show that the coefficients on *SEC* and *Manual* are robust to more extensive fixed effects structures, further mitigating concerns about omitted variables or unobserved shocks.

Taken together, the analyses in this section show that OTC market quality is higher when firms provide more disclosure either through SEC filings or through listings in securities manuals. However, as manual listing is a firm choice, the corresponding estimates have to be interpreted with caution. Our analyses in the Internet Appendix are designed to mitigate endogeneity concerns but selection on unobservables is difficult to address. The latter is less of a concern for SEC reporting, as it is largely imposed on firms (see sections 2.1 and 2.4).

5.3. State securities laws

In this section, we examine whether observed market quality reflects differences in the strength of state securities (or blue sky) laws which is the least stringent form of disclosure regulation (see bottom row of Figure 2). In contrast to federal securities laws, state securities laws generally rely on merit reviews based on reporting to the regulator instead of a public disclosure doctrine. We therefore expect state securities regulation to have a more indirect effect on market quality, e.g., by encouraging firms to satisfy blue sky laws via the manual exemption and hence manual disclosure or by screening out firms with investor protection concerns. However, blue sky laws apply at the trade level or in a firm's state of headquarters. Hence, we assign state securities laws according to a firm's state of headquarters because most states require home-state registration and trades are often likely to involve buyers and sellers in the home state. We then test whether firms headquartered in states with tougher merit reviews enjoy higher market liquidity and lower crash risk.

The analyses are based on the NASDAQ venue history and include only observations from the OTC market (BB and NBB) because firms traded on traditional exchanges are exempt from state merit reviews. All regressions are estimated at the firm-month level and include year-month and industry fixed effects. The key variable of interest in these regressions is *Merit review*, which is an

average of three scores for the strictness of state merit reviews.[22] In a second specification, we estimate separate coefficients on *Merit review* for states with and without a manual exemption. This model allows us to examine whether merit reviews matter more in states that do not offer a manual exemption. We also include a dummy variable *SoInc* ≠ *SoHqt* that is equal to one when a firm's state of headquarters is not the same as its state of incorporation, and zero otherwise. Since firms that incorporate outside their home state are probably different (e.g., more sophisticated) than firms that do not, this control variable is intended to capture unobserved firm characteristics (see also Litvak, 2011). We include indicators for SEC filings and manual inclusion as well as the same control variables for firm characteristics as before.

Table 6 reports the results. Starting with liquidity, we find a significantly positive coefficient of 0.019 for *Merit review*. Thus, firms headquartered in states with tougher merit review laws have significantly more liquid stocks. The estimated effect is about one-third as large as the coefficient estimates for *SEC* and *Manual* in the same regressions (both about 0.060; not reported in Table 6). The second column shows that the estimated coefficient on *Merit review* is larger in magnitude for firms from states without the manual exemption (0.022 versus 0.013 for firms from states with manual exemption). This result lines up nicely with the beneficial role of manual exemptions in state securities laws (see Section 2.3). Turning to crash risk, we find that the coefficient estimates on *Merit review* are insignificant and close to zero in both specifications.

[22] We combine scores from three sources: (1) Nancy Fallon-Houle (www.nfhlaw.com), a law firm that specializes in blue sky laws and tabulates merit review for Regulation A filings on a scale from 0 to 3; (2) Wolters Kluwer Tax & Accounting's CCH Intelliconnect ranks merit reviews for S-33 filings participating in the North American Securities Administrators Association's Coordinated Equity Review Program on a scale from 0 to 3; and (3) the Small Business Guide codes SCOR merit reviews on a scale from 0 to 3. In the empirical analysis, we use the simple average of these three scores as a measure of the strictness of merit reviews. Our results are robust to replacing the average with individual indicators for the strictness of merit reviews.

In the Internet Appendix, we provide results based on the same regressions using firm fixed effects (see section IA.8). In this analysis, the coefficients on *Merit review* are identified by firms that move their headquarters to states that differ in the strictness of their merit reviews. We find that the results for liquidity become even stronger with firm fixed effects, but the relevant coefficients remain insignificant in the crash risk regressions. Thus, while the results indicate a positive relation between the strictness of state merit reviews and liquidity, they also suggest that state merit reviews could be ineffective in terms of screening out securities with higher crash risk.

5.4. Pink Sheets information tiers and Caveat Emptor label

In August 2007, the then Pink Sheets LLC introduced tiers and labels differentiating firms by information status as well as flagging firms with a public interest or investor protection concern.[23] These designations are monitored by the Pink Sheets and modified when disclosures change. In this section, we examine whether market quality varies across these tiers and information labels.[24] We expect market quality to increase for tiers and labels indicating a higher information status.

The analyses are based on the PS tier history spanning the period October 2007 to October 2010, and include observations solely from the NBB (i.e., Pink Sheets and Grey Market). All regressions are estimated at the firm-month level and include year-month and either industry or firm fixed effects. We examine effects associated with the information regimes by adding dummy variables for firms in the *Pink No Info*, *Pink Limited Info* and *Pink Current Info* tiers, with Grey Market firms being the omitted category. We also include a dummy variable indicating a *Caveat*

[23] See section 2 and Appendix 1.1 for more details.

[24] Jiang et al. (2015) examine whether the new labels attract investor attention and affect prices and liquidity. Their analysis is based on three-month windows before and after the introduction of the labels. They find that liquidity improves for Pink Current Information firms and deteriorates for Pink No Information firms. They also find a positive association between announcement abnormal returns and subsequent liquidity changes. Their analysis discards Caveat Emptor firms. Litvak (2009) examines prices around the announcement of the initiative and finds that firms subsequently classified as low information providers have negative abnormal returns, suggesting that investors have some ability to predict how firms will be classified.

Emptor flag. Furthermore, we add an indicator for current SEC filings, an indicator for manual inclusion and the same set of controls as in the previous analyses (except that we do not need venue indicators given the sample restriction). We drop the months in which a firm's information status changes to mitigate reverse causality concerns.

Table 7 reports the results. The first set of columns shows that liquidity is positively associated with the Pink Sheet information tiers. Including firm fixed effects, the estimated coefficients suggest that liquidity decreases monotonically from stocks in the *Pink Current Info* tier, to stocks in the *Pink Limited Info* tier, to stocks in the *Pink No Info* tier, and declines further for Grey Market firms. In this specification, firms with a *Caveat Emptor* label are even less liquid than Grey Market stocks, suggesting that investors avoid stocks with this flag. The second set of columns illustrates that crash risk is negatively associated with the Pink Sheets information tiers. The magnitudes of the estimated coefficients decrease monotonically, indicating a steady reduction in crash risk as information provision improves. With industry fixed effects, *Caveat Emptor* stocks have the highest future crash risk, consistent with the label's purpose. The coefficient estimates are also economically significant. For example, the coefficient estimate on *Pink Current Info* in the liquidity (crash risk) regressions with industry fixed effects is 0.355 (-0.135), corresponding to more than a half (more than one-fifth) of the standard deviation of 0.659 (0.531) for the liquidity (crash risk) proxy in the regression sample.

We perform additional analyses in the Internet Appendix to tighten identification and corroborate the interpretation that the documented differences in market quality reflect the Pink Sheets information tiers. In section IA.9, we show that the results are confined to non-financial firms. The effects of the information tiers are expected to be weaker or perhaps even non-existent

for financial firms, considering that they have to report to their respective regulators (and these filings can be accessed by investors).

In section IA.10, we exploit the strengthening of the Pink Sheets regulatory regime over our sample period through the staggered adoption of four major initiatives. Since these initiatives are set at the market level, they are exogenous to a given firm. Our analysis shows that liquidity improves and crash risk declines for NBB stocks relative to BB stocks following the adoption of the four regulatory initiatives in the Pink Sheets. By the end of the sample period, NBB stocks have essentially caught up to BB stocks in terms of market quality. As we estimate these effects with firm fixed effects, they do not simply reflect the decline in the number of BB firms over time. Taken together, the analyses in this section provide evidence that firms in higher Pink Sheets information tiers exhibit superior liquidity and lower crash risk.

5.5. Information regimes and return performance

The previous analyses show that market liquidity and crash risk vary systematically across the OTC information regimes. A natural question is whether these differences in information regimes also result in differential return performance. We assess return performance by estimating alphas for portfolios of stocks in the various information regimes using standard asset pricing models. In each month, we collect stocks belonging to each information regime, and compute equally-weighted and value-weighted returns for this portfolio. For instance, we take all Pink Sheets stocks that are non-SEC filers and not covered in a manual and compute the returns for this portfolio in every month. If a stock switches regimes, we drop its return in the transition month when computing the portfolio returns. As in Ang et al. (2013), we estimate a five-factor model including market, size,

value, momentum, and liquidity factors.[25] In order to account for thin trading, we include three lags of each factor in addition to its contemporaneous value.[26]

Table 8 reports the alpha estimates for Grey Market and Pink Sheets stocks (NBB) in Panel A, and for Bulletin Board (BB) and NASDAQ Small Cap market (SCM) stocks in Panel B. Two conclusions emerge from this analysis. First, the alphas for BB and NBB stocks suggest severe underperformance for OTC stocks. In contrast, the alphas for SCM stocks are either not significantly different from zero or negative but very small in magnitude. The negative alphas for OTC stocks imply an underperformance of -5% per month. This estimate is consistent with the results shown in Eraker and Ready (2015). The negative alphas are also consistent with the distribution of raw returns for OTC stocks shown in the Internet Appendix IA.2 and in Figure 3.

Second, the alphas are remarkably similar across the OTC information regimes that arise from SEC reporting and manual inclusion. For instance, considering NBB firms that are not covered in a manual, the alphas for SEC filers are very similar to those for non-filers: -4.8% for non-SEC filers versus -4.9% for SEC filers using equally weighted returns.

Thus, in contrast to our market quality results, the regulatory regimes in the OTC market do not appear to be associated with differential return performance. A potential explanation is that returns and market quality reflect conditions in the OTC market differently. In the presence of short-sale constraints and with many retail investors seeking securities with lottery-like payoffs, as discussed by Ang et al. (2013) and Eraker and Ready (2015), it is difficult for more sophisticated investors to

[25] We recognize that these factors are constructed based on exchange-traded rather than OTC stocks. However, our intention is simply to examine (relative) abnormal performance of OTC stocks across information regimes.

[26] The models are estimated using log returns given the relative large frequency of extreme discrete returns (see Figure 3). Alphas based on discrete returns yield very similar inferences across information regimes but are less precisely estimated, which is likely due to large positive outliers in the discrete return series.

arbitrage OTC stocks.[27] In section IA.12 of the Internet Appendix, we show that short selling is indeed very difficult in the OTC market.

Instead, (relatively) more sophisticated (retail) investors may simply refrain from trading as the lack of information for OTC stocks becomes more severe. The departure of (more) sophisticated investors from the weaker regimes not only reduces liquidity, but also leaves more room for investors seeking lottery-like payoffs to push prices up, resulting in a higher probability of crashes. Although stocks in the stronger regimes exhibit superior liquidity and lower crash risk, they are still on average overpriced given the general absence of short selling in the OTC market.

6. Conclusion

In this paper, we analyze a comprehensive sample of over 10,000 U.S. stocks that publicly trade in the OTC market. Many of these issuers are not required to register with the SEC and hence are often referred to as "dark." However, OTC firms that are exempt from federal securities laws are subject to state securities laws as well as venue-based rules stipulating disclosures, and hence not necessarily dark. It is therefore more appropriate to view the OTC market as a twilight zone of different regulatory and information regimes.

We characterize this twilight zone and the regulatory regimes in the OTC market. We provide much-needed descriptive statistics on industry, entry, survival, venue changes, and trading activity by OTC venue as well as trading history. OTC firms tend to be small, trade at low prices, have negative average returns and exhibit high return volatilities. We show that a large number of stocks

[27] Conrad et al. (2014) find that firms with a high probability of death also have a larger predicted probability of a very large (jackpot) return over the subsequent year. These firms tend to have low and declining institutional ownership and, thus, are mainly held by retail investors. Since retail investors have skewness preferences (Barberis and Huang, 2008), they are likely to overpay for the chance of a jackpot which, in turn, leads to low expected returns. Furthermore, these low returns are not arbitraged away because jackpot stocks tend to be small, have low institutional ownership and low analyst coverage, and thus are hard to arbitrage. This evidence reconciles negative returns and crash risk with the chance of extreme positive payoffs via a 'limits to arbitrage' argument. The similarity of alphas across regimes is also consistent with Conrad et al. (2014).

enter the OTC market without an IPO or prior listing in the major markets. However, relatively few of these new OTC firms are able to graduate to the traditional exchanges. Yet, firms tend to survive in the OTC market for extended periods of time, including those delisting from an exchange.

Next, we examine the role of venues and regulatory regimes in market quality using proxies for two aspects of market quality: liquidity and crash risk. We show that OTC firms that provide SEC disclosures, publish information in a recognized securities manual, are headquartered in states with stricter merit reviews, and are in higher-level Pink Sheets information tiers exhibit higher market liquidity and lower crash risk. In short, we find that differences in OTC regulatory and information regimes map into differences in market quality. This finding suggests that (at least some) investors recognize information and regulatory differences across the OTC regimes and trade (or abstain from trading) accordingly. Thus, our study contributes to a more nuanced understanding of investor behavior in the OTC markets. Theories on information asymmetry and adverse selection continue to hold in the OTC market. We emphasize that this conclusion is not at odds with the findings in Ang et al. (2013) and Eraker and Ready (2015). Their asset pricing results suggest that behavioral biases of retail investors, gradual diffusion of information, and short-selling constraints explain why OTC stocks consistently underperform and display very different return characteristics compared to stocks listed on the traditional exchanges. Our results suggest that some, likely more sophisticated, investors abstain from trading stocks when information problems become severe, a response that is likely reflected in the market quality proxies, in particular, liquidity.

Overall, our study points to an important trade-off facing OTC market regulators aiming to create a viable market for small growth firms while protecting investors. Lowering regulatory requirements reduces the compliance burden for smaller firms, but it also significantly reduces market liquidity and increases crash risk for investors. Additionally, our paper highlights the

relevance of state securities laws for the OTC market, including merit reviews, manual exemptions as well as associated securities manual publications. The OTC market is often viewed as dark and unregulated but in fact there are many alternative regimes and a thicket of complicated state regulations. We know very little about the effects of these regimes, which govern the trading of securities that are not covered by federal securities laws. This study is, to our knowledge, the first to provide evidence on how these regimes are related to market liquidity and crash risk.

We conclude with a few cautionary words about the interpretation of our results. Identifying the causal effects of OTC regulatory regimes is difficult. For instance, it is possible that unobservable changes in firm performance or other economic shocks influence market quality proxies and at the same time are related to trading venues, SEC filing status, manual publication or Pink Sheets tiers. To the extent that our analyses do not control for the effect of performance changes on liquidity and crash risk, our results are biased. We exploit several institutional features and provide extensive sensitivity analyses to mitigate such concerns, but ultimately we interpret the regression results as associations, rather than causal effects.

Appendix 1: Additional institutional details

1.1 Pink Sheets tiers

Starting in 2007, the Pink Sheets (now OTC Markets Group) introduced a tier system for companies whose stock is quoted on its platform (www.otcmarkets.com). All securities are assigned a tier based on their reporting method (SEC Reporting or Alternative Reporting Standard) and disclosure category (Current, Limited or No Information). Each stock's tier is displayed next to the ticker symbol on the Pink Sheets website.

Securities in the highest tier, OTCQX, are required to have a current disclosure status and meet minimum financial qualifications. To be included in this tier, companies undergo a qualitative review by the OTC Markets Group and need to be sponsored by a third-party investment bank, depositary bank or securities attorney. Companies are not required to be registered with or reporting to the SEC, but must submit financial information to the Pink Sheets for review and display on their website. In addition, companies must be ongoing operations; i.e., they cannot be shells, blank-check companies or in bankruptcy. Many companies in the OTCQX tier are foreign issuers. As the number of U.S. firms in this tier is very small during our sample period, we do not analyze it separately.

Securities in the next tier, OTCQB, must be current in their disclosure and report to the SEC or a U.S. banking or insurance regulator. This tier was introduced in April 2010 and its requirements were extended in May 2014. By contrast, securities in the OTC Pink tier have no SEC or equivalent reporting requirements, and can even be delinquent in their SEC filings. They are placed in one of three categories based on the amount and timeliness of financial disclosure:

1. Pink Current Information companies have submitted information no older than six months to the OTC Markets data and news service, or have made a filing on the SEC's EDGAR system in the previous six months. This category can include shell companies or development stage companies with little or no operations as well as companies without audited financial statements.
2. Pink Limited Information companies are unwilling or unable to meet OTC Markets' guidelines for providing adequate current information but have submitted some of the information required. These are often firms with financial reporting problems, in distress, or in bankruptcy.
3. Pink No Information companies are unwilling or unable to provide disclosure to the public markets. Firms in this category do not make current information available via the OTC Markets disclosure and news service, or if they do, the available information is older than six months. This category includes defunct firms that have ceased operations as well as "dark" firms.

Companies that are deemed to have a public interest or investor protection concern, for example, due to stock promotion, disruptive corporate actions, or legal proceedings, receive a Caveat Emptor flag.

1.2 State securities (blue sky) laws

State securities laws predate the 1933 and 1934 Acts. While the latter Acts are based on a disclosure doctrine, state securities laws rely on a merit-based regime.[28] In other words, state securities regulators have the authority to examine applications for registration, and to approve only those applications that are "fair" to investors. Over the years, several attempts have been made to create more uniform securities laws across states, via the Uniform Securities Acts (USAs) of 1930, 1956, 1988, and 2002. However, there is still significant variation across blue sky laws, making compliance challenging for issuers whose stock is traded by investors in multiple states.

Recent federal acts have to some extent preempted blue sky laws.[29] For our purposes, the most important of these is the National Securities Markets Improvement Act (NSMIA) of 1996. This legislation creates a class of securities called "federal covered securities," which includes securities listed on national exchanges, securities issued by a registered investment company, secondary trading of securities issued by federally registered and SEC reporting companies, as well as securities offered or sold without SEC registrations based on one of the exemptions mentioned in footnote 35. NSMIA prevents states from imposing additional disclosure or "merit" standards on such offerings, requiring registration by qualification of such securities as well as prohibiting or limiting the use of any offering document prepared by or on behalf of any issuer of such securities. However, NSMIA allows states to impose filing requirements for documents filed with the SEC (such as a prospectus and Form D) and states may impose filing fees.

Securities Registration

There are four types of state securities registration: coordination, notification, Small Corporation Offering (SCOR), and qualification.[30] Registration by coordination is used for issues that are simultaneously registering under the 1933 Act and in the states where the offering is to be sold. Registration by notification (also called filing) is available for issuers with a class of widely-held equity securities registered under the

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[28] This section draws primarily on individual states' blue sky laws as reported by Wolters Kluwer Tax & Accounting's CCH Intelliconnect. Virtually all states' blue sky laws originally included a merit review, but the nature of merit review today ranges from the very stringent in states like California and Texas, to a regime which in practice mimics the federal disclosure-based process.

[29] These include the Private Securities Litigation Reform Act of 1995 ("PSLRA"), the 1998 Securities Litigation Uniform Standards Act ("SLUSA"), the National Securities Markets Improvement Act of 1996 ("NSMIA"), SOX, and the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act ("Dodd-Frank").

[30] Arizona and Ohio allow registration by description while Idaho, Nevada, Oregon, and Rhode Island use the term registration by filing for processes similar to registration by notification.

Exchange Act of 1934 that can provide evidence of meeting certain minimum standards.[31] In both cases, NSMIA essentially usurps the state securities regulator's ability to deny state registration.

Many states also offer securities registration under the SCOR definition.[32] These offerings are designed to help small businesses raise capital, and are limited in size to no more than $1 million. SCOR offerings are exempt from SEC Registration following Rule 504 of Regulation D and the Intrastate offering exemption (Rule 147). Unlike other exemptions under Regulation D (see below), SCOR offerings may be marketed by brokers and selling agents, and there is no limitation on the number of investors. Security offers and sales exempt from SEC registration following Rule 505 (up to $5 million) and Rule 506 (unlimited) offerings under Regulation D still need to be registered in the states where the investors are located. Most jurisdictions have a simplified process which considers the offer or sale as registered in the state provided the issuer files a copy of the federal Form D with the state regulator.

All jurisdictions except New York have statutes that allow registration of securities by qualification, if none of the other registration types apply.[33] When seeking registration by qualification, information similar to the registration requirements under the 1933 Act has to be provided to the state securities regulator. The regulator then decides after conducting a merit review whether or not to make the registration effective.

Costs for securities registration vary widely across states, but the typical state has a fee that is proportional to the value of the securities offered in the state.[34] State securities registrations are usually valid for one year, and many states require the issuer to update the offering information (prospectus including financial statements) periodically. As discussed in section 2, information filed with regulators in connection with a state securities registration is typically not made publicly available in the way SEC filings are made available on EDGAR.

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31 Eligibility requirements for registration by notification/filing are: that the SEC registered securities are held by more than 500 persons on record; that the issuer has a net worth of more than $4 million or a pre-tax net income of more than $2 million for two out of the three fiscal years preceding the offering; that the issuer has actively engaged in business operations for 36 consecutive months preceding the offering; that at least four market makers have been quoting the SEC registered securities for at least 30 days out of the three months preceding the offering; that the underwriter commissions will not exceed 10% of the offering; that neither the issuer nor any of its subsidiaries have failed to pay a preferred stock dividend or defaulted on any bond or long-term lease; and that the price of the offered security is no less than $5.00.

32 Further information on SCOR requirements and applicable laws can be found at www.nasaa.org/industry-resource/corporation-finance/scor-overview.

33 This type of registration is used by states for Rule 144A offerings, Regulation A offerings, Intrastate offerings larger than $1 million (Rule 147), and offerings to accredited investors.

34 Typically, the rule is 1/10 of 1% or 1/20 of 1%. Note that there are some states with flat fees, and others with no maximum fee. The average across states is a minimum fee of $390 and a maximum of $2,525.

Secondary Trading and Exemptions

As long as the state securities registration is effective, secondary trading of the security is allowed provided the trades involve only residents of states where the security is registered. In addition, most states require firms to register in the state in which their headquarters are based (home state registration). An issuer has to renew its state registration(s) in order for secondary trading to continue beyond one year.

The requirement to maintain effective registrations in multiple states is costly, and issuers may therefore seek to qualify for one of the exemptions to state securities registration. In addition to federal covered securities, many states exempt, for example, bank stocks, savings & loans, insurance companies, credit unions, and public utilities from registration provided that the issuers are regulated by federal and/or state laws. USA 2002 also includes twelve exemptions for transactions in securities, and seven of these exemptions directly address equity trading:[35] However, the adoption of the USA 2002 exemptions varies significantly across states.

One way for a firm to obtain an exemption from registering the securities in each state where investors may reside is to list the firm in a nationally recognized securities manual. The most prominent manuals are Mergent's (previously Moody's) Manual and the Standard & Poor's Corporation Records. These two manuals are explicitly recognized in 41 jurisdictions (including the District of Columbia) and one state recognizes Fitch's manual. To be covered in Mergent's Manual, for instance, the firm currently pays an initial listing fee of $4,700 and an annual renewal fee of $1,100.

The manuals contain a company profile which includes the company history, business description, subsidiaries, plant & property, and management listing. The manuals also include financials: income accounts for the most recent 3 years, balance sheets for the last 2 years, as well as a description of the capital stock. If available, company information is provided, including contact information, website, annual meeting date, counsel, auditors, long-term debt, number of shareholders, transfer agent, shareholder relations contact, five-year stock pricing range, and the number of employees.

The manuals are available in print and online for industry professionals and major research libraries. Once a firm is listed in a recognized manual, investors from most states can freely trade unregistered shares

[35] The USA 2002 exemptions relevant for transactions in securities are: (1) isolated non-issuer transactions, (2) securities listed in a recognized manual, (3) unsolicited orders, (4) transactions involving institutional investors/financial institutions, (5) limited offerings, (6) existing security holders, and (7) transactions involving securities registered under the 1933 Act. USA 2002 exemptions with the most common adoptions are the limited offering exemption (51 jurisdictions), the institutional investor/financial institution exemption (45 jurisdictions), and the manual exemption (42 jurisdictions).

on the secondary market.[36] Thus, a manual listing significantly enhances information disclosures to potential investors and enlarges the pool of investors for which secondary trading would be permitted.

1.3 State corporate laws

State corporate laws may also contain financial reporting requirements that are relevant to firms not subject to federal laws. Companies are free to incorporate in the state of their choice, no matter where their headquarters or operations, and approximately 50% of U.S. firms have chosen to incorporate in Delaware. The Model Business Corporation Act (MBCA), which is the basis for corporate laws in 24 states, describes reporting requirements and penalties. According to the MBCA, firms are required to provide annual financial statements to shareholders within 120 days of the end of the fiscal year. If a shareholder is not mailed financial statements and submits a written request, these statements must be mailed. However, several states (e.g., California, New York, and Delaware) do not follow the MBCA.

According to the American Bar Association (2002), 15 states require the automatic provision of annual reports and 26 states require companies to furnish an annual report only upon receipt of a written shareholder request. The other states do not require annual financial statements to be furnished. Of the states with some reporting requirement, 16 states require financials to be mailed within 120 days of the fiscal year end, while a few states give companies 180 days after the fiscal year end or "a reasonable time" following the receipt of a request. Several states impose penalties such as fines or the right to legal costs or remedies, if the firm fails to deliver the financial statements.

However, while state corporation laws sometimes require firms to provide financial statements to shareholders, these laws apply at the level of the record holder and hence, to our understanding, do not necessarily lead to disclosure to beneficial owners or prospective shareholders. For this reason, the effect of financial reporting mandated by state corporation laws on liquidity and crash risk is not clear.

We investigate the associations using the American Bar Association's (2002) description of reporting requirements. We define states as having weak (10), medium (26), and strong (15) financial reporting requirements, and assign firms to each category based on their state of incorporation. We run the same regression model used to evaluate state securities laws (Table 6). Overall, the results (untabulated) are inconclusive. In the base specification with industry fixed effects, firms incorporated in a state with strong state corporate law reporting requirements do not exhibit higher liquidity, although they do have significantly lower crash risk in states with medium and strong requirements. When we add firm fixed effects, the positive association with liquidity becomes stronger, but the crash risk associations are now weaker and insignificant. However, relatively few OTC firms change their state of incorporation over the sample period

[36] Exceptions are Alabama, California, Illinois, Kentucky, Louisiana, New York, Pennsylvania, Tennessee, and Virginia.

and hence can contribute to the identification of state corporate law effects. We therefore also run specifications excluding Delaware and Nevada, the two most commonly chosen states of incorporation, as well as including a binary indicator for out-of-state incorporation. These two choices should mitigate concerns about self-selection. The results remain mixed. Hence, we conclude that there are no reliable associations between the reporting requirements embedded in state corporate laws and the two market quality proxies, potentially reflecting the fact that these financial reports are generally not furnished to beneficial owners.

Appendix 2: Example firms

This appendix provides details on seven typical OTC firms. For each firm, we state its sample group (as defined in Table 1) and describe its main business (as of the end of our sample period or the last available date), sales and employee information (if available), its place of incorporation and location, its evolution including important corporate events, trading venue and reporting history.

2.1 ZYTO Corp. (OTC only)

ZYTO is engaged in the manufacturing and distribution of "biocommunication" devices and software designed to facilitate communication between computers and the human body in a process called a "biosurvey." It markets its applications primarily to health care professionals. The firm is in the Surgical and Medical Instruments industry (SIC 3841). At the end of 2011, ZYTO had approximately 30 employees. Sales in recent years were $1.7 million (2007), $1.9 million (2008) and $4 million (2011).

ZYTO is headquartered in Utah and incorporated in Delaware. The firm was created in September 2006 following a reverse merger of Nevada-based ZYTO Corp. with Delaware-based Quiver Corp. In July 2007, it raised $1.4 million in a Reg D offering from 36 investors (18 of which were unaccredited). As of March 2012, it had 221 holders of record.

The firm traded in the Pink Sheets from 2006 to April 2011 before it became dually quoted on the Bulletin Board (BB). The firm has a website (www.zyto.com), which includes a press release section with quarterly performance reports and other information of interest. The firm did not report any financial statements before 2008. While solely in the Pink Sheets, its information label fluctuated between No Information, Limited Information and Current Information. It filed for SEC registration in July 2010 and made its first 10-K filing in March 2011. In December 2012, the firm announced its voluntary termination of SEC registration and return to the Pink Sheets, largely for cost reasons. As of April 2013, the firm is labeled as Current Information, as it continues to provide financial statements (certified by its attorney), despite being no longer registered with the SEC. Since February 2010, the firm has been covered in the S&P manual.

2.2 Quri Resources Inc. (OTC only)

Quri Resources is engaged in the discovery, exploration, and development of gold, silver, copper, and other mineral resources. Its properties include the Wellington mining project in Ecuador and the Oatman gold project consisting of various mining concessions in Arizona. The firm is in Metal Mining Services (SIC 108). In 2011, Quri had two employees. Its revenue was $89,000 (2011) and $97,000 (2010). The company is incorporated in Delaware, with principal places of business in Miami, Florida and Quito, Ecuador. Before February 2009, Quri was named Transoft Technologies, Inc.

The firm was quoted in the Grey Market through November 2006 and in the Pink Sheets since then. In May 2009, the Pink Sheets information label switched from Limited Information to No Information. Since October 2010, Quri has been labeled Caveat Emptor, warning investors that the OTC Markets Group has been unable to contact the company or confirm its location. The Pink Sheets website shows Quri's last financial report as of November 30, 2008.

The Quri Resources website (www.quriresources.net) is no longer active, and has been replaced by a new one (www.quriresources.com). The latter website provides no financial information and calls itself a "blog." It describes the company as being "interested in the technology surrounding the recovery of precious metals and rare gems from the earth's soil." The firm is not covered in our two manuals. In September 2010, the SEC charged Quri with orchestrating a "pump and dump" scheme.[37] The SEC alleges that the firm issued several false and misleading press releases about impending acquisitions between February and June 2009, allowing CEO Jaime Gomez to sell shares at inflated prices for a total gain of $27,100.

2.3 Clarent Hospital Corp. (OTC only)

Clarent Hospital owned and operated acute health-care hospitals and related healthcare businesses. It is in Health Care Equipment & Services (SIC 8062). The firm was based in Houston, Texas and incorporated in Delaware in 1980. Its predecessor was Paracelsus Healthcare Corporation, which filed for bankruptcy in 2000. Clarent emerged from these bankruptcy proceedings and reincorporated as a private company in 2001. In November 2001, Clarent sold its Westwood Medical Center and used the proceeds to boost liquidity and pay down a portion of its debt. On October 14, 2008, the firm announced that it would pay a dividend of 0.10 per share and the remaining assets would be placed in a liquidating fund. The proceeds of this fund would go to the shareholders of record as of Dec 19, 2008. As of December 20, 2008 Clarent Hospital Corp. went out of business.

Clarent was quoted in the Grey Market and the Pink Sheets. The firm did not have a website and never filed with the SEC. Neither Mergent nor S&P covered the firm in their manuals.

2.4 Miracor Diagnostics, Inc. (Fallen angel)

Miracor Diagnostics, Inc. provided medical diagnostic imaging services in the U.S. Its industry is Services – Specialty Outpatient Facilities (SIC 8093). Originally in the oil and gas sector, the firm became solely a medical firm in January 1994. Starting in July 1998, it moved into the diagnostic business through asset acquisitions. By 2005, the firm operated 13 wholly owned centers in California, Florida, Illinois, Ohio, and Oregon. These centers offered magnetic resonance imaging, computed tomography and other diagnostic

[37] See http://www.sec.gov/litigation/complaints/2010/comp21675.pdf.

imaging services in a patient-friendly environment. The number of employees remained constant between 2003 and 2005 at approximately 100. Revenues increased steadily to a level of $20 million in 2005.

The company was incorporated in Utah in February 1980 and headquartered in California.[38] In 2006, the firm started to lose money and, in March 2007, it suspended payments to secured lenders and sought to restructure its debt. In April 2007, Miracor filed for bankruptcy. The firm emerged from bankruptcy in December 2007 and subsequently abandoned all significant operations. In June 2009, the state of Utah effectively ordered the company's administrative dissolution.

The firm's shares traded on the NASDAQ SCM until March 1998, when it was delisted and moved to the BB. It traded in this market until May 2007—between February 2003 and May 2007 it was dually-quoted on the BB and the Pink Sheets. As of June 2007, the firm was removed from the BB and traded exclusively in the Pink Sheets, after it filed for bankruptcy and stopped reporting. Consequently, its Pink Sheets information tier was No Information. In July 2010, the stock was finally removed from the OTC market.

The company had a website (www.miracor.com). It was listed in Mergent's Manual through December 2006, but not covered by S&P. The firm was an SEC filer through 2007. In April 2007, the firm notified the SEC that it was unable to file its 2006 annual report, and might never file again. In June 2010, the SEC cited Miracor for being delinquent in its filings.

2.5 True Religion Apparel (Rising star)

True Religion Apparel, Inc. designs and sells premium clothing (denim jeans and assorted sportswear) to consumers globally. Its industry is Apparel & Clothing Manufacturers (SIC 2300). As of March 2013, the company operated 124 stores in the U.S. and 31 international stores. Its products are also sold at major department stores and the firm licenses its name for selected products. In December 2012, True Religion had 3,086 employees. Its net sales have grown rapidly over the years from $270.0 million in 2008 to $467.3 million in 2012.

The firm was incorporated in Nevada in 2001 under the name Gusana Explorations Inc. At the time, it was based in Vancouver, Canada and its business plan was to explore and develop mineral properties. Later, the firm searched for opportunities in the clothing industry as an extension of its existing operations, and eventually decided to let its mining claims lapse. In June 2003, the firm acquired all the shares of Guru Denim, Inc. via a reverse merger and, in August 2003, changed its name to True Religion Apparel, Inc., with headquarters in California. In 2008, it changed its state of incorporation to Delaware. On May 10, 2013, the

[38] The firm was incorporated as Gold Probe in 1980 and changed its name to Hailey Energy Corporation in September 1981 after acquiring Hailey Energy Company. There were further name changes to Cytoprobe in 1992, to Medical Device Technologies in April 1995, and to Miracor in October 1999.

firm announced that it would be acquired by the investment management firm TowerBrook Capital Partners LP in an $835 million deal. The price of $32 per share in cash represented a 9 percent premium over the previous day's closing price and a 52 percent increase over the price in October 2012.

The firm's shares were quoted on the BB starting in March 2003, and migrated to NASDAQ in August 2005. As of February 2013, True Religion had only 56 holders of record but roughly 11,500 beneficial shareholders. The firm has a website (www.truereligionbrandjeans.com). It has filed reports with the SEC every year since 2002 (which are also available on the firm's website). It has not been covered by the securities manuals.

2.6 Broadwind Energy (Rising star)

Broadwind Energy provides technologically advanced products and services to customers in the wind energy, oil and gas, mining, and infrastructure industries, primarily in the U.S. but also in other industrial markets. Its operations include the production of wind turbine towers, fabrication of specialty weldments, production and repair of precision gears and gearing systems, and blade and gearbox maintenance services. The firm is in the Electrical Apparatus & Equipment industry (SIC 5063). On December 31, 2012, Broadwind Energy had 753 employees. Its total revenues were $185.9 million (2011) and $210.7 million (2012).

The firm incorporated in Nevada in 1996 as Blackfoot Enterprises, Inc. The business plan was to sell replica totem poles and cigar store Indians but the firm ran out of funds and became a shell company in January 1997. In February 2006, following a reverse merger between Blackfoot and privately-held Tower Tech Systems Inc., Blackfoot changed its name to Tower Tech Holdings Inc., and moved its headquarters to Wisconsin. In January 2008, the firm reincorporated in Delaware and shifted its headquarters to Illinois, changing its name to Broadwind Energy, Inc. in February 2008. Over the years, it grew and evolved through several acquisitions. In 2011, the firm faced class-action lawsuits related to officer breach of fiduciary trust and SEC inquiries related to accounting irregularities. As of April 2013, these legal matters had not been resolved entirely. Broadwind Energy had 66 holders of record as of February 2013.

The firm's common stock was quoted in the OTC market since March 2004. It was dually quoted in the BB starting in June 2005. The stock began trading on NASDAQ's National Market in April 2009, and changed its listing to the NASDAQ SCM in December 2011. The firm has a website (www.broadwindenergy.com), where it provides 10-K, 10-Q and 8-K reports. It has voluntarily reported to the SEC since its beginnings in 1996. The firm was listed in Mergent's securities manual as of January 2009 and in the S&P manual as of July 2009.

2.7 The NASDAQ OMX Group (Rising star)

NASDAQ OMX Group, Inc. is a holding company providing trading, clearing, securities listing, and technology services on a global scale. It is in the Security and Commodity Brokers, Dealers, Exchanges, and Services industry (SIC code 6200). The firm operates the NASDAQ stock market, eSpeed (a new Treasuries trading platform) in the US, several exchanges in Europe, including those in Stockholm, Copenhagen, Helsinki, Iceland and the Baltic states. It also operates a derivatives market for power and a clearing house for freight and seafood in Norway, an interest rates derivatives market in London, as well as energy and carbon derivatives products (NASDAQ OMX Commodities). As of December 31, 2013, NASDAQ OMX had 3365 employees. Total revenues were 3.21 billion in 2013 compared to 3.12 billion in 2012 and 3.44 billion in 2011. The firm is incorporated in Delaware and headquartered in New York.

Nasdaq was founded in 1971 as a wholly-owned subsidiary of the National Association of Securities Dealers, Inc. (NASD; now FINRA). In 2006, Nasdaq reorganized into a holding company. The NASDAQ Stock Market became an independent registered national securities exchange in 2007. In February, 2008, Nasdaq and OMX AB merged their businesses to form the NASDAQ OMX Group, Inc.

Commencing June 2000, the NASD began the process of separating Nasdaq from the NASD, as well as raising financing for both entities, via a private placement of common stock to NASD members, investment companies and issuers listed on NASDAQ. Following the expiration of trading restrictions on these shares, public trading in the common stock started July 1, 2002 on the BB under the ticker symbol NDAQ. The stock was quoted on the BB through February 9, 2005, then migrated to NASDAQ, following a secondary offering of shares priced at $9 per share. On February 7, 2014, the firm's share price was $37.54, and it had approximately 586 holders of record.

The firm has a website, http://www.nasdaqomx.com/, where it provides 10-K, 10-Q and 8-K reports. As a result of the private placement of its stock, the firm became an SEC filer as of June 2001. The firm was listed in Mergent's Manual as of January 2008 and in the S&P manual as of July 2008.

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Figure 1

Regulatory regimes in U.S. OTC markets

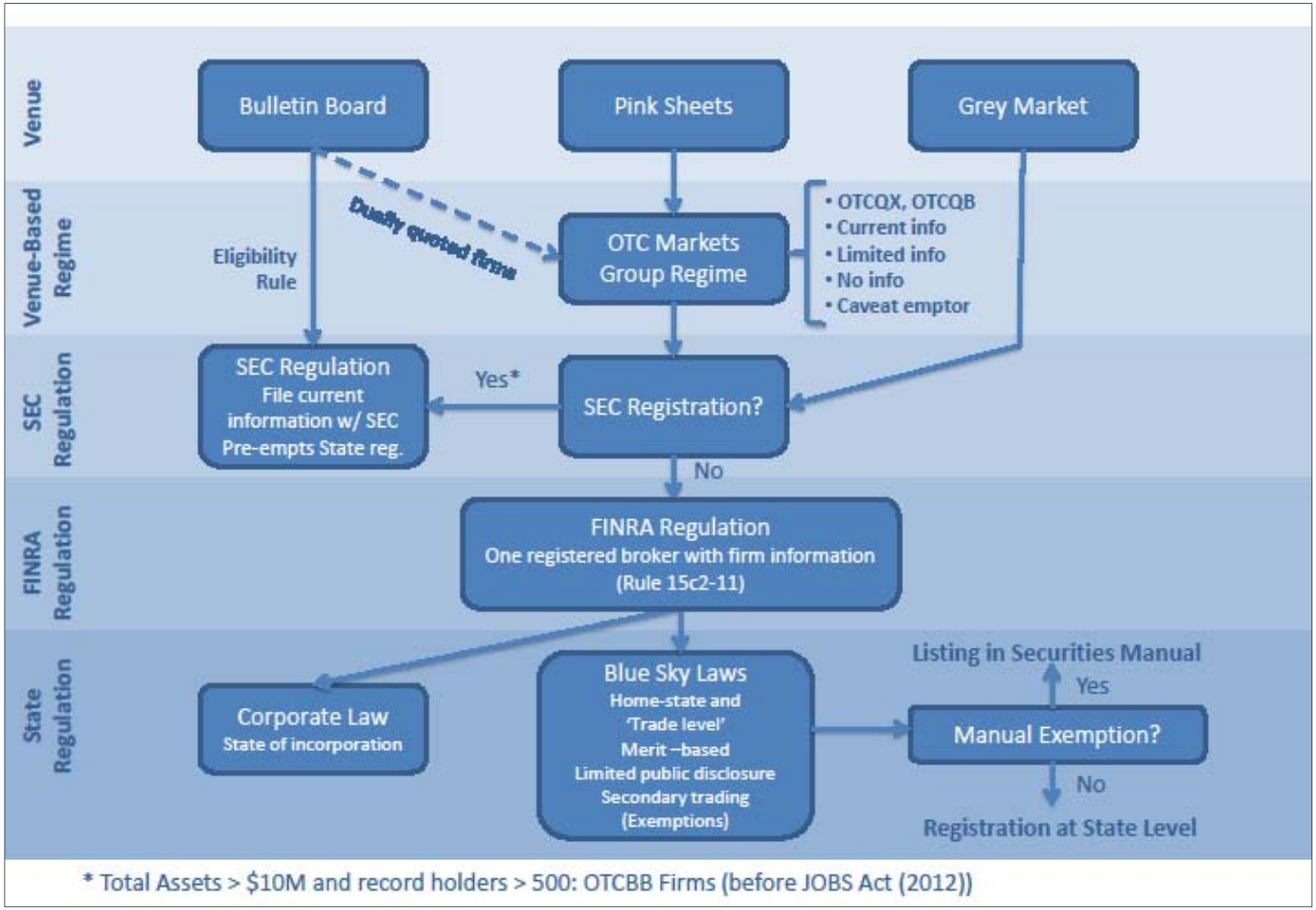

Figure 1 schematically summarizes the regulatory regimes in U.S. OTC markets.

Figure 2

Regulatory and disclosure regimes in U.S. capital markets

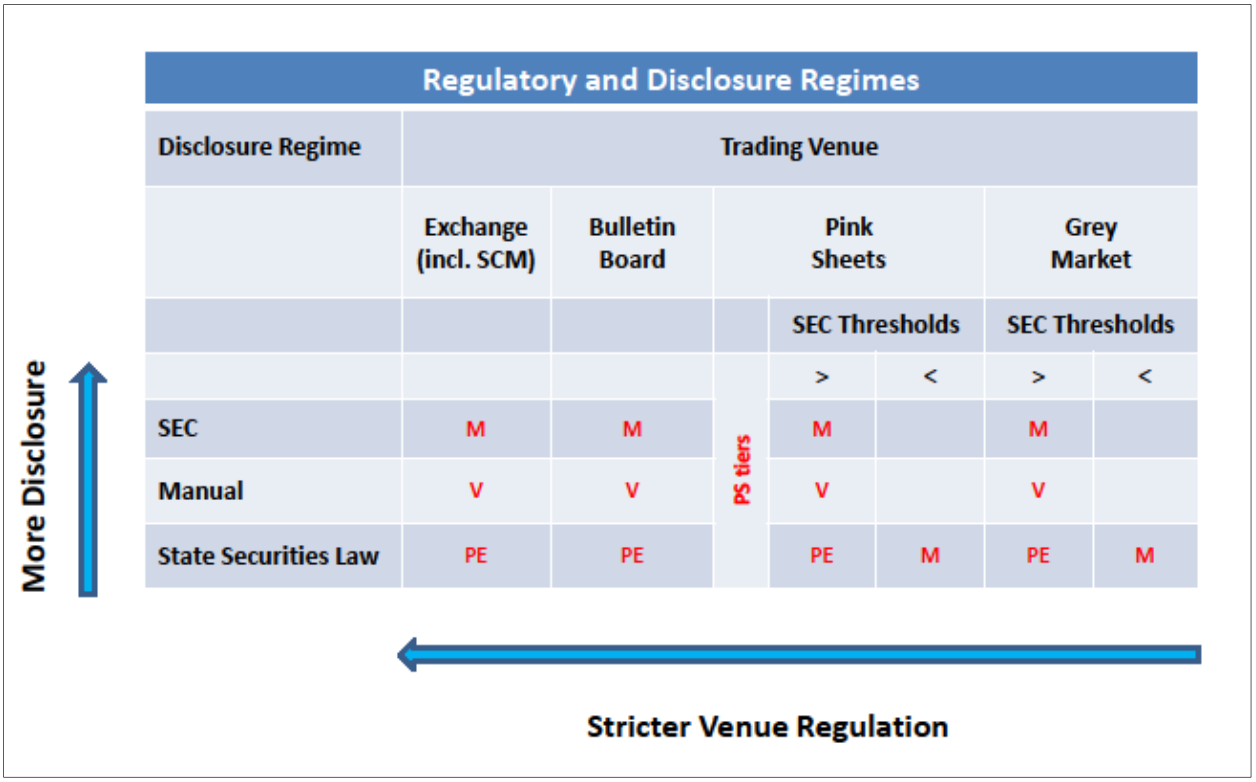

Figure 2 summarizes the regulatory and disclosure regimes in U.S. capital markets. The hierarchy of markets, going from the most to the least regulated, is: Exchange (i.e., traditional non-OTC markets including the NASDAQ Small Cap Market or SCM), the Bulletin Board (BB), the Pink Sheets (PS) and the Grey Market (GM). The disclosure regimes, going from mandatory disclosure (denoted M) to voluntary disclosure (denoted V), are: SEC reporting (SEC) mandated by trading venue, SEC reporting for issuers above the thresholds on total assets ($10M) and shareholders (500) that trigger automatic SEC reporting obligations; voluntary appearance in a securities manual (Manual); and State Securities Laws. Within the Pink Sheets, there are PS regimes which include initiatives undertaken by its operator, the OTC Markets Group: the introduction of PS information tiers (OTCQX, OTCQB, and OTC Pink) as well as the move to greater transparency in pricing. Over our sample period, SEC filing has been mandatory for Exchange, SCM and BB firms (denoted M). PS and GM firms are not required to file with the SEC unless they exceed the above asset or shareholder thresholds, but they may do so voluntarily. State securities laws apply in every state where the firm sells its shares, as well as in the states of both buyer and seller. Finally, state securities regulation is pre-empted (denoted PE) in two instances: if issuers are registered with the SEC; or if their securities trade in one of 42 states where issuers are exempt from state registration requirements if they are included in "a nationally recognized securities manual" such as Mergent's Manuals and Standard & Poor's Corporation Records.

Figure 3

Stock returns in the OTC sample

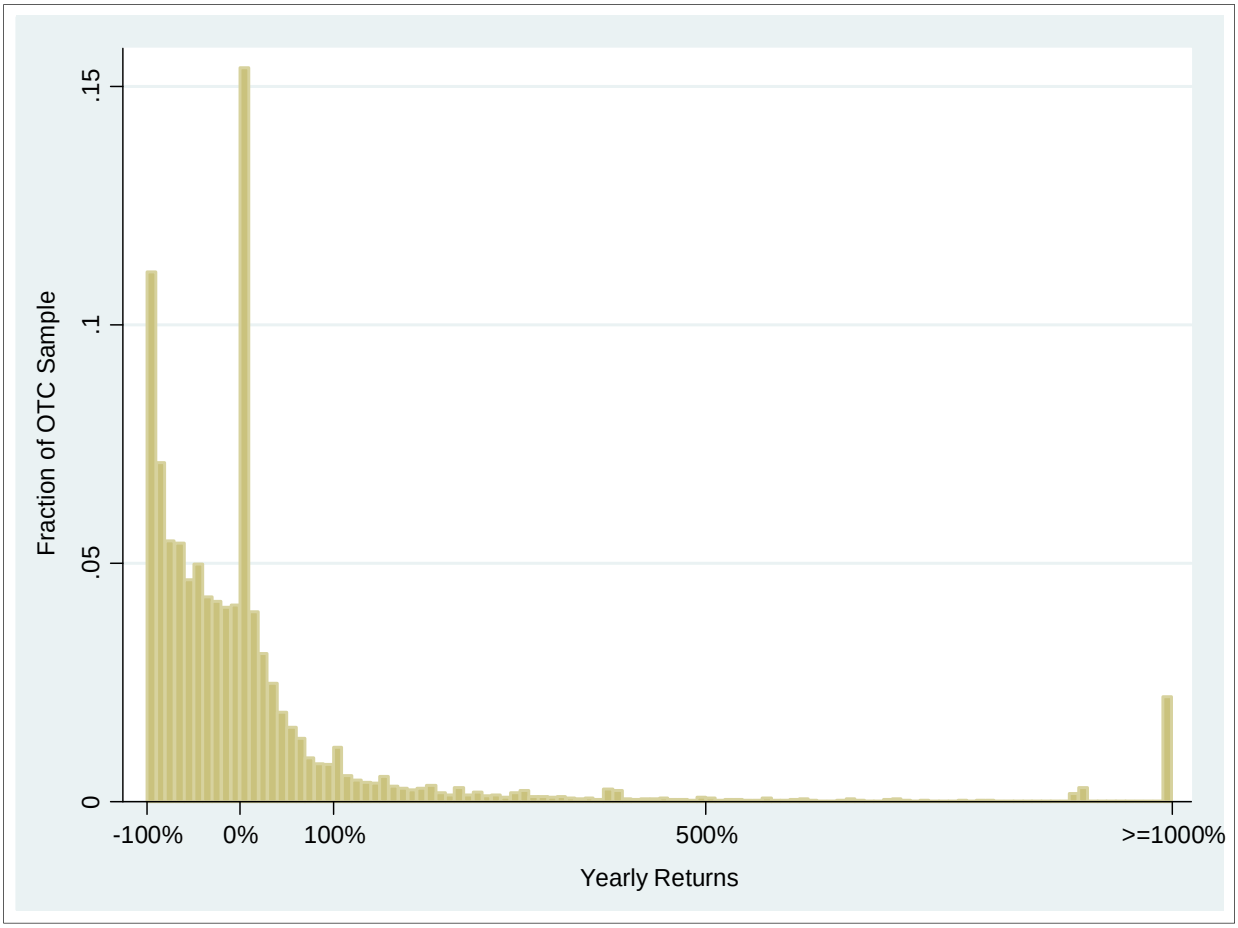

Figure 3 presents a histogram of the distribution of yearly discrete stock returns for all firm-years in the OTC sample (i.e., firms from the NASDAQ SCM benchmark group are excluded). The rightmost bar comprises firm-years with returns equal to or higher than 1000%.

Table 1

Sample selection and sample group classification

Panel A: Sample selection

Sample selection steps	# Firms
Match NASDAQ venue history - Datastream	16,965
- Firms incorporated outside USA	4,114
- 20-F filers	26
- REITs	91
- Firms with DS time series < 50 days	603
- Rarely traded firms	1,328
Final sample (Jan 2001- Oct 2010)	10,803

Panel B: Sample group classification

Sample group	# Firms	Fraction
In OTC only (start in 2001)	5,016	47%
New firms (remain in OTC)	3,134	30%
Rising stars (start in 2001)	370	3%
Rising stars (new firms)	276	3%
Fallen angels (from exchange)	1,787	17%
Total OTC	10,583	100%
Benchmark: NASDAQ SCM	220	
Total Sample	10,803	

Panel C: Dark firms across sample groups

Sample group	Dark firms	SEC at some point		Manual at some point	
	# Firms	# Firms	Fraction SEC filing while in OTC	# Firms	Fraction Manual inclusion while in OTC
In OTC only (start in 2001)	1,407	3,501	59%	2,104	24%
New firms (remain in OTC)	719	2,373	80%	1,006	18%
Rising stars (start in 2001)	0	370	88%	309	31%
Rising stars (new firms)	0	276	86%	222	26%
Fallen angels (from exchange)	0	1,787	43%	1,605	39%
Total OTC	2,126	8,307	63%	5,246	24%
Benchmark: NASDAQ SCM	0	220	-	206	-
Total Sample	2,126	8,527	-	5,452	-

This table presents the sample selection process (Panel A) and describes the sample composition (Panels B and C). The sample is based on a proprietary dataset provided by NASDAQ that includes the venue history of all equity securities that are traded in the OTC market (i.e., the Bulletin Board, the Pink Sheets or the Grey Market) or the NASDAQ Small Cap Market (SCM) at some point during the period January 2001 through October 2010. Matching

Table 1 (continued)

this dataset with capital market data from Datastream results in an initial sample of 16,965 firms. We eliminate firms that are incorporated outside the U.S. or file Form 20-F. We also exclude Real Estate Investment Trusts (REITs) and firms with short capital market histories (i.e., Datastream provides data for less than 50 trading days) or whose securities trade rarely (i.e., less than five trading days in total and/or no stock price changes throughout). The final sample comprises 10,803 firms. The sample groups in Panels B and C are defined as follows: *In OTC only (start in 2001)* includes firms that trade in the OTC market throughout the sample period, i.e. from January 2001 onwards. *New firms (remain in OTC)* comprises firms that trade in the OTC market throughout, but enter the sample as new firms after January 2001. *Rising stars (start in 2001)* are firms that are in the OTC market as of January 2001 but subsequently trade up to the traditional exchanges (AMEX, NASDAQ or the NYSE) or the NASDAQ Small Cap market. *Rising stars (new firms)* enter the sample after January 2001 as OTC firms and later trade up. *Fallen angels (from exchange)* are firms that enter the sample by delisting from the traditional exchanges and trading down to the OTC market (in or after January 2001). *NASDAQ SCM* is a benchmark group comprising firms that remain on the NASDAQ Small Cap market throughout the sample period. In Panel C, we define dark firms as firms that never file with the SEC and are never included in securities manuals (Mergent's Manual or the Standard & Poor's Corporation Records). The fractions within the OTC are computed by dividing the number of OTC firm-months with SEC filings or with inclusion in securities manuals by the total number of OTC firm-months.

Table 2

Survival statistics and trading venue transitions

Panel A: Firm entries and exits

Sample group	# Firms	Start in sample		End in sample	
		= Jan 2001	> Jan 2001	< Oct 2010	= Oct 2010
In OTC only (start in 2001)	5,016	5,016	0	1,684	3,332
New firms (remain in OTC)	3,134	0	3,134	454	2,680
Rising stars (start in 2001)	370	370	0	74	296
Rising stars (new firms)	276	0	276	62	214
Fallen angels (from exchange)	1,787	1,634	153	818	969
Total OTC	10,583	7,020	3,563	3,092	7,491
Benchmark: NASDAQ SCM	220	178	42	110	110

Panel B: Trading venue transitions across years

Venue	Sample: existing in 2001				Sample: existing in 2003				Sample: existing in 2005			
	2001		2006		2003		2008		2005		2010	
NBB	2,706	100%	2,174	80%	3,788	100%	2,895	76%	4,625	100%	2,943	64%
BB			302	11%			281	7%			232	5%
SCM/Exchange			30	1%			47	1%			46	1%
Removed			200	7%			565	15%			1,404	30%
NBB			1,095	37%			925	32%			967	36%
BB	2,961	100%	1,254	42%	2,873	100%	1,282	45%	2,688	100%	1,128	42%
SCM/Exchange			201	7%			232	8%			167	6%
Removed			411	14%			434	15%			426	16%

Panel C: Firm survival and crashes across years

Status	Sample: existing in 2001				Sample: existing in 2003				Sample: existing in 2005			
	2001		2006		2003		2008		2005		2010	
NBB	2,586	100%			2,588	100%			3,166	100%		
Alive			1,699	66%			1,902	73%			1,887	60%
Crash			700	27%			302	12%			484	15%
Removed			187	7%			384	15%			795	25%
BB	2,948	100%			2,788	100%			2,582	100%		
Alive			2,047	69%			2,071	74%			1,804	70%
Crash			491	17%			290	10%			367	14%
Removed			410	14%			427	15%			411	16%

This table presents statistics on survival and trading venue transitions. Panel A illustrates how many firms enter the sample at or after the beginning of the sample period (January 2001) and how many firms leave the sample at or before the end of the sample period (October 2010). These statistics are presented by sample group. For details on the sample group composition, see Table 1. Panel B shows 5-year venue transition matrices for firms that are part of the sample in 2001, 2003 and 2005, respectively. The matrices illustrate whether and how the trading venue changes

Table 2 (continued)

over the subsequent five years. *NBB* includes both Pink Sheets and Grey Market firms. *BB* refers to firms on the Bulletin Board. *SCM/Exchange* comprises firms listed on the NASDAQ Small Cap market or on the traditional exchanges (AMEX, NASDAQ or the NYSE). *Removed* refers to firms that are no longer traded on any exchange or venue (including the OTC market). Panel C presents survival statistics for firms that are part of the sample in 2001, 2003 and 2005, respectively, and have not crashed previously. *Crash* (*Alive*) covers firms that (i) experience (do not experience) a cumulative monthly return of -95% at some point during the five-year window and (ii) subsequently have a stock price below 0.01 USD for at least six months.

Table 3

Descriptive statistics on market quality proxies

Panel A: Liquidity (t)

Venue		# Firms months	Mean	StDev	P25	P50	P75
NBB	Missing	145,888	-0.3712	0.4628	-0.6118	-0.5549	-0.3475
NBB	Grey Market	20,246	-0.4925	0.3118	-0.6118	-0.6112	-0.5307
NBB	Pink Sheets	152,072	-0.2577	0.5211	-0.6053	-0.4670	-0.1239
BB		298,477	0.0564	0.6136	-0.4186	-0.0703	0.3780
Total OTC		616,683	-0.1403	0.5847	-0.5732	-0.3569	0.1304
SCM (Benchmark or to/from OTC)		39,489	0.5665	0.6477	0.1566	0.5023	0.7890
Exchange (to/from OTC)		68,409	0.9121	0.7192	0.5059	0.7555	1.1650

Panel A1: Proportion of zero return days (t)

Venue		# Firms months	Mean	StDev	P25	P50	P75
NBB	Missing	145,888	0.8677	0.2142	0.8421	0.9545	1.0000
NBB	Grey Market	20,246	0.9300	0.1573	0.9500	1.0000	1.0000
NBB	Pink Sheets	152,072	0.7974	0.2489	0.6818	0.9048	1.0000
BB		298,477	0.5805	0.3013	0.3182	0.6087	0.8571
Total OTC		616,683	0.7134	0.2972	0.5000	0.8182	1.0000
SCM (Benchmark or to/from OTC)		39,489	0.2642	0.2372	0.0526	0.1905	0.4211
Exchange (to/from OTC)		68,409	0.1412	0.1818	0.0000	0.0870	0.1905

Panel A2: Share turnover (t)

Venue		# Firms months	Mean	StDev	P25	P50	P75
NBB	Missing	145,888	0.0728	0.2507	0.0000	0.0033	0.0335
NBB	Grey Market	20,246	0.0316	0.1692	0.0000	0.0002	0.0060
NBB	Pink Sheets	152,072	0.0991	0.2733	0.0013	0.0144	0.0689
BB		298,477	0.1492	0.3150	0.0091	0.0423	0.1413
Total OTC		616,683	0.1149	0.2890	0.0015	0.0198	0.0918
SCM (Benchmark or to/from OTC)		39,489	0.2671	0.4197	0.0437	0.1119	0.2884
Exchange (to/from OTC)		68,409	0.4401	0.5316	0.0955	0.2372	0.5665

Panel B: Crash risk (t to t+2)

Venue		# Firms months	Mean	StDev	P25	P50	P75
NBB	Missing	84,825	0.0804	0.6837	-0.2619	-0.1038	0.4891
NBB	Grey Market	6,251	0.1393	0.8139	-0.3242	-0.0926	0.7456
NBB	Pink Sheets	108,324	0.0567	0.5994	-0.2232	-0.1068	0.1997
BB		253,936	-0.0460	0.4092	-0.2011	-0.1227	-0.0368
Total OTC		453,336	0.0047	0.5288	-0.2120	-0.1147	0.0266
SCM (Benchmark or to/from OTC)		34,344	-0.1261	0.2009	-0.1948	-0.1335	-0.0800
Exchange (to/from OTC)		59,079	-0.0957	0.2439	-0.1851	-0.1284	-0.0728

Table 3 (continued)

Panel B1: Negative skewness of returns (t to t+2)

Venue		# Firms months	Mean	StDev	P25	P50	P75
NBB	Missing	84,825	0.2161	4.1159	-1.4156	0.0053	1.9154
NBB	Grey Market	6,251	-0.1012	4.6100	-1.9715	0.0104	1.6640
NBB	Pink Sheets	108,324	0.2328	3.5271	-1.0598	-0.0091	1.2685
BB		253,936	-0.1508	2.2777	-0.8514	-0.1533	0.4762
Total OTC		453,336	0.0102	3.0620	-0.9540	-0.0892	0.7495
SCM (Benchmark or to/from OTC)		34,344	-0.3057	1.2180	-0.7777	-0.2218	0.2554
Exchange (to/from OTC)		59,079	-0.1622	1.2125	-0.6937	-0.1813	0.3034

Panel B2: Cumulative return less than -95% (t to t+2)

Venue		# Firms months	Mean	StDev
NBB	Missing	84,825	0.1559	0.3627
NBB	Grey Market	6,251	0.2435	0.4292
NBB	Pink Sheets	108,324	0.1321	0.3386
BB		253,936	0.0753	0.2639
Total OTC		453,336	0.1063	0.3082
SCM (Benchmark or to/from OTC)		34,344	0.0163	0.1266
Exchange (to/from OTC)		59,079	0.0300	0.1706

This table presents descriptive statistics on our market quality proxies by trading venue at the firm-month level. We use two proxies: liquidity (Panel A) and crash risk (Panel B). *Liquidity* is the first principal component of the proportion of zero return days and share turnover, both measured over the current month (t). The *proportion of zero return days* is the fraction of trading days in a given month with zero returns (Panel A1). *Share turnover* is the average number of shares traded per day divided by the average number of shares outstanding in a given month (Panel A2). *Crash risk* is the first principal component of the negative skewness of returns and a dummy variable capturing large negative returns, both measured over rolling three-month windows that include the current month and two subsequent months (t to t+2). The *negative skewness* of returns is the negative coefficient of skewness, i.e. the negative of the third moment of daily log returns divided by the standard deviation of daily log returns raised to the third power (Panel B1). The dummy variable is also based on daily log returns and indicates a *cumulative return less than -95%* over the three-month window (Panel B2). *NBB* includes both Grey Market and Pink Sheets firms. A proprietary dataset provided by the OTC Markets Group (the PS venue history) allows us to identify these subsamples. The remaining firms for which this separation is not possible are flagged as *NBB Missing*. *BB* refers to firms on the Bulletin Board. *SCM* indicates firms on the NASDAQ Small Cap market and comprises firms in the benchmark group (see Table 1) as well as firms that come from or will switch to the OTC market. *Exchange* captures firms listed on the traditional exchanges (AMEX, NASDAQ or the NYSE) that come from or will switch to the OTC market. For consistency with the regression analysis reported in Table 4 (based on the NASDAQ venue history), we apply the same filters: for liquidity, we exclude months in which firms change trading venues; for crash risk, the month of and the six months before venue changes are excluded.

Table 4

Regression analysis: Trading venues

Panel A: Liquidity (t)

Independent variables	Dependent variable: Liquidity (t)			
	NASDAQ venue history: Jan 2001 - Oct 2010		PS venue history: Feb 2003 - Oct 2010	
Trading venue indicators				
Pink Sheets			0.095***	0.128***
			(7.28)	(7.54)
BB	0.238***	0.246***	0.280***	0.317***
	(29.47)	(32.64)	(17.55)	(16.97)
SCM (Benchmark or to/from OTC)	0.795***	0.681***	0.945***	0.806***
	(51.02)	(46.10)	(37.12)	(31.01)
Exchange (to/from OTC)	1.004***	0.700***	1.095***	0.792***
	(68.42)	(54.45)	(48.60)	(34.64)
Control variables (lagged)				
Log(Market value)	0.102***	0.074***	0.119***	0.070***
	(47.83)	(35.70)	(44.69)	(26.31)
Return volatility	0.116***	0.046***	0.114***	0.052***
	(15.39)	(8.12)	(10.82)	(6.68)
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	724,581	724,581	431,928	431,928
R-squared	0.40	0.62	0.41	0.65

Table 4 (continued)

Panel B: Crash risk (t to t+2)

Independent variables	Dependent variable: Crash risk (t to t+2)			
	NASDAQ venue history: Jan 2001 - Oct 2010		PS venue history: Feb 2003 - Oct 2010	
Trading venue indicators				
Pink Sheets			-0.050**	-0.110***
			(-2.57)	(-4.74)
BB	-0.096***	-0.163***	-0.137***	-0.245***
	(-22.42)	(-28.14)	(-6.74)	(-10.26)
SCM (Benchmark or to/from OTC)	-0.139***	-0.219***	-0.183***	-0.305***
	(-24.98)	(-24.46)	(-8.63)	(-11.89)
Exchange (to/from OTC)	-0.123***	-0.243***	-0.173***	-0.315***
	(-21.10)	(-29.42)	(-8.15)	(-12.67)
Control variables (lagged)				
Log(Market value)	0.012***	0.052***	0.011***	0.054***
	(10.79)	(32.34)	(8.57)	(26.27)
Return volatility	0.283***	0.122***	0.247***	0.102***
	(33.96)	(13.06)	(23.77)	(8.76)
Cumulative return	0.062***	0.091***	0.062***	0.091***
	(32.69)	(47.42)	(26.28)	(38.81)
Share turnover	0.017***	0.009***	0.015***	0.006
	(6.44)	(2.66)	(4.59)	(1.61)
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	546,759	546,759	335,322	335,322
R-squared	0.07	0.16	0.06	0.16

Table 4 (continued)

This table presents regression analyses relating liquidity (Panel A) and crash risk (Panel B) to the trading venues of the sample firms. For details on the proxies for liquidity (t) and crash risk (t to t+2), see Table 3. All regressions are estimated at the firm-month level and include year-month and either industry or firm fixed effects. The first two specifications in each panel are based on the full sample as described in Table 1 (NASDAQ venue history; period: January 2001 to October 2010), and include the following trading venue indicators: *BB* (firms traded on the Bulletin Board), *SCM* (firms on the NASDAQ Small Cap market) and *Exchange* (firms listed on AMEX, NASDAQ or the NYSE) with NBB firms (firms traded on the Pink Sheets or the Grey Market) being the omitted category. The third and fourth specifications exploit the PS venue history as described in Table 3 (period: February 2003 to October 2010), and refine the analysis by including an additional venue dummy for *Pink Sheets* firms, with Grey Market firms being the omitted category. We include the following lagged control variables: *Log(Market value)* is the natural logarithm of the median market value over the previous three months (t-3 to t-1); *Return volatility* is the standard deviation of weekly log returns over the previous six months (t-6 to t-1); *Cumulative* return is the cumulative log return over the previous three months (t-3 to t-1); and *Share turnover* is average number of shares traded per day divided by the average number of shares outstanding over the previous three months (t-3 to t-1). We also include, but do not report the coefficients on, three price-level dummy variables that indicate whether the median stock price over the three previous months (t-3 to t-1) is below $0.01, $0.10 or $1.00, respectively. The analyses are subject to the following transition filters: for the liquidity regressions, we exclude months in which firms change trading venues; for the crash risk regressions, the month of and the six months before venue changes are excluded. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 5

Regression analysis: SEC filings and manual inclusions

Panel A: Liquidity (t)

Independent variables	Dependent variable: Liquidity (t)			
	All venues		NBB only	
Manual	0.054***	0.057***	0.111***	0.090***
	(7.64)	(9.89)	(10.09)	(12.14)
SEC	0.034***	0.050***	0.055***	0.047***
	(3.29)	(6.50)	(5.27)	(6.16)
Trading venue indicators	Yes	Yes		
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	713,217	713,217	311,252	311,252
R-squared	0.40	0.63	0.14	0.50
Prop. matched sample				
Manual	0.044***	0.041***		
	(5.84)	(6.09)		
SEC			0.028**	0.027***
			(2.36)	(2.70)

Table 5 (continued)

Panel B: Crash risk (t to t+2)

Independent variables	Dependent variable: Crash risk (t to t+2)			
	All venues		NBB only	
Manual	-0.030***	-0.004	-0.046***	-0.012
	(-11.30)	(-0.86)	(-5.15)	(-1.04)
SEC	-0.057***	-0.070***	-0.044***	-0.069***
	(-7.47)	(-8.25)	(-5.33)	(-5.74)
Trading venue indicators	Yes	Yes		
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	501,286	501,286	178,255	178,255
R-squared	0.07	0.16	0.07	0.20
Prop. matched sample				
Manual	-0.024***	-0.003		
	(-8.89)	(-0.69)		
SEC			-0.050***	-0.082***
			(-5.29)	(-3.78)

This table presents regression analyses relating liquidity (Panel A) and crash risk (Panel B) to the SEC filing and manual inclusion status of the sample firms. For details on the proxies for liquidity (t) and crash risk (t to t+2), see Table 3. All regressions are estimated at the firm-month level and include year-month and either industry or firm fixed effects. The analyses are based on the NASDAQ venue history (period: January 2001 to October 2010) and include firm-month observations either from all venues or from the NBB only (Pink Sheets and Grey Market). *SEC* is a dummy variable equal to one for firms that file 10-Ks and 10-Qs with the SEC, and zero otherwise. All firms outside the NBB are defined as SEC registrants, that is, *SEC* equals zero only for firms in the Pink Sheets or the Grey Market that do not file with the SEC. *Manual* is a dummy variable equal to one for firms that are included in either Mergent's Manual or the Standard & Poor's Corporation Records in a given year and zero otherwise. We also include, but do not report the coefficients on, trading venue indicators, lagged control variables and price-level controls (see Table 4 for details). The analyses are subject to the following filters: for the liquidity regressions, we exclude months in which firms change their SEC filing and/or manual inclusion status; for the crash risk regressions, the month of and the six months before such changes are excluded. The upper (lower) part of each panel reports regressions results based on the full sample (a propensity-matched sample). We perform the propensity-matching at the half-year level without replacement using a caliper of 0.0001. In the regressions based on observations from all

Table 5 (continued)

venues (from the NBB only), we match on *Manual* (*SEC*) using *SEC* (*Manual*), lagged market value, lagged return volatility and lagged stock price, as well as dummy variables for industry, state of headquarters and half-years as matching variables. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 6

Regression analysis: State merit reviews

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
Merit review	0.019***		0.001	
	(2.99)		(0.30)	
Merit review (with manual exemption)		0.013*		0.001
		(1.85)		(0.33)
Merit review (w/o manual exemption)		0.022***		0.001
		(3.35)		(0.25)
SoInc ≠ SoHqt	0.085***	0.084***	0.034***	0.034***
	(10.91)	(10.76)	(9.54)	(9.55)
Trading venue indicators	Yes	Yes	Yes	Yes
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	550,930	550,930	433,215	433,215
R-squared	0.23	0.23	0.06	0.06

This table presents regression analyses relating liquidity and crash risk to the strictness of Blue Sky laws at the state level. For details on the proxies for liquidity (t) and crash risk (t to t+2), see Table 3. All regressions are estimated at the firm-month level and include year-month and industry fixed effects. The analyses are based on the NASDAQ venue history (period: January 2001 to October 2010) and include only firm-month observations from the OTC market (BB and NBB). *Merit review* is a measure of the strictness of the state's merit review as described in section 5.3. For each sample firm, we use *Merit review* for its state of headquarters because most states require home state registration. In the second specification, we distinguish between states that offer a manual exemption and those that do not (*with* or *w/o manual exemption*). Thus, *Merit review (with manual exemption)* takes the value of *Merit review* only when firms are headquartered in a state with a manual exemption, and is zero otherwise. *SoInc ≠ SoHqt* is a dummy variable that equals one for firms incorporated outside the state of their headquarters, and zero otherwise. We also include, but do not report the coefficients on, trading venue indicators, indicators for SEC filing and manual inclusion status, lagged control variables and price-level controls (see Tables 4 and 5 for details). No filters are imposed in these analyses. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 7

Regression analysis: Pink Sheets tiers and Caveat Emptor

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
Caveat Emptor	0.007	-0.059*	0.066***	-0.043
	(0.21)	(-1.78)	(2.78)	(-0.80)
Pink No Info	0.139***	0.212***	-0.029	-0.314***
	(5.44)	(5.97)	(-0.98)	(-4.66)
Pink Limited Info	0.447***	0.340***	-0.063**	-0.390***
	(14.41)	(8.71)	(-2.02)	(-5.68)
Pink Current Info	0.355***	0.456***	-0.135***	-0.517***
	(10.39)	(10.16)	(-4.15)	(-7.00)
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	79,760	79,760	45,788	45,788
R-squared	0.17	0.60	0.06	0.27

This table presents regression analyses relating liquidity and crash risk to indicators for the Pink Sheets information tiers and the Caveat Emptor label. For details on the proxies for liquidity (t) and crash risk (t to t+2), see Table 3. All regressions are estimated at the firm-month level and include year-month and firm fixed effects. The analyses are based on a proprietary dataset provided by the OTC Markets Group (PS tier history; period: October 2007 to October 2010) and include only firm-month observations from the NBB (Pink Sheets and Grey Market). *Caveat Emptor* is a dummy variable indicating firms that are flagged by the OTC Markets Group as having a public interest concern. *Pink No Info*, *Pink Limited Info* and *Pink Current Info* are dummy variables for firms in the respective Pink Sheets information tier which were introduced by the OTC Markets Group in 2007. Grey Market firms are the omitted category. We also include, but do not report the coefficients on, indicators for SEC filing and manual inclusion status, lagged control variables and price-level controls (see Tables 4 and 5 for details). The analyses are subject to the following sample filters: for the liquidity regressions, we exclude months in which firms change Pink Sheets information tiers and/or their Caveat Emptor status; for the crash risk regressions, the month of and the six months before such changes are excluded. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

Table 8

Return analysis by information regime

Panel A: NBB firm months

Portfolio weighting	NBB			
	SEC no		SEC yes	
	Manual no	Manual yes	Manual no	Manual yes
Equal	-0.048***	-0.049***	-0.049***	-0.059***
	(-10.15)	(-6.76)	(-7.73)	(-8.67)
Value	-0.049***	-0.015**	-0.042***	-0.033***
	(-8.59)	(-2.41)	(-4.75)	(-4.20)

Panel B: BB and SCM firm months

Portfolio weighting	BB		SCM	
	SEC required		SEC required	
	Manual no	Manual yes	Manual no	Manual yes
Equal	-0.052***	-0.050***	-0.008	-0.004
	(-11.73)	(-8.94)	(-0.76)	(-1.06)
Value	-0.056***	-0.041***	-0.018	-0.009***
	(-13.08)	(-6.04)	(-1.58)	(-2.64)

This table presents alpha estimates from monthly time-series regressions that relate equal- and value-weighted portfolio log returns at the information regime-level (venue, SEC filing and manual inclusion status) to a five factor asset pricing model comprising market, size, value, momentum and the Pastor-Stambaugh (2003) liquidity factors. The liquidity factor is available at Lubos Pastor's website. The other factors come from Kenneth French's website. We include the contemporaneous value and three lags of each factor to account for thin trading. Firm-months in which the information regime changes (e.g., due to a venue switch and/or a change in the SEC filing or manual inclusion status) are excluded from the regressions. Panel A reports estimates for Grey Market and Pink Sheets firms (NBB). Panel B reports estimates for firms on the Bulletin Board (BB) and on the NASDAQ Small Cap market (SCM), respectively. The table reports OLS coefficient estimates and (in parentheses) t-statistics based on Newey-West standard errors. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

For Online Publication

Internet Appendix

"The Twilight Zone: OTC Regulatory Regimes and Market Quality"

This appendix provides supplemental discussion and analysis for our manuscript "The Twilight Zone: OTC Regulatory Regimes and Market Quality".

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IA.1 Industry and geographic characteristics by sample group

Table IA.1 presents statistics on the distribution of industry (Panels A and B), state of headquarters (Panel C) and state of incorporation (Panel D) for each sample group.

Panel A shows that financials are the largest group, followed by firms in cyclical services, information technology and non-cyclical consumer products. However, there are notable differences across sample groups. For instance, while financials dominate in most groups, firms operating in cyclical services and information technology constitute a larger fraction of the *Fallen angels* category. The latter finding is intuitive as these industries face significant fundamental uncertainty. Panel B provides a more detailed industry classification. Financial services companies and banks represent the two largest industry groups for firms that remain in the OTC throughout, while pharmaceuticals and health care firms are among the top five industries in the *Rising stars* category and the benchmark group *NASDAQ SCM*.

Panel C illustrates that most sample firms are headquartered in California, New York, Florida or Texas, and shows that the distribution of headquarters across states is related to population. A relatively large proportion of firms that enter the sample after January 2001 is based in a country other than the U.S. or Canada (*New firms (remain in OTC)*: 9%; *Rising stars (new firms)*: 14%). This suggests that the OTC market has become popular among foreign companies in recent years. Panel D shows that the majority of the OTC firms is incorporated in Delaware or Nevada. While Delaware dominates in most sample groups, firms in the *New firms (remain in OTC)* category are more likely to be incorporated in Nevada. Untabulated statistics show that 74% of the sample firms choose to incorporate in a state that is different from their state of headquarters. These numbers are comparable to those in Litvak (2011) showing that over 80% of Compustat firms are incorporated outside their home state.

Table IA.1

Panel A: Broad industry categories by sample group

Industry group	Sample group													
	In OTC only (start in 2001)		New firms (remain in OTC)		Rising stars (start in 2001)		Rising stars (new firms)		Fallen angels (from exchange)		Total OTC		Benchmark: NASDAQ SCM	
	# Firms	Share	# Firms	Share	# Firms	Share	# Firms	Share	# Firms	Share	# Firms	Share	# Firms	Share
Basic industries	173	3%	98	3%	14	4%	23	8%	88	5%	396	4%	7	3%
Cyclical consumer goods	106	2%	59	2%	9	2%	12	4%	59	3%	245	2%	7	3%
Cyclical services	894	18%	540	17%	35	9%	55	20%	404	23%	1,928	18%	21	10%
Financials	1,659	33%	1,179	38%	130	35%	35	13%	239	13%	3,242	31%	115	52%
General industrials	383	8%	141	4%	24	6%	26	9%	161	9%	735	7%	12	5%
Information technology	615	12%	289	9%	31	8%	21	8%	410	23%	1,366	13%	18	8%
Non-cyclical consumer	558	11%	331	11%	74	20%	52	19%	262	15%	1,277	12%	30	14%
Non-cyclical services	114	2%	63	2%	5	1%	18	7%	81	5%	281	3%	1	0%
Resources	362	7%	321	10%	43	12%	21	8%	51	3%	798	8%	8	4%
Unclassified	9	0%	9	0%	0	0%	0	0%	2	0%	20	0%	0	0%
Utilities	143	3%	104	3%	5	1%	13	5%	30	2%	295	3%	1	0%
Total	5,016	100%	3,134	100%	370	100%	276	100%	1,787	100%	10,583	100%	220	100%

Panel B: Top 5 industries by sample group (within-group share)

Rank	Sample group													
	In OTC only (start in 2001)		New firms (remain in OTC)		Rising stars (start in 2001)		Rising stars (new firms)		Fallen angels (from exchange)		Total OTC		Benchmark: NASDAQ SCM	
	Industry	Share	Industry	Share	Industry	Share	Industry	Share	Industry	Share	Industry	Share	Industry	Share
1	Financial Svc	19%	Financial Svc	25%	Banks	33%	Pharma	9%	Software	14%	Financial Svc	17%	Banks	45%
2	Banks	12%	Banks	11%	Pharma	9%	Banks	8%	Technology	9%	Banks	11%	Health care	6%
3	Software	9%	Software	7%	Health care	7%	Retailers	5%	Banks	6%	Software	9%	Software	6%
4	Support Svc	5%	Oil & gas	5%	Oil & gas	7%	Food	5%	Support Svc	6%	Support Svc	5%	Electronics	5%
5	Health care	4%	Media	5%	Software	4%	Electronics	5%	Health care	5%	Media	4%	Pharma	5%

Panel C: Top 5 states of headquarters by sample group (within-group share)

Rank	Sample group													
	In OTC only (start in 2001)		New firms (remain in OTC)		Rising stars (start in 2001)		Rising stars (new firms)		Fallen angels (from exchange)		Total OTC		Benchmark: NASDAQ SCM	
	State	Share	State	Share	State	Share	State	Share	State	Share	State	Share	State	Share
1	California	15%	California	16%	California	16%	Other country	14%	California	21%	California	17%	New York	11%
2	Florida	9%	Other country	9%	Texas	9%	California	12%	New York	10%	Florida	8%	California	10%
3	New York	8%	Florida	9%	Florida	7%	New York	11%	Texas	8%	New York	8%	Ohio	6%
4	Texas	7%	Canada	8%	New York	7%	Texas	8%	Florida	6%	Texas	7%	Florida	6%
5	Not found	5%	New York	7%	New Jersey	5%	Florida	4%	Massach.	5%	Other country	5%	N. Carolina	6%

Panel D: Top 5 states of incorporation by sample group (within-group share)

Rank	Sample group													
	In OTC only (start in 2001)		New firms (remain in OTC)		Rising stars (start in 2001)		Rising stars (new firms)		Fallen angels (from exchange)		Total OTC		Benchmark: NASDAQ SCM	
	State	Share	State	Share	State	Share	State	Share	State	Share	State	Share	State	Share
1	Delaware	30%	Nevada	46%	Delaware	34%	Delaware	54%	Delaware	60%	Delaware	34%	Delaware	43%
2	Nevada	23%	Delaware	22%	Nevada	12%	Nevada	21%	Nevada	4%	Nevada	26%	Ohio	6%
3	Florida	7%	Florida	6%	California	5%	Florida	4%	California	4%	Florida	6%	Virginia	5%
4	Colorado	5%	California	5%	Florida	5%	Colorado	3%	New York	3%	California	4%	New York	5%
5	California	4%	Colorado	3%	Colorado	4%	California	3%	Florida	3%	Colorado	4%	Florida	4%

This table presents firm-level statistics on industry, state of headquarters and state of incorporation by sample group. Panel A provides information on broad industry categories. Panel B shows the top 5 industries using a more detailed industry categorization. Panel C reports the top 5 states in which the sample firms have their headquarters. Panel D focuses on the top 5 states of incorporation. For firms that switch industries or state of headquarters/incorporation, we use the industry or state where the firm spends the longest time during the sample period. For details on the sample groups, see Table 1 in the paper.

IA.2 Market-based firm characteristics by sample group

Table IA.2 provides descriptive statistics on market-based firm characteristics for our OTC sample by sample group.

Panel A shows that the mean (median) volume-weighted market value is about $52 million ($17 million) across all OTC sample firms. The large difference between the mean and median indicates a highly right-skewed distribution. Firms in the *In OTC only (start in 2001)* group tend to be smallest: the median is about $7.2 million and more than a quarter have market values of less than $2 million. Firms in the *Rising stars (new firms)* category tend to be largest, with a median of about $125 million.

Panel B shows that the volume-weighted stock price is also skewed with a mean (median) of $6.81 ($1.01) across all OTC sample firms. The *In OTC only (start in 2001)* group has a particularly high proportion of low-priced stocks. In contrast, a large fraction of *Benchmark* firms from the *NASDAQ SCM* trade above one U.S. dollar.

Panel C shows that firms in the OTC market exhibit, on average, negative annualized returns over the entire sample period (mean: -60.19%; median: -45.98%). There is substantial variation across sample groups. For example, while the median annualized return for the *New firms (remain in OTC)* group is -59.15% over the sample period, it is 2.54% for firms in the *Rising stars (new firms)* category. Each sample group has firms with large positive returns. Untabulated statistics show that even among firms that remain in the OTC market there are more than 1,000 stocks with cumulative returns above 10% over the entire sample period. Figure 3 in the paper illustrates this heterogeneity with a histogram of returns for all firm years in the OTC sample. While stock returns are indeed negative for the majority of firm years, some annual

returns are extremely high.[1] Taken together, these results are consistent with Eraker and Ready (2015).

Panel D shows that return volatility (measured as the standard deviation of monthly returns) is high in the OTC market. Again, large differences are visible across OTC sample groups. For instance, the median volatility for new firms that remain in the OTC market (0.39) is almost twice the volatility of firms in the *Rising stars* groups and three times the volatility of *NASDAQ SCM Benchmark* firms.

Table IA.2

Panel A: Average market value in $US across months (volume weighted)

Sample group	# Firms	Mean	StDev	P25	P50	P75
In OTC only (start in 2001)	4,433	25,842,486	68,452,482	1,809,716	7,238,550	22,678,626
New firms (remain in OTC)	2,659	45,232,324	79,665,907	8,070,141	21,087,173	48,353,415
Rising stars (start in 2001)	370	132,300,000	112,500,000	47,387,900	99,475,202	189,300,000
Rising stars (new firms)	259	194,700,000	177,100,000	65,124,142	124,600,000	293,200,000
Fallen angels (from exchange)	1,776	90,542,786	125,200,000	12,100,150	36,063,789	118,100,000
Total OTC	9,497	52,123,936	98,250,939	4,656,899	16,676,756	50,221,229
Benchmark: NASDAQ SCM	220	54,290,381	54,614,188	20,104,104	38,353,974	68,975,586

Panel B: Average stock price in $US across months (volume weighted)

Sample group	# Firms	Mean	StDev	P25	P50	P75
In OTC only (start in 2001)	5,015	7.81	23.15	0.12	0.48	2.13
New firms (remain in OTC)	3,134	4.96	17.08	0.35	0.92	2.46
Rising stars (start in 2001)	370	11.15	10.05	3.94	7.72	16.29
Rising stars (new firms)	267	10.21	10.01	3.75	6.53	13.77
Fallen angels (from exchange)	1,782	5.83	9.70	1.10	2.81	7.05
Total OTC	10,568	6.81	19.11	0.27	1.01	4.48
Benchmark: NASDAQ SCM	220	11.95	10.66	4.07	9.70	15.02

[1] Note that the statistics in Table IA.2 are based on log returns at the firm level, whereas Figure 3 shows the distribution of discrete returns at the firm-year level.

Panel C: Annualized returns over entire sample period

Sample group	# Firms	Mean	StDev	P25	P50	P75
In OTC only (start in 2001)	4,914	-55.74%	71.63%	-87.74%	-42.72%	-2.18%
New firms (remain in OTC)	3,070	-69.90%	97.87%	-127.44%	-59.15%	-9.82%
Rising stars (start in 2001)	362	-5.18%	31.30%	-18.60%	1.33%	16.52%
Rising stars (new firms)	270	-6.54%	48.89%	-25.18%	2.54%	21.36%
Fallen angels (from exchange)	1,751	-75.28%	85.16%	-100.63%	-58.07%	-17.34%
Total OTC	10,367	-60.19%	82.73%	-97.45%	-45.98%	-3.72%
Benchmark: NASDAQ SCM	214	12.63%	28.22%	-2.33%	10.32%	27.04%

Panel D: Volatility of monthly stock returns

Sample group	# Firms	Mean	StDev	P25	P50	P75
In OTC only (start in 2001)	5,016	0.3471	0.1828	0.2134	0.3767	0.4763
New firms (remain in OTC)	3,134	0.3901	0.1854	0.2624	0.4055	0.5140
Rising stars (start in 2001)	370	0.2205	0.1141	0.1154	0.2155	0.2922
Rising stars (new firms)	276	0.2415	0.1194	0.1527	0.2293	0.3190
Fallen angels (from exchange)	1,787	0.3399	0.1405	0.2430	0.3316	0.4335
Total OTC	10,583	0.3514	0.1776	0.2223	0.3657	0.4755
Benchmark: NASDAQ SCM	220	0.1378	0.0736	0.0785	0.1210	0.1876

This table presents firm-level descriptive statistics by sample group. Panel A (Panel B) reports statistics for average market value (average stock price) in U.S. dollars weighted by trading volume. Panel C summarizes the distribution of annualized log returns over the entire sample period. Panel D provides statistics on the volatility (i.e., the standard deviation) of monthly log returns. For details on the sample groups, see Table 1 in the paper.

IA.3 Trading activity in the OTC market

Table IA.3 provides descriptive statistics on trading activity in the OTC market by trading venue at the firm-month level.

Panel A shows that the mean (median) proportion of trading days is 40.12% (28.57%) across all firm-months in our OTC sample. These statistics are consistent with Ang et al. (2013) who report a mean proportion of trading days of about 53% across their sample of OTC stocks (see also Bollen and Christie, 2009). Trading frequency varies substantially in the cross-section of our sample. For example, while about 10% of OTC stocks trade almost every day (untabulated), a quarter of all OTC stocks have zero volume on 95% of the days. There is also systematic variation in trading frequency across venues. For example, the median proportion of trading days is 57.14% for firms on the Bulletin Board (BB) but only 4.55% for Grey Market firms.

Panel B shows that trading volume on trading days is generally low, with a mean (median) of $37,220 ($2,456) across all firm-months in our OTC sample. Again, there is substantial variation across trading venues. For example, while BB firms have a median volume of $7,258, the median volume of firms in the Pink Sheets (Grey Market) is merely $428 ($15). In several instances, the mean values are influenced by large outliers (e.g., for firms in the Grey Market).

Taken together, this analysis shows that trading activity tends to be low in the OTC market but also that it varies predictably across venues. By and large, more regulated venues have more actively traded securities.

Table IA.3

Panel A: Proportion of trading days over firm month

Venue		# Firms months	Mean	StDev	P25	P50	P75
NBB	Missing	209,511	23.46%	30.90%	0.00%	9.52%	35.00%
NBB	Grey Market	30,238	14.03%	23.19%	0.00%	4.55%	15.79%
NBB	Pink Sheets	184,903	36.74%	34.36%	5.00%	25.00%	65.00%
BB		321,812	55.36%	35.87%	21.05%	57.14%	94.74%
Total OTC		746,464	40.12%	36.68%	5.00%	28.57%	75.00%
SCM (Benchmark or to/from OTC)		41,584	82.77%	22.93%	70.00%	95.24%	100.00%
Exchange (to/from OTC)		75,717	94.01%	15.23%	100.00%	100.00%	100.00%

Panel B: Average daily trading volume in $US - non-zero trading volume days only

Venue		# Firms months	Mean	StDev	P25	P50	P75
NBB	Missing	137,770	33,429	505,506	23	438	4,052
NBB	Grey Market	16,304	99,089	945,801	0	15	692
NBB	Pink Sheets	153,787	25,415	249,164	44	428	3,701
BB		296,875	41,696	190,896	1,945	7,258	24,036
Total OTC		604,736	37,220	340,823	220	2,456	12,951
SCM (Benchmark or to/from OTC)		41,118	162,524	470,128	10,829	29,757	95,063
Exchange (to/from OTC)		67,127	578,152	996,176	28,840	124,119	606,465

This table presents descriptive statistics on trading activity in the OTC market by trading venue at the firm-month level. Panel A provides statistics on the proportion of trading days (i.e., days with non-zero trading volume). Panel B reports statistics on the average daily trading volume in U.S. dollars on trading days (i.e., conditional on daily trading volume being non-zero). *NBB* includes both Grey Market and Pink Sheets firms. A proprietary dataset provided by the OTC Markets Group (the PS venue history) allows us to identify these subsamples. The remaining firms for which this separation is not possible are flagged as *NBB Missing*. *BB* refers to firms on the Bulletin Board. *SCM* indicates firms on the NASDAQ Small Cap market and comprises firms in the benchmark group (see Table 1 in the paper) as well as firms that come from or will switch to the OTC market. *Exchange* captures firms listed on the traditional exchanges (AMEX, NASDAQ or the NYSE) that come from or will switch to the OTC market. No filters are imposed in these analyses.

IA.4 Validation of market quality proxies

In this section, we validate our market quality proxies. First, in Table IA.4a, we compare our liquidity proxy and its input variables with two commonly used liquidity measures: the price impact measure suggested by Amihud (2002) and the bid-ask spread. For both measures, higher values indicate more illiquid stocks. As expected, our liquidity proxy is negatively correlated with both the Amihud measure and the bid-ask spread (see Panel B). These correlations are sizeable (between -0.6499 and -0.5379) and statistically significant, suggesting that our proxy does indeed capture stock liquidity. Note that we do not use the Amihud measure or the bid-ask spread in our main analyses because both measures are available for only a subset of our sample. Specifically, the Amihud measure (bid-ask spread) is available for merely 53% (23%) of the firm-months used in the liquidity analysis reported in Table 4, Panel A, of the paper.

Second, in Table IA.4b, we use data on pump and dump (or P&D) schemes to validate our proxy for crash risk. A P&D scheme is a fraudulent form of market manipulation that involves the manipulator taking a long position in a stock before artificially increasing demand through an unsolicited campaign (e.g., via email, phone or fax). Prior research shows that P&D campaigns often lead to temporary price increases and subsequent corrections or crashes (e.g., Frieder and Zittrain, 2008; Hanke and Hauser, 2008). Thus, if our proxy (measured over the current and the two subsequent months) captures (future) crash risk, we expect it to increase significantly for stocks that are subject to P&D schemes. We test this relation for a large sample of P&D schemes based on four different data sources. The regression results confirm the expectation that the crash risk proxy increases following P&D schemes. The coefficient on the *Pump and Dump* indicator is positive and statistically significant in each panel. This increase in crash risk is also

economically large in all specifications. For example, the coefficient estimate of the *Pump and Dump* indicator in the first specification in Panel A (0.169) corresponds to roughly one-third of the standard deviation of the crash risk proxy of 0.4919 (not tabulated, but very similar to the statistic reported in Table 3, Panel B in the paper; the small difference is due to differences in the sample filters employed in the main analysis).

Taken together, the results reported in this section provide evidence that our market quality proxies capture liquidity and crash risk, respectively.

Table IA.4a

Panel A: Descriptive statistics

Variable	# Firms months	Mean	StDev	P25	P50	P75
[1] Liquidity	724,581	-0.0024	0.6895	-0.5519	-0.2317	0.3736
[2] Prop. of zero return days	724,581	0.6349	0.3422	0.3182	0.7368	0.9524
[3] Share turnover	724,581	0.1539	0.3422	0.0030	0.0307	0.1347
[4] Log(Amihud measure)	383,485	-5.0477	3.1586	-7.1610	-5.0467	-2.8990
[5] Log(Bid-ask spread)	163,364	-2.4023	1.5972	-3.4329	-2.2513	-1.2528

Panel B: Correlation matrix

Variable	# Firms months	[1]	[2]	[3]	[4]	[5]
[1] Liquidity	724,581		-0.9705	0.9120	-0.5837	-0.6499
[2] Prop. of zero return days	724,581	-0.8644		-0.8212	0.6564	0.6761
[3] Share turnover	724,581	0.8584	-0.4842		-0.4103	-0.5660
[4] Log(Amihud measure)	383,485	-0.5379	0.6522	-0.3391		0.8857
[5] Log(Bid-ask spread)	163,364	-0.6241	0.6615	-0.4190	0.8839	

This table compares our liquidity proxy and its input variables (see Table 3 in the paper for details) with two commonly used liquidity measures: The *Amihud measure* is the median daily price impact in a given month. We follow Amihud (2002) and compute the daily price impact as the absolute log return divided by U.S. dollar trading volume (measured in thousands). We compute monthly medians using days with non-zero returns (e.g., Daske et al., 2008). The *bid-ask spread* is the median daily percent spread in a given month. The daily percent spread is the difference between the closing ask price and the closing bid price, divided by the midpoint. We use the natural logarithm of the *Amihud measure* and the *bid-ask spread* because both variables are right-skewed. Panel A presents descriptive statistics at the firm-month level. Panel B reports Spearman (above the diagonal) and Pearson (below the diagonal) correlations at the firm-month level. All correlations are statistically significant at the 1% level (two-tailed). For consistency with the regression analysis reported in Table 4 in the paper (based on the NASDAQ venue history), we exclude months in which firms change trading venues.

Table IA.4b

Panel A: All P&D firm months

Independent variables	Dependent variable: Crash risk (t to t+2)			
	All venues		NBB only	
Pump and Dump	0.169***	0.100***	0.209***	0.082***
	(9.91)	(6.26)	(6.57)	(2.81)
Trading venue indicators	Yes	Yes		
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	501,286	501,286	178,255	178,255
R-squared	0.07	0.16	0.07	0.20

Panel B: Matched P&D firm months only

Independent variables	Dependent variable: Crash risk (t to t+2)			
	All venues		NBB only	
Pump and Dump	0.220***	0.141***	0.283***	0.117**
	(7.68)	(5.26)	(5.66)	(2.54)
Trading venue indicators	Yes	Yes		
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	501,286	501,286	178,255	178,255
R-squared	0.07	0.16	0.07	0.20

This table presents regression analyses relating crash risk to pump and dump (P&D) schemes. For details on the proxy for crash risk (t to t+2), see Table 3 in the paper. The basic research design is the same as in Table 5, Panel B of the paper including the sample filter (i.e., the month of and the six months before changes in SEC filing and/or manual inclusion status are excluded). *Pump and Dump* is a dummy variable equal to one for months in which firms are subject to market manipulation by the P&D schemes, and zero otherwise. We identify P&D schemes from four data sources: (1) the database compiled by Frieder and Zittrain (2008); for details, see www.cyber.law.harvard.edu/stockspam; (2) the Stock Spam Effectiveness Monitor that is used by Hanke and Hauser (2008); for details, see www.crummy.com/features/StockSpam; (3) www.spamnation.info; this website is now offline, we use a copy from February 2012; (4) the Qwoter's Spam Report; for details, see www.qwoter.com/spam. In Panel A, the *Pump and Dump* indicator equals one for 1,077 firm-months with a P&D scheme according to at least one data source. In Panel B, the *Pump and Dump* indicator equals one for a subset of 356 firm-months with a P&D scheme according to all four data sources. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively

IA.5 Liquidity changes around trading venue transitions

We examine liquidity changes around trading venue transitions to tighten identification. If venue differences and the associated disclosure regimes drive the differences in liquidity in the main analysis reported in the paper, we should find a change in liquidity around venue transitions, with liquidity deteriorating when the regime weakens and improving when the regime strengthens. Accordingly, we study the change in monthly liquidity in a short window from 6 months before through 6 months after the date of a firm's transition from one trading venue to another. We map out the liquidity response by estimating a separate coefficient for each month in event time, while including year-month and transition fixed effects.

Table IA.5 presents the key coefficient estimates. Figure IA.5 plots these coefficient estimates for selected specifications. For transitions from NBB (Pink Sheets or Grey Market) to BB (Bulletin Board), the coefficient estimates on the pre-transition indicators are significantly negative, while those on the post-switch indicators are significantly positive. Since the base case is liquidity in the transition month, these coefficients imply that liquidity is lower before the transition and higher afterwards. The pre-transition coefficients are fairly uniform with no apparent trend. The difference in the coefficients around the transition (month m+1 relative to month m-1) is four times larger than the next largest difference in the coefficients for adjacent months. For BB to NBB transitions, this pattern is reversed.

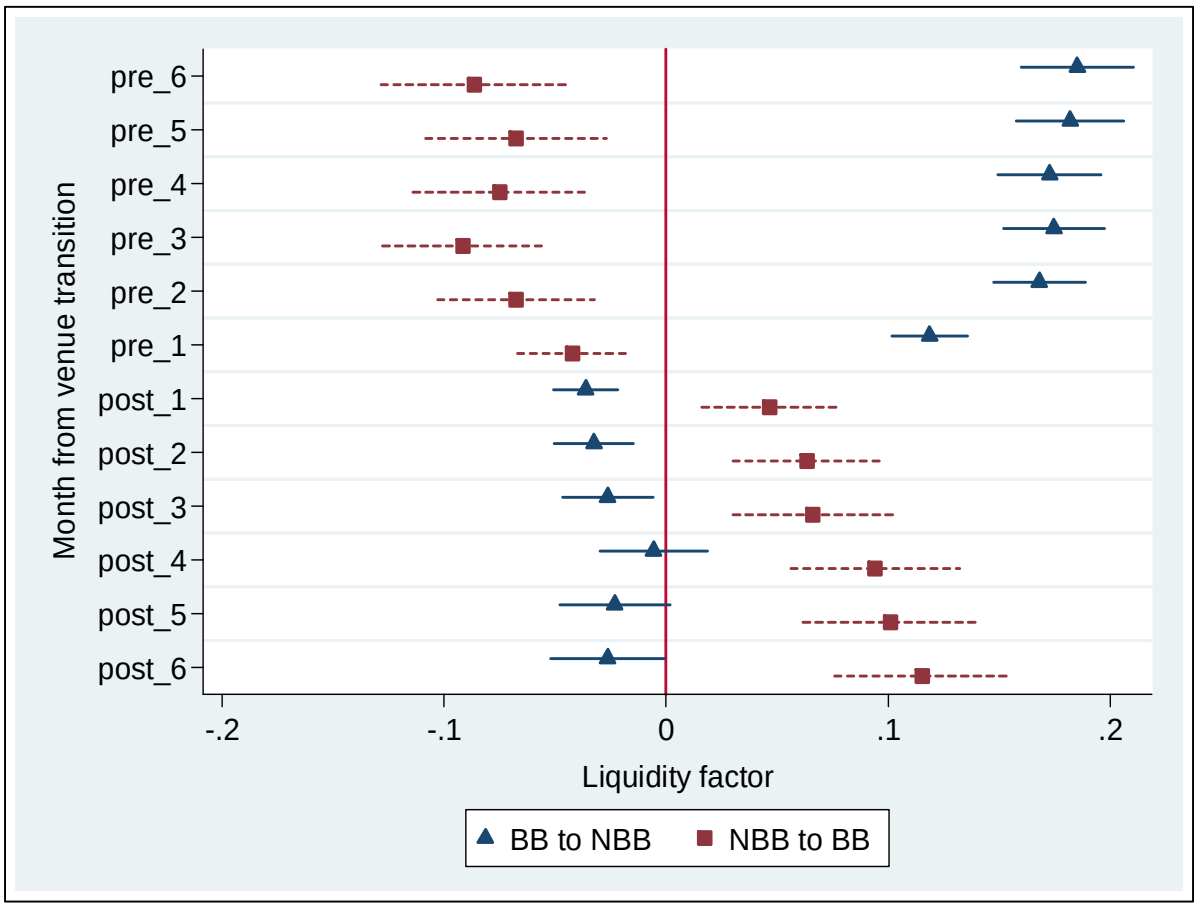
These results imply that liquidity improves significantly when a firm moves from the NBB to the BB (i.e., when the regulatory regime strengthens) and declines significantly when a firm moves from the BB to the NBB (i.e., when its regulatory regime weakens). The effects occur right around the transition month. There is little evidence of pre-transition trends in liquidity, as would be expected with reverse causality.

Table IA.5

Independent variables	Dependent variable: Liquidity (t)			
	NBB to BB		BB to NBB	
	All	Clean only	All	Clean only
Pre-Transition (m-6)	-0.086***	-0.076***	0.185***	0.141***
Pre-Transition (m-5)	-0.068***	-0.072***	0.182***	0.125***
Pre-Transition (m-4)	-0.075***	-0.064***	0.173***	0.140***
Pre-Transition (m-3)	-0.091***	-0.090***	0.175***	0.142***
Pre-Transition (m-2)	-0.068***	-0.069***	0.168***	0.127***
Pre-Transition (m-1)	-0.042***	-0.037**	0.119***	0.107***
Post-Transition (m+1)	0.047***	0.044**	-0.036***	-0.057***
Post-Transition (m+2)	0.063***	0.064***	-0.033***	-0.065***
Post-Transition (m+3)	0.066***	0.064***	-0.026**	-0.054**
Post-Transition (m+4)	0.094***	0.082***	-0.006	-0.013
Post-Transition (m+5)	0.101***	0.078***	-0.023*	-0.010
Post-Transition (m+6)	0.115***	0.101***	-0.026**	-0.020
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Transition fixed effects	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	8,621	5,631	32,074	6,976
R-squared	0.70	0.70	0.66	0.68

This table presents regression analyses relating liquidity to trading venue transitions. For details on the proxy for liquidity, see Table 3 in the paper. The regressions focus on 13-month windows around venue transitions. We exclude transitions of firms that switch venues multiple times during this window. All regressions are estimated at the firm-month level and include year-month and transition fixed effects. The first specification examines 842 transitions from the NBB (Pink Sheets or Grey Market) to the BB (Bulletin Board). The second specification analyzes a subset of 554 clean transitions from the NBB to the BB. This subset includes only those firms that do not change their SEC filing status during the transition window. The third (fourth) specification focuses on 2,595 transitions (a subset of 567 clean transitions) from the BB to the NBB. All specifications include indicators for each of the 6 months before and the 6 months after the transition (i.e., the transition month, *m*, is the omitted category). We also include, but do not report the coefficients on, indicators for SEC filing and manual inclusion status, lagged control variables and price-level controls. The table reports OLS coefficient estimates. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively, based on standard errors clustered by firm.

Figure IA.5



This figure plots the coefficient estimates on the transition indicators, together with upper and lower 95% confidence values, for the first and third specifications reported in Table IA.5.

IA.6 E-Ticker Analysis

In this analysis, we exploit the fact that the Bulletin Board (BB) adds an "E" suffix to a firm's ticker to flag to the market that the firm is delinquent in its SEC reporting. This institutional feature enables us to tighten the link between market quality and SEC reporting, since the ticker suffix is a timely indicator of the firm's reporting status and tied only to SEC reporting. As an additional test, we can compare the estimated market quality effects for firms that subsequently return to compliance with SEC reporting requirements – causing the "E" to be removed – and firms that are eventually forced off the Bulletin Board to the Pink Sheets or the Grey Market (NBB) due to non-compliance. If SEC reporting drives the market quality results reported in the paper, we expect market quality to deteriorate following the addition of the "E" suffix. Furthermore, the effect should be smaller for firms that are only temporarily non-compliant.

The first specification in each panel shows that the coefficient on *E-Ticker* is negative for liquidity and positive for crash risk, and statistically significant in each case. Thus, as soon as the ticker indicates delinquency in SEC reporting, market quality declines, i.e., liquidity drops and crash risk increases. The second specification shows that the coefficients are larger in magnitude for *E-Ticker BB-to-NBB* than *E-Ticker BB-to-BB*. Thus, the reduction in liquidity and the increase in crash risk are larger for firms that never return to SEC compliance compared to firms that are only temporarily non-compliant. These findings support our interpretation that SEC reporting requirements drive the stock liquidity and crash risk effects reported in the paper.

Table IA.6

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
[1] E-Ticker	-0.035***		0.123***	
	(-5.84)		(21.13)	
[2a] E-Ticker BB-to-BB		-0.027***		0.020***
		(-3.65)		(3.40)
[2b] E-Ticker BB-to-NBB		-0.049***		0.310***
		(-5.25)		(27.84)
[2a] - [2b] = 0 [p-value]		[0.05]		[<0.01]
Trading venue indicators	Yes	Yes	Yes	Yes
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	732,584	732,584	593,243	593,243
R-squared	0.62	0.62	0.16	0.16

This table presents regression analyses relating liquidity and crash risk to delinquency in SEC reporting on the Bulletin Board. For details on the proxies for liquidity and crash risk, see Table 3 in the paper. All regressions are estimated at the firm-month level and include year-month and firm fixed effects. The analyses are based on the NASDAQ venue history (period: January 2001 to October 2010) and include firm-month observations from all venues. *E-Ticker* is a dummy variable equal to one if a firm's ticker is temporarily suffixed with the letter "E", and zero otherwise. The Bulletin Board adds this suffix to flag firms that are delinquent in their SEC reporting. *E-Ticker BB-to-BB* indicates one subset of the E-Ticker cases where firms subsequently return to compliance with SEC reporting requirements and are therefore allowed to stay on the Bulletin Board. *E-Ticker BB-to-NBB* indicates the other subset of the E-Ticker cases where firms never return to compliance with SEC reporting requirements and are forced to leave the Bulletin Board. We also include, but do not report the coefficients on, trading venue indicators, indicators for SEC filing and manual inclusion status, lagged control variables and price-level controls (see Tables 4 and 5 in the paper for details). No filters are imposed in these analyses. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

IA.7 SEC filing and manual inclusion for financial companies

This analysis exploits the fact that financial companies (i.e., banks and insurance companies) are regulated and required to provide disclosure filings to their respective regulators. As a result of this institutional feature, we expect that SEC reporting and manual inclusion are less important for the information environment of financial companies. Thus, the effects of SEC and manual reporting on liquidity and crash risk should be smaller for banks and insurance companies, all else equal. We consider this analysis as an alternative way to test whether SEC reporting and manual inclusion drive the market quality results reported in the paper.

We retrieve industry details from several databases (SNL, Datastream, Worldscope and Factset) and focus on the subset of firms for which at least two of these databases provide coincident information. We estimate the models reported in Table 5 in the paper, but add terms that interact the variables *Manual* and *SEC* with a *Financials* indicator variable that is equal to one for banks and insurance companies, and zero otherwise.

Table IA.7 shows that the coefficients on *SEC*Financial* and *Manual*Financial* are, as expected, significantly negative for liquidity and significantly positive for crash risk when using firm-month observations from all venues. When focusing on the subset of NBB firms (i.e., firms traded in the Pink Sheets or the Grey Market) that do not report to the SEC, the coefficients on *Manual*Financial* are significantly negative for liquidity, but not significant for crash risk. Thus, in this sample, the manual results are somewhat weaker. Overall, however, the coefficients on the interactions are generally significant and of the opposite sign to the main effects, indicating weaker or even non-existent effects for financial companies. These findings corroborate our interpretation that SEC reporting and manual inclusion drive market quality and ease concerns about alternative explanations (such as omitted variables).

Table IA.7

Panel A: Liquidity (t)

Independent variables	Dependent variable: Liquidity (t)			
	All venues		NBB with SEC = 0 only	
[1a] Manual	0.075***	0.066***	0.141***	0.109***
	(8.69)	(9.62)	(9.57)	(10.92)
[1b] Manual * Financials	-0.095***	-0.046***	-0.118***	-0.049**
	(-5.99)	(-3.12)	(-3.09)	(-2.03)
[2a] SEC	0.065***	0.060***		
	(5.24)	(6.83)		
[2b] SEC * Financials	-0.178***	-0.088***		
	(-8.97)	(-3.88)		
[1a] + [1b] = 0 [p-value]	[0.14]	[0.11]	[0.53]	[<0.01]
[2a] + [2b] = 0 [p-value]	[<0.01]	[0.21]		
Trading venue indicators	Yes	Yes		
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	586,435	586,435	201,378	201,378
R-squared	0.42	0.63	0.14	0.50

Panel B: Crash risk (t to t+2)

Independent variables	Dependent variable: Crash risk (t to t+2)			
	All venues		NBB with SEC = 0 only	
[1a] Manual	-0.032***	-0.006	-0.036***	-0.020
	(-10.68)	(-1.23)	(-2.92)	(-1.23)
[1b] Manual * Financials	0.045***	0.026**	-0.019	0.015
	(7.48)	(2.46)	(-0.50)	(0.32)
[2a] SEC	-0.057***	-0.060***		
	(-6.70)	(-6.52)		
[2b] SEC * Financials	0.090***	0.057**		
	(5.89)	(2.35)		
[1a] + [1b] = 0 [p-value]	[0.02]	[0.04]	[0.12]	[0.90]
[2a] + [2b] = 0 [p-value]	[0.05]	[0.90]		
Trading venue indicators	Yes	Yes		
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	421,539	421,539	118,092	118,092
R-squared	0.07	0.16	0.08	0.21

This table presents regression analyses relating liquidity (Panel A) and crash risk (Panel B) to SEC filing and manual inclusion status for financial companies. For details on the proxies for liquidity and crash risk, see Table 3 in the paper. The basic research design is the same as in Table 5 in the paper. In addition, we interact the key variables *Manual* and *SEC* with the dummy variable *Financials* that is equal to one for banks and insurance companies, and zero otherwise. For this analysis, we retrieve industry details from several databases (SNL, Datastream, Worldscope and Factset) and focus on the subset of firms for which at least two of these databases provide coincident information. The first two specifications include firm-month observations from all venues. The third and fourth specifications focus on firm-month observations from the NBB (Pink Sheets and Grey Market) for firms that are not registered with the SEC. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

IA.8 Adding firm fixed effects to the analysis of state merit reviews

In order to tighten identification in our state merit review analysis, we employ a more restrictive fixed effects structure. The regressions in the paper use industry fixed effects. Here, we employ firm fixed effects. Recall that the state merit review variable is assigned on the basis of the state in which a firm's headquarters is located. The inclusion of firm fixed effects means that the merit review coefficients are identified based on changes in firms' state of headquarters.

We identify 1,472 cases in which firms change their state of headquarters during the sample period. Table IA.8 shows that the results for liquidity become even stronger when we include firm fixed effects. For example, the coefficient estimate on *Merit Review* is 0.019 (t-statistic 2.99) with industry fixed effects (see Table 6 in the paper), but is twice as large with firm fixed effects (0.038; t-statistic 2.56). The coefficient on *Merit review (w/o manual exemption)* also doubles. The result that the coefficient on *Merit review* is larger in states without a manual exemption than in states with a manual exemption is similar to that reported in Table 6 of the paper. For crash risk, the coefficients remain insignificant and close to zero, similar to the results reported in the paper. Overall, these results should ease concerns about alternative explanations or omitted variables.

Table IA.8

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
Merit review	0.038**		0.010	
	(2.56)		(1.18)	
Merit review (with manual exemption)		0.024		0.003
		(1.47)		(0.36)
Merit review (w/o manual exemption)		0.046***		0.014
		(2.89)		(1.53)
SoInc ≠ SoHqt	0.013	0.009	-0.015	-0.017
	(0.60)	(0.41)	(-1.11)	(-1.26)
Trading venue indicators	Yes	Yes	Yes	Yes
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	550,930	550,930	433,215	433,215
R-squared	0.53	0.53	0.16	0.16

This table presents regression analyses relating liquidity and crash risk to the strictness of Blue Sky laws at the state level. For details on the proxies for liquidity (t) and crash risk (t to t+2), see Table 3 in the paper. The basic research design is the same as in Table 6 in the paper except that the regressions in this table include firm fixed effects instead of industry fixed effects. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

IA.9 Pink Sheets information tiers and financial companies

In this section, we exploit the fact that financial companies (i.e., banks and insurance companies) are subject to additional disclosure requirements. Consequently, market quality is less likely to be affected by information regimes in the Pink Sheets. The analysis is similar to the analysis in section IA.7. Namely, we use the same research design as in our main tests (Table 7 in the paper) but add terms that interact the key variables with a *Financials* indicator variable. This indicator is equal to one for banks and insurance companies, and zero otherwise. For this analysis, we combine firms in the Pink Limited Information and Pink Current Information tiers.[2]

Table IA.9 shows that the coefficient estimates on *Pink No Info*Financial* and *Pink Limited/Current*Financial* are negative for the liquidity and positive for crash risk. More importantly, the sum of the main effect and the corresponding interaction term is insignificantly different from zero in all specifications, which implies that liquidity and crash risk for financial companies does not vary across the Pink Sheets information tiers. These findings support our interpretation that Pink Sheets information regimes drive the market quality effects in our main analysis.

[2] Untabulated statistics show that about 60% of all firm-month observations in the PS tier history belong to the Pink No Information tier followed by the Pink Limited Information tier (about 20%) and the Pink Current Information tier (about 15%). To boost power, we combine the latter two categories, for which information availability is substantially greater than for the first group.

Table IA.9

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
[1a] Pink No Info	0.163***	0.195***	-0.066**	-0.325***
	(5.32)	(5.43)	(-2.02)	(-4.57)
[1b] Pink No Info * Financials	-0.123	-0.373	0.134	0.479
	(-0.99)	(-1.43)	(1.34)	(1.06)
[2a] Pink Limited/Current	0.452***	0.335***	-0.112***	-0.427***
	(12.62)	(8.49)	(-3.31)	(-5.96)
[2b] Pink Limited/Current * Financials	-0.344***	-0.419	0.120	0.600
	(-2.77)	(-1.64)	(1.20)	(1.37)
[1a] + [1b] = 0 [p-value]	[0.74]	[0.50]	[0.47]	[0.73]
[2a] + [2b] = 0 [p-value]	[0.36]	[0.74]	[0.93]	[0.69]
Caveat Emptor indicator	Yes	Yes	Yes	Yes
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	60,785	60,785	36,233	36,233
R-squared	0.17	0.61	0.06	0.27

This table presents regression analyses relating liquidity and crash risk to Pink Sheets information tiers for financial companies. For details on the proxies for liquidity and crash risk, see Table 3 in the paper. The basic research design is the same as in Table 7 in the paper except that we combine firms in the Pink Limited Information and Pink Current Information tiers. In addition, we interact the key variables *Pink No Info* and *Pink Limited/Current Info* with a *Financials* dummy variable that is equal to one for banks and insurance companies, and zero otherwise. For this analysis, we retrieve industry details from several databases (SNL, Datastream, Worldscope and Factset) and focus on the subset of firms for which at least two of these databases provide coincident information. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

IA.10 Regime changes in the Pink Sheets

In this section, we examine the effects of four major regime changes in the Pink Sheets that were aimed at enhancing transparency in this market.[3] This analysis tightens identification related to the role of information regimes in the OTC market because the regime changes are set at the market level and hence exogenous to any given firm. If these initiatives are valued by investors, we expect the changes to increase market quality.

A first indication that these regime changes have been influential is the steady decline in the number of firms quoted on the Bulletin Board (BB) but not the Pink Sheets.[4] To analyze the regime changes more formally, we create a *Regime index* that starts at zero and increases to 0.25 (as of June 2003), 0.50 (as of August 2007), 0.75 (as of June 2009) and to 1.00 (as of April 2010). We then introduce the interaction term *BB* × *Regime index* in order to capture the effects of these regime changes on BB firms (for which the indicator variable *BB* is one) relative to NBB firms (i.e., firms traded in the Pink Sheets or the Grey Market).

Table IA.10 presents the results of regressions that relate liquidity and crash risk to the *BB* indicator and the interaction term between *BB* and *Regime Index*. The analyses are based on BB and NBB firm-month observations from the NASDAQ venue history (period: January 2001 to October 2010). We present models with year-month and either industry or firm fixed effects.

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[3] In June 2003, the Pink Sheets introduced Pink Link, an electronic messaging and automated trade negotiation service to replace the telephone-based communication process. In August 2007, they introduced the information tiers. In June 2009, they introduced Real-Time+, which offers real-time pricing data to all investors at no cost. Traditional exchanges make such data available only with a 15-minute delay. In April 2010, the Pink Sheets refined their information tiers and introduced the OTCQB category (see Appendix 1.1 in the paper).

[4] Untabulated analyses show that the fraction of BB-only firms has fluctuated between 5% and 10% between mid-2003 (when we start to have data that allow us to reliably identify finer categories of OTC firms) and mid-2007. Starting in August 2007, the fraction declines and falls below 1% in 2010. By October 2010, there are eight BB-only firms left in our sample.

Thus, all models include a flexible time trend to capture general and unrelated changes in the Pink Sheets market.

The first two specifications show that market liquidity is generally higher for BB firms. However, the coefficient estimate on the interaction term is negative, implying that the liquidity advantage for BB stocks relative to NBB stocks declines over time. In fact, the combined effect at the end of the sample period (when the regime index takes a value of 1) is close to zero suggesting that, by October 2010, liquidity for NBB stocks is close to that for BB firms. The third and fourth specifications illustrate that the results for crash risk are similar. Specifically, BB stocks initially have lower crash risk, but stocks solely quoted in the NBB catch up over time.

Overall, the results in this section show that the market quality advantage (i.e., higher liquidity and lower crash risk) of dually-quoted BB stocks relative to stocks that are solely quoted in the NBB has declined over time. This advantage seems to have disappeared steadily as a result of successive regime changes in the Pink Sheets.

Table IA.10

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
BB	0.340***	0.305***	-0.114***	-0.160***
	(25.32)	(27.51)	(-15.04)	(-16.98)
BB x Regime index	-0.390***	-0.229***	0.140***	0.038**
	(-21.93)	(-13.39)	(11.99)	(2.55)
Manual and SEC indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Yes	Yes	Yes	Yes
# Firm months	596,415	596,415	351,520	351,520
R-squared	0.22	0.52	0.07	0.18

This table presents regression analyses relating liquidity and crash risk to regulatory changes in the Pink Sheets markets. For details on the proxies for liquidity (t) and crash risk (t to t+2), see Table 3 in the paper. All regressions are estimated at the firm-month level and include year-month and either industry or firm fixed effects. The analyses are based on the NASDAQ venue history (period: January 2001 to October 2010) and include only firm-month observations from the OTC market (BB and NBB). *BB* is a trading venue indicator for firms traded on the OTC Bulletin Board. *Regime index* is an ordinal variable that increases with major reforms in the Pink Sheets regulatory regime. It takes the value of 0 (from the start of the sample period until May 2003), 0.25 (from June 2003 to July 2007), 0.5 (from August 2007 to May 2009), 0.75 (from June 2009 to March 2010) and 1 (from April 2010 to the end of the sample period). We also include, but do not report the coefficients on, indicators for SEC filing and manual inclusion status, lagged control variables and price-level controls (see Tables 4 and 5 in the paper for details). The analyses are subject to the following filters: for the liquidity regressions, we exclude months in which firms change their trading venue and/or the variable *Regime index* increases; for the crash risk regressions, the month of and the six months before such changes are excluded. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

IA.11 Extending the fixed effects structure

In this section, we provide additional analyses extending the fixed effects structure in our main models. These analyses gauge the sensitivity of our findings to unobserved industry as well as geographic shocks to mitigate concerns about omitted variables. To control for (observed and unobserved) economic shocks that are specific to certain industries, we interact industry and year-month fixed effects (see Panel A of Table IA.11). Likewise, we control for economic shocks that are geographic in nature by including *State of Headquarters * year-month* fixed effects (see Panel B) and *State of Incorporation * year-month* fixed effects (see Panel C). We also estimate models that include interactions between the trading venue indicators and firm characteristics, such as return volatility and size, to allow for different coefficients on the key control variables by venue (not tabulated). We find that these extensions do not materially alter the coefficient estimates for our key variables *Manual* and *SEC*. Thus, the findings reported in the paper are robust to these extensions. This analysis further mitigates concerns that omitted variables or unobserved shocks drive our SEC reporting and manual inclusion results.

Table IA.11

Panel A: Industry x year-month

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
Manual	0.055***	0.057***	-0.028***	-0.002
	(7.80)	(9.92)	(-10.69)	(-0.51)
SEC	0.034***	0.049***	-0.058***	-0.072***
	(3.23)	(6.40)	(-7.54)	(-8.52)
Trading venue indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Interaction with Industry		Interaction with Industry	
# Firm months	713,217	713,217	501,286	501,286
R-squared	0.40	0.63	0.07	0.17

Panel B: State of headquarters (SoHqt) x year-month

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
Manual	0.062***	0.058***	-0.026***	-0.003
	(8.70)	(10.03)	(-9.89)	(-0.65)
SEC	0.033***	0.051***	-0.055***	-0.068***
	(3.14)	(6.62)	(-7.19)	(-8.07)
Trading venue indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Interaction with SoHqt		Interaction with SoHqt	
# Firm months	713,217	713,455	501,286	501,470
R-squared	0.41	0.63	0.08	0.17

Panel C: State of incorporation (SoInc) x year-month

Independent variables	Dependent variable: Liquidity (t)		Dependent variable: Crash risk (t to t+2)	
Manual	0.066***	0.058***	-0.022***	-0.001
	(9.26)	(10.04)	(-8.38)	(-0.28)
SEC	0.033***	0.051***	-0.058***	-0.071***
	(3.18)	(6.58)	(-7.80)	(-8.36)
Trading venue indicators	Yes	Yes	Yes	Yes
Control variables (lagged)	Yes	Yes	Yes	Yes
Price-level indicators	Yes	Yes	Yes	Yes
Firm fixed effects		Yes		Yes
Industry fixed effects	Yes		Yes	
Year-month fixed effects	Interaction with SoInc		Interaction with SoInc	
# Firm months	713,217	713,455	501,286	501,470
R-squared	0.41	0.63	0.08	0.17

This table presents regression analyses relating liquidity and crash risk to the SEC filing and manual inclusion status of the sample firms. For details on the proxies for liquidity (t) and crash risk (t to t+2), see Table 3 in the paper. The basic research design is the same as in Table 5 in the paper, and uses firm-month observations from all venues. In this table, we enhance the basic design by including extended fixed effects. In Panel A, we add interacted *industry* x *year-month* fixed effects to capture shocks that are specific to certain industries. In Panel B (Panel C), we add interacted *state of headquarters* x *year-month* (*state of incorporation* x *year-month*) fixed effects to control for shocks that are geographic in nature. The table reports OLS coefficient estimates and (in parentheses) t-statistics. The t-statistics are based on standard errors clustered by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed), respectively.

IA.12 Short selling in the OTC market

In this section, we provide evidence on how difficult it is to short sell stock in the OTC market. Table IA.12 presents statistics on the supply of stock lending for short selling at the firm-quarter level. The analysis is based on a dataset that includes information on the supply of lendable stocks and covers the period 2006Q3 to 2010Q3.[5]

Panel A shows that the dataset covers only a fraction of our sample. However, coverage varies systematically as data are more likely to be available for firms in regulated trading venues and – within trading venues – for firms that have higher market values. For example, data coverage is 21.5% for firms in the Bulletin Board (BB) but only 4.3% for firms in the Grey Market. The median market value is $18.8 million for covered BB firms compared to $9.0 million for the full BB sample. To the extent that stocks of large firms are more likely to be subject to short selling (e.g., D'Avolio, 2002), the dataset therefore overestimates the prevalence of short selling activity.

Panel B illustrates that the supply of lendable stocks is negligible in the OTC market, even for the subsample of larger firms with available data. There is no supply at all for more than half of the firm-quarters in the BB and the NBB (Pink Sheets and Grey Market). The mean supply of lendable stocks across these firm-quarters is $670,000 or 1.46% relative to market value. This evidence is very different from the statistics in Prado et al. (2016) who focus on U.S. stocks at traditional exchanges over the same period. They document an average supply of 20.02% relative to market value.

[5] We are very grateful to Pedro Saffi for running our sample through his dataset of stock lending supply. See Prado et al. (2016) for details on the data.

Taken together, the analysis in this section provides strong evidence that short selling is extremely difficult in the OTC market. Consequently, even sophisticated investors will find it hard, if not impossible, to correct overpricing in this market.

Table IA.12

Panel A: Data availability

Venue		Full sample			Subsample with available data		
		# Firm quarters	Market value ($US) Mean	Median	# Firm quarters	Market value ($US) Mean	Median
NBB	Missing	19,533	15,894,018	392,750	354	64,587,847	13,695,743
NBB	Grey Market	4,695	7,873,281	13,548	202	25,004,705	84,294
NBB	Pink Sheets	34,444	10,362,585	359,943	2,502	38,384,581	4,479,072
BB		43,145	26,791,018	8,975,999	9,264	41,089,201	18,802,094
Total OTC		101,817	18,270,527	2,029,790	12,322	40,951,439	15,207,406
SCM (Benchmark or to/from OTC)		4,670	55,346,473	32,399,215	3,821	60,790,609	36,284,960
Exchange (to/from OTC)		8,177	158,771,470	83,317,504	7,474	166,442,352	91,357,540

Panel B: Statistics on supply of lendable stocks

Venue		Subsample with available data					
		# Firm quarters with Supply > 1,000,000 $US	1,000 $US	Supply ($US) Mean	Median	Supply / Market value Mean	Median
NBB	Missing	54	160	2,122,804	300	1.62%	0.01%
NBB	Grey Market	11	50	753,221	0	7.97%	0.00%
NBB	Pink Sheets	369	1,414	2,028,179	3,500	4.24%	0.20%
BB		412	3,055	245,527	0	0.56%	0.00%
Total OTC		846	4,679	669,753	0	1.46%	0.00%
SCM (Benchmark or to/from OTC)		1,190	3,141	2,776,512	263,000	2.58%	0.95%
Exchange (to/from OTC)		4,961	7,122	24,574,340	3,942,850	8.94%	5.37%

This table presents descriptive statistics on the supply of lendable stocks in the OTC market by trading venue at the firm-quarter level. The dataset covers the period 2006Q3 to 2010Q3. Panel A shows how many firm-quarters in our sample are covered by this dataset and compares average market values in U.S. dollars across the full sample and the covered subsample. Panel B provides statistics on the supply of lendable stocks in U.S. dollars and relative to the firms' market values. For details on the trading venue categories, see Table 3 in the paper.

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