Improving Disclosure Incentives for Thinly Traded Stocks by Varying the Market Microstructure

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Extended abstract

Two distinct literatures discuss their own interpretations of ‘transparency’ associated with trading stocks. The disclosure literature adopts an interpretation for transparency in terms of the visibility of communication that a firm adopts for public releases of information to the market. This literature focuses upon the quantity and quality of the contents of corporate news wire releases and financial statements. In contrast the market microstructure literature adopts an interpretation in terms of the level of visibility of the trading process used to auction a stock. In this literature the focus is upon the differential information that agents such as market makers have in the details of the auction trading process in order driven versus quote driven markets or some hybrid variant. To date these two literatures have remained largely separated.

In this research we argue that for thinly traded stocks the incentives for firms to improve disclosure of their market position and prospects depends critically upon the market microstructure within which the stocks are traded. Thus for instance, if regulators or stock exchanges adopt an objective of wanting to improve the market visibility of previously thinly traded stocks we suggest it is insufficient to simply recommend or require such firms simply increase disclosure. This research suggests that the benefits from increased disclosure may only be captured by the firms if an appropriate trading mechanism is simultaneously put in place since otherwise other interested parties such as market makers, and not the firms, may capture the gains from increased disclosure. The research uses the London Stock Exchanges AIM market, introduction of a hybrid order driven system (initially called SETSmm) to test for the differential benefits of disclosure associated with a change in market microstructure. The contribution of this research is to understand the interactions between trading mechanism design and the economic incentives for disclosure to show how variation in trading mechanism affects the net benefits of disclosure for thinly traded firms.
1 INTRODUCTION

There exists a large literature on corporate disclosure which links observed disclosure practice to economic variables such as the cost of capital that a firm faces in order to finance expansion. However, a relatively small portion of this literature focuses upon the thinly traded stocks of smaller companies and the specific problems they face to change status. It is as if such stocks typically have poor disclosure and relatively small analysts following and thus are doomed to face a continuing higher cost of capital. In a related sense Bushee and Leuz (2005) studied the economic consequences of an SEC regulatory change which introduced a requirement that all firms listing on the OTC Bulletin Board comply with the reporting requirements under the Securities Exchange Act of 1934. Bushee and Leuz (B&L) used this one-off regulatory reform change to investigate how firms balanced the tradeoff between increased disclosure on the revised OTCBB market versus alternatively going “pink” listing instead on Pink Sheets\(^1\) or going private. B&L found that close to three quarters of firms decided to go pink and not be subject to SEC disclosure requirements. Analysis of the going pink sample showed that the firms were typically characterized as smaller, less leveraged and more profitable and that for those firms it was argued that the costs of increased disclosure did not outweigh the benefits. That is the type of results that B&L document suggest that there is a very steep change in reporting behavior between the larger disclosure complying firms and the smaller non-compliers’. However to the extent one is concerned with attracting a larger sample of smaller firms to disclose on a public transparent market it is logical to ask the question what instruments are there in place that could change how smaller firms manage the disclose versus do not disclose trade-off. This is a concern because the steep change in observed disclosure suggests it may be difficult for “smaller” firms to evolve into “larger” firms without incurring considerable costs.

The above discussion suggests there may exist a discontinuity in the evolutionary path of firms caused by costs of disclosure. To understand why this discontinuity may be a significant block to evolutionary growth of firms we note that researchers have argued

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\(^1\) Pink sheets are not regulated by the SEC and there is much reduced transparency and liquidity.
that small thinly traded stocks may end up in liquidity traps which they find hard to escape because traders may conjecture that the liquidity in a stock is too low and will direct their attention elsewhere. However such conjectures may become self-fulfilling if sufficiently widespread since as traders stop following a stock they reduce the trading volume and end up validating the initial belief leading the market into a low trade, low-liquidity trap (Pagano (1989)) in which disclosures made by firms may essentially be ignored and thus in equilibrium the firm does not increase disclosure.

Research in market microstructure has considered what sort of exchange trading mechanism design is best suited to help improve liquidity of small companies that are thinly traded. However, this literature typically does not incorporate corporate disclosure policy as a strategic variable. One contribution of this research is to understand the interactions between trading mechanism design and the economic incentives for disclosure to show how such discontinuities can be mitigated by understanding how the variation in trading mechanism affects the net benefits of disclosure for thinly traded firms. Put simply for some quote based trading mechanisms firms experience less benefit from increased disclosure because other market trading participants such as market makers in the stock capture significant rents. As the trading mechanism is made more transparent with hybrid or pure order driven exchange trading\(^2\) the rents to market makers reduce and the firms start to accrue a greater share of the benefits from disclosure.

To summarize we note it is well known that institutional features of stock exchanges are a major determinant of the liquidity in traded stocks. That is the choice of exchange market microstructure which specifies the transparency of the trading behavior of all market participants may have a major determining effect on how smaller firms manage the disclosure trade-off. In this research we explore whether varying the transparency of trading behavior on an exchange can have a positive influence on the incentives for a thinly traded firm to increase corporate disclosure and thus while becoming more transparent able to escape from a potential self fulfilling liquidity trap\(^3\).

\(^2\) See Espinosa, Tapier and Trombetta (2008)

\(^3\) Pagano (1989).
For our research design we exploit a recent institutional change that took place on the AIM market of the London Stock Exchange. Before 2005 all stocks on the AIM market where traded using a (SEAQ) quote driven system in which market makers provided bid ask spreads. More detail is provided in the following subsection. The essential feature of the quote driven system was that there was very restricted transparency of trades with market makers being in a monopolistic situation as the only economic agents knowing the trading intentions of market participants. A concern with such a microstructure is that while market makers provide liquidity in a stock they may use their asymmetric access to information when setting bid ask spreads to earn large trading profits. An alternative system is an order driven computerized system (SETS) in which all trades are transparent. However, for thinly traded stocks pure order driven systems may suffer from episodes of (transparent) low liquidity. In response the London Stock Exchange decided to introduce a hybrid (transparent) order driven system with market makers originally called SETSmm. Thus during the switching period from SEAQ to SETSmm the transparency of the exchange trading varied and it became possible to explore whether this change in market microstructure induced a change in disclosure incentives for the thinly traded stocks on AIM.

The paper is set out as follows. Section 2 reviews the literature on hybrid market microstructure. Section 3 provides research design and hypotheses. Section 4 covers data and empirical testing.

2. HYBRID MARKET MICROSTRUCTURE

Harris (2003) provides a detailed review of the trading protocols used in financial markets. The wide range of protocols can be classified broadly speaking into being either order driven or quote driven markets with a range of hybrid market possibilities mixing specific features from either polar form. In quote driven markets trading contracts are based upon prices set by designated monopoly liquidity suppliers often called market makers. It is sometimes possible to negotiate a better price with a market maker but the
bid and asks of other traders is the private information of the market makers. In contrast, in a pure order driven market, liquidity is provided by the constant flow of orders from traders which is made transparent to all market participants. In such settings ‘transparency’ is defined by the ability of market participants to obtain information on the trading process (pre or post trade). Historically thinly traded stocks were usually traded on quote driven systems since it was believed that the support of market makers was essential to support the liquidity of such stocks. However, this has become increasingly called into question as concerns have been voiced that market makers benefit excessively from low ex-post transparency of trades. A range of new order based markets have been set up for thinly traded stocks which augment the traditional electronic order driven system with a limited role for market makers. It is the introduction of such a system SETSmm on the London AIM markets that will be the principal focus of our study here. Interestingly Nimalendran and Petrella (2003) analyse the introduction of a similar hybrid (order protocol with market makers) market in Italy. Their research focus and design differs from ours but we now provide a short review of their work as it provides some useful insights into our subsequent analysis.

Nimalendran and Petrella (N&P) look at the introduction of a hybrid trading system in the Italian market. They compare different trading structures for companies listed on the same market. On the exchange a specialist is obliged to continuously display bid and ask quotes, within the limits of a maximum allowed spread, and for the execution of a minimum number of lots per trading day. The maximum spread and the minimum number of lots per day for each stock is determined by the Exchange. Specialist quotes are posted on the limit order book, and displayed on the trading terminals to all market participants. Therefore, an ISE specialist is not monopolistic in managing and displaying the book. Rather, any intermediary has access to the electronic limit order book and can place limit orders that compete with the specialists quotes.

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4 A significant literature exists on modelling how transparency of the trading mechanism affects price formation – see for instance Chapter 10 of de Jong and Rindi. That literature focuses upon the relative gains to various types of traders under various transparency settings and not the potential benefits to firms which is our main concern here.

5 This feature reduces structural differences across stocks in the sample, and highlights differential effects induced by different trading mechanisms. A number of studies have a much more limited ability to control for differences in structural characteristics of the underlying securities.
In addition specialists commit themselves to enhance the quality of the information released by companies issuing thinly-traded stocks by agreeing to publish not less than two financial analyses on the stocks for which they act as designated specialist.

For providing market making and financial analysis services, specialists are compensated via a reduction in trading fee by the ISE. Further, they benefit from bid ask spread revenues and possibly lower adverse selection costs due to greater knowledge of the firm (because they establish in-depth and continuous relationships with the company). Finally, they can also receive a side payment from the issuer company.

N&P employ an event study (ES) approach that avoids any problem due to mismatching of firms. In this approach, the same stock is examined in two different trading environments (in our case, pure vs. hybrid order driven systems). This reduces the likelihood that important firm-specific variables will be omitted from the analysis.

The simple event study approach, that contrasts market quality variables measured before and after the switching, is not free from shortcomings either. The possibility that stock fundamentals and risk characteristics may have changed after the switching date could bias the results. To control for this possible bias, they use an event study approach combined with a matched sample of similar firms that do not switch trading systems (CES approach). This allows them to control for any changes in the stocks characteristics over time. The CES approach relies on the results of two event studies: one conducted on the stocks moving from the POD to the HOD system (i.e., benchmark sample), and the second on a set of matched firms that do not change trading regime (i.e., control sample). By comparing the changes in the quality measures for the stocks that switched trading structures with the variations observed for the control sample, they isolate the pure effect due to market structure. In fact, this procedure enables them to control for the presence of factors other than specialist intervention, also possibly affecting market quality in the sample period.
In particular, the specialist – by sanctioning traders exploiting private information – can improve the terms of the trade faced by uninformed traders. The main implication of their model is that benefits of a specialist based market will be greatest when the potential for privately informed trading is greatest.

However, supporting arguments also exist that a specialist could exacerbate the adverse selection problem. In fact, assuming that he/she is actually able to identify trade motivation, the specialist could ‘‘cream-skim’’ liquidity orders and leave informed orders to other liquidity providers. Ready (1999), based on TORQ data combined with SuperDOT information on stopped orders, finds that stops and price improvements by specialists impose adverse selection costs on limit order traders.

3. RESEARCH DESIGN

We commence this section by briefly reviewing the literature on corporate disclosure and explain how our principal research hypotheses combine the results from this literature with the research on market microstructure and trade transparency. We explain how our principal concern is with the potential interaction between disclosure and market microstructure transparency variables. Our principal hypothesis relates to the sign of the interaction of two variables, one taken from each of these approaches.

A growing body of literature investigates the capital market outcomes of increased corporate disclosure activities (e.g., Leuz and Verrecchia, 2000; Botosan, 1997, Hail and Leuz, 2006). In essence, the literature suggests that improved disclosure reduces information asymmetries among investors and increases market liquidity by leveling the playing field among investors (Verrecchia, 2001). However, increased corporate disclosure is associated with significant costs that firms have to bear. For example, stricter reporting rules require significant preparation and dissemination of accounting reports. Also, voluntary provided information to capital markets can reveal proprietary information to competitors. Thus, firms will have incentives to improve their disclosures only if benefits exceed the costs of increased disclosures. The costs of increased
disclosure can be particularly burdensome for smaller, more thinly traded firms. For example, many costs associated with stricter mandatory reporting requirements are fixed and smaller firms cannot use economies of scale easily to reduce them. As a result, the majority of smaller firms opt to move to less regulated markets rather than to comply with more stringent required disclosures (Bushee and Leuz, 2005; Leuz, Triantis and Wang, 2008). On the reverse side, those firms that move to less regulated market segments, exhibit, on average significant costs in terms of reduced liquidity and market value. Literature on voluntary corporate disclosure suggests that by increasing the quantity and quality of disclosure firms can increase their investors’ base and improve market liquidity.

The underlying assumption is that for voluntary disclosure to be effective firms already should have certain attributes such as size and visibility. However, due to visibility issues, improved disclosures efforts of small and mid cap stocks are often overlooked by investors. Moreover, the net benefits of disclosing valuable proprietary information that may be used by competitors can be negative, discouraging small firms on minor stock exchanges to disclose.

On the other hand, studies on market microstructure (e.g., N&P) provide evidence that small, thinly traded firms can improve their market liquidity by adopting an optimal trading system that offers greater transparency to market participants, enabling thinly traded stocks to escape self fulfilling liquidity trap.

A question therefore arises whether adopting an optimal trading system which provides greater trade transparency for thinly traded stocks, may enhance the incentives of those firms to disclose. That is in the B&L study firms either decide to remain public with high levels of disclosure or alternatively they “go pink” with little or no public disclosure and hence how a firm jumps the large chasm between the later and former environments is a major concern. However, what this research argues is that if the market microstructure is allowed to vary there may exist an equilibrium intermediate case in which thinly traded
stocks see the benefits from enhanced disclosure and while not at the level of established large stocks provides an intermediate stepping stone to a full listing.

Our study makes use of the introduction of a hybrid trading structure SETSmm on the London Stock Exchange Alternative Investments Market (AIM) for smaller capitalizations stocks. AIM has a simplified regulatory environment which enables small and medium sized growing companies to raise capital from knowledgeable, mostly institutional investors, without having to incur costs associated with complying with the stricter regulations for listing on the Main Market. SETSmm trading system is a cross between SETS, a purely order-driven open limit order book for trading the most liquid securities including FTSE100 and liquid FTSE250 and SEAQ, quote-driven market maker system for the majority of small to mid-cap stocks. SETSmm offers a greater transparency of small cap stocks to market participants relative to quote-driven system whereby specialist liquidity suppliers usually have monopoly on trading and market making. On the other hand, SETSmm recognizes the importance of market maker support in small and mid cap stocks while enhancing liquidity and execution of trades.

To the extent that the introduction of SETSmm increases trading activity and enables better access for investors in trading smaller companies shares, smaller firms should have greater economic incentives to increase their disclosures and accrue greater net benefits from disclosing more.

Thus we hypothesize that: **The resulting economic benefits of improved disclosure will be greater for firms under the SETSmm trading system than under a quote-driven system.**

We now turn to consider how we will measure the above critical disclosure variable. Attempts of smaller firms on less regulated exchanges to improve their disclosures are often challenged due to their size and low visibility. Visibility problems are typically solved by increasing analyst coverage and moving exchanges which, for small cap firms is difficult to achieve. Before being able to attract interest of a large number of analysts,
many small and mid size firms engage in disclosure strategies to “wake up” investor base by increasing press coverage (Bushee and Miller, 2005). Moreover, a proactive approach in building investors relations and public communications are documented to be key attributes of small companies in increasing their institutional investors’ base and analyst following. In particular, sophisticated institutional investors have superior ability to process and interpret the implications of public signals enhancing their potential for profit making trading opportunities (Kim and Verrecchia, 1994). Thus, taking into account that AIM firms target predominantly institutional investors with specialist knowledge, we consider a disclosure strategy that focuses on efficient dissemination of relevant information by means of press releases. We proxy for improvements in information releases by the number of press release wires (WIRES) from Factiva. The wires capture firms’ decisions to provide information to capital markets as they are free of editorial decisions by news agencies as to whether to release the news or not. The variable is computed on a quarterly basis as the sum of articles in press release wires during the quarter for each company in our sample. We then transform the continuous variable WIRES into a binary indicator variable DIS splitting it by the median of the firm-quarter observations (DIS takes the value of 1 if an observation is above the median of WIRES and 0 otherwise).

Having defined our disclosure variable we now turn to the market microstructure variable. The main goal of our study is to investigate the extent at which the economic benefits of improved disclosure is greater for firms that adopt more transparent hybrid trading structure (SETSmm) relative to firms that remain under a quote-driven system (SEAQ). Towards this goal first we obtain data on firms that switched from SEAQ to SETSmm from the sample of a total of 284 companies listed on AIM from January 2002 to December 2008. We distinguish between firms that switched to SETSmm from those that did not and define two separate binary indicators variables SET and NOSET denoting all firm-quarter observations from firms switching and not switching during our sample period, respectively.
In order to test for the results from various combinations of disclosure and market microstructure we next construct a set of dependant variables which proxy for economic benefits of disclosure. The economic benefit of disclosure best supported by theory is the effect on information asymmetry and market liquidity (see for example Verrecchia, 2001; Leuz and Verrecchia, 2000). It is based on the notion that increased levels of disclosure lower the information asymmetries among investors. In the presence of information asymmetry, less informed investors have to price protect themselves against investors with more information which leads to the introduction of bid-ask spreads and less willingness to trade. Less information asymmetry results in less adverse selection, which is reflected in greater ability of investors to quickly buy or sell shares with little price impact and at low cost. We use six proxies for economic benefits of disclosure. The first variable is the bid-ask spread, a proxy for information asymmetry most commonly used in the literature (Leuz and Verrecchia, 2000; Verrecchia, 2001; Bushee and Leuz, 2005). More disclosure implies less information asymmetry and less adverse selection resulting in lower bid-ask spreads. We compute a bid-ask spread variable (SPREAD) as a quarterly median of daily quoted spreads, measured at the end of each trading day as the absolute difference between the bid and ask price divided by the mid-point. The second variable measures the price impact of trades (PRIMPACT) that is the ability of investors to trade in a share without moving its price. It is computed as the ratio of absolute daily return to the pound value of daily trading volume (Amihud, 2002). We calculate quarterly medians of the daily ratios. From the discussion above it follows that greater disclosure should result in greater ability of investors to trade with less price impact. The third variable is price volatility (VOLAT), a proxy for information asymmetry used in prior literature (Lang and Lundholm, 1993, Leuz and Verrecchia, 2001). The theory suggest that to the extent that improved disclosure mitigates information asymmetry, the magnitudes of surprises about firm’s prospects are reduced resulting in less volatile share prices. We compute price volatility as a standard deviation of daily stock returns in a given quarter. The fourth proxy is trading volume of shares (VOLUME) which we define as a quarterly median of daily numbers of shares traded scaled by the number of shares.

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6 Datastream expresses daily trading volume in thousands of pounds. Hence, the construct PRIMPACT captures the percentage by which a share price moves in £1,000 of daily trading volume.
outstanding to control cross-sectional differences. The fifth proxy captures (the inverse of) the extent of trading activity defined as the percentage of trading days with zero daily share returns out of all potential trading days in a quarter (ZERORET). The sixth variable (DAYS) captures the number of days with a positive trading volume in a quarter divided by the total number of trading days. Prior literature (Bushee and Leuz, 2005; Bushee and Miller, 2005) finds this proxy particularly useful for capturing trading activity in low-liquidity markets such as AIM. Trading activity is expected to increase in disclosure and thus we expect to see a positive impact of disclosure on VOLUME and DAYS and a negative impact on ZERORET variable.

Moreover, to the extent that a transparent trading structure enhances firms’ incentives to disclose we expect that trading under SETSmm is reinforcing the negative (positive) impact of disclosure on SPREAD, PRIMPACT, VOLAT, ZERORET (VOLUME, DAYS) thus a more pronounced association between disclosure and economic benefits proxies for SET firms relative to NOSET firms.

To empirically investigate the heterogeneity in net economic benefits of disclosure between SET and NOSET firms we fit the following model:

\[
\text{Benefit}_i = \alpha_1 \text{NOSET}_i + \alpha_2 \text{SET}_i + \beta_1 \text{NOSET}_i \times \text{DIS}_i + \beta_2 \text{SET}_i \times \text{DIS}_i + \delta' \text{C} + \varepsilon_i \quad (1)
\]

Where Benefit\(_i\) is proxied by one of the six dependant variables (SPREAD, PRIMPACT, VOLAT, ZERORET, VOLUME and DAYS); NOSET\(_i\) and SET\(_i\) are the binary indicator variables that represent observations from non switching and switching firm groups respectively. DIS\(_i\) is a binary variable that divides firm-quarter observations into high and low disclosers depending on whether an observation falls into the upper or lower half of the continuous variable WIRES’ distribution; C is a vector of control variables. In modeling SPREAD, PRIMPACT, ZERORET and DAYS regressions we follow the extant literature (e.g., Leuz and Verrechia, 2001 Daske, Hail, Leuz and Verdi, 2008) and control for firm size, trading volume, return volatility and the presence of insiders. We calculate firm size as the market value of equity (SIZE) and measure the percentage of widely held shares (OWNERDIS) as the inverse proxy for the presence of insiders.
Trading volume and return volatility are proxied by variables VOLUME and VOLAT defined above. In the model with VOLAT as the dependant variable we control for firm size and insiders’ presence. In modeling VOLUME we control for size, return volatility and insiders’ presence.

Note that the constant term is omitted in the specification of the model set in equation (1) so that the two groups are identified separately and the coefficients on indicator variables NOSET and SET correspond to each group’s average level of the economic benefit variables when disclosure is low. The interaction coefficients on NOSET*DIS and SET*DIS represent the incremental effect of high disclosure on the economic benefits for the two groups, respectively. To estimate total effects for high disclosers we have to sum the two corresponding coefficients. We expect disclosure to have stronger effect on economic benefits for SET relative to NOSET firms. Thus, we expect a negative coefficient on the interaction term SET*DIS when economic benefits is proxied by SPREAD, PRIMPACT, VOLAT, ZERORET and a positive coefficient when it is proxied by VOLUME, DAYS. More importantly, to the extent that trading within SETSmm transparent trading structure is reinforcing effects of disclosure we expect coefficient on SET*DIS to be greater in magnitude than the coefficient on NOSET*DIS capturing a more negative (positive) impact of disclosure on SPREAD, PRIMPACT, VOLAT, ZERORET (VOLUME, DAYS) for firms trading under SETSmm regime.

In Section 2 we discussed the study by Nimalendran and Petrella (2003) who find that stocks moving from POD to HOD trading mechanism experience improvements in market quality measures. We note the useful benefits of their empirical approach which combines both an event study and a control sample methodology enabling them to isolate pure effects to market structure. However, their conclusion points out a potentially important limitation of this empirical approach: firms’ decision to switch trading structure is an endogenous choice based on a consideration of costs and benefits of the switch. Hence, it is not possible to conclude that switching from POD to HOD would be beneficial for all firms since this approach only analyses firms that choose to move and thus suffers from a self-selection bias (Battalio, 2003).
In the present study, we recognize that firms may *choose* to switch to SETSmm. Thus, an OLS approach in estimating equation (1) is likely to suffer from self-selection bias. To address this concern, we conduct the following two-step estimation procedure, which is used in the literature to control for self-selection bias (Green, 1997):

\[ s_i^* = \beta w_i + u_i \]  
\[ b_i = \alpha s_i + \beta s_i \times d_i + \delta c_i + \epsilon_i \]

The two-equation model estimates the effect of an endogenous binary variable capturing trading choice \( s_i \) on a continuous observable variable economic benefit \( b_i \). It is assumed that the trading choice variable \( s_i \) can be modeled as the outcome of an unobservable latent variable \( s_i^* \): \( s_i = 1 \) if \( s_i^* > 0 \) and \( s_i = 0 \) otherwise, where \( s_i^* \) is a net benefit of a firm’s decision to switch to trading structure SETSmm. The unobservable variable \( s_i^* \) is determined by a set of exogenous factors presented by a vector of variables \( w_i \) and a random term \( u_i \). In addition to the trading choice variable \( s_i \), variable \( b_i \) is determined by an exogenous indicator variable reflecting the level of disclosure \( d_i \) that interacts with \( s_i \), a vector of exogenous control factors \( c_i \), and a random error \( \epsilon_i \).

The first-stage equation (2) specifies a probit model whereby firm’s endogenously-determined choice of switching to SETSmm is regressed on a set of exogenous factors in order to control for inherent self-selection bias. These factors reflect firm characteristics that are associated with firms’ incentives to move to a more transparent trading mechanism. For example, growing firms with financing needs wishing to improve their access to a wider pool of investors are likely to opt for a trading structure that is designed to attract new investors ([www.londonstockexchange.com/setsmm](http://www.londonstockexchange.com/setsmm)). In addition, SETSmm trading mechanism was introduced in December 2005 and applied initially to the largest 50 AIM securities whereby the constituents of the FTSE AIM UK 50 index automatically traded under SETSmm regime. Hence, we include firm size, inclusion in the AIM50
index, ownership dispersion, capital intensity, firm performance and financial leverage as determinants of a company’s decision to move to SETSmm.

We combine these variables in the following model:

\[ SET_i = \gamma_0 + \gamma_1 \text{SIZE}_i + \gamma_2 \text{ROA}_i + \gamma_3 \text{OWNERDIS}_i + \gamma_4 \text{CAPINT}_i + \gamma_5 \text{FLEV}_i + \gamma_6 \text{AIM50}_i + u_i \]  

(4)

Where \( SET_i \) is a binary indicator variable that equals 1 if a firm switches to SETSmm and 0 otherwise, \( \text{SIZE} \) is the market value of equity, \( \text{ROA} \) is the yearly average ratio of operating income to total assets, \( \text{OWNERDIS} \) is the percentage of widely held shares, \( \text{CAPINT} \) is capital intensity proxied by the proportion of long-term assets in total assets, \( \text{FLEV} \) is financial leverage defined as the ratio of total financial debt to total assets and \( \text{AIM50} \) is a dummy indicating whether a firms is included in the AIM50 index. All variables are calculated on a quarterly basis during the research period from January 2002 to December 2008. We obtain financial data from Worldscope, stocks prices and the number of shares outstanding are from Datastream and the listings of AIM50 index constituents is from the London Stock Exchange web site.

The second-stage equation (3) is specified by the regression (1) that models the interactive impact of disclosure and trading structure on a set of proxies for economic benefits of increased transparency. The empirical analysis follow.

4. EMPIRICAL RESULTS

Descriptive Statistics

Panel A in Table 1 presents descriptive statistics for the dependent variables from the main model (1) for the entire sample of 284 firms listed on AIM during the research period from January 2002 to December 2008. The entire series of sample observations is further split into the two groups according to the type of trading mechanism. We find that shares on SETSmm are significantly more liquid than stocks trading under quote-driven regime. For example, the average bid-ask spread of the SET group is 0.048% compared
to 0.063% for the NOSET group. For the average SET group 36.4% of daily share returns equal zero compared to 51.9% for NOSET group. With respect to the frequency of days traded we find that for an average SET (NOSET) share 87.5% (81.5%) of trading days within a quarter are with nonzero trading volume. SET shares also have higher average daily trading turnover (0.40%) relative to NOSET shares (0.30%). On the other hand SET shares seem to be more volatile (0.033) compared to NOSET shares (0.028). All the differences in the means across the two groups are significant at 1% level except for the variable PRIMPACT\textsuperscript{7}. The average PRIMPACT for a SET (NOSET) share is 0.117 (0.003) suggesting that on average a £1,000 trade moves stock price by 11.7% (0.3%).

Panel B sets out descriptive statistics on the continuous disclosure variable WIRES and for several firm characteristics. Firms trading with SETSmm trading system appear to be more active in their corporate disclosures, bigger in size and included in the AIM50 index\textsuperscript{8}.

\textit{Univariate Analyses}

We start our empirical analysis with a univariate comparison of the dependent variables from the second stage of the model described above between high and low disclosing firm-quarters across the two observed trading systems: the SETSmm and the Quote-driven one. This approach allows us to compute differences in economic benefit proxies between low and high disclosers and to compare these differences across the two trading mechanisms. Table 2 presents mean values and numbers of observations of the dependant variables across low and high disclosers under the two trading regimes. The findings provide a consistent picture reflecting greater economic benefits in terms of bid-ask spread, price impact, trading frequency and trading volume for high disclosing firm-quarters. In addition, in all cases except for trading volume, these benefits of pronounced disclosure activities are stronger for firms trading on SETSmm relative to firms with a quote-driven trading. For example, the mean bid-ask spread for SETSmm low disclosing

\textsuperscript{7} We note that the distributions of PRIMPACT and SPREAD are right skewed. To address this issue we estimate our models by using logarithms of these variables.

\textsuperscript{8} The association between inclusion in the AIM50 index and trading under SETSmm regime is to a certain extent mechanical, as a constituent of AIM50 index automatically trades under SETSmm.
firm-quarters is 6.74% and decreases to 3.83% when there are greater disclosure activities. For firms trading under the quote-driven regime, spread also decreases from 7.55% for low disclosing firm-quarters to 5.72% for high disclosing firm-quarters. Both differences are statistically significant at 1% level. Moreover, the decrease in the bid-ask spread is significantly greater by 1.08% for SETSmm firms relative to the firms with a quote-driven trading. Similar patterns are observed for economic benefits in terms of the price impact, proportion of zero return days and the percentage of days traded. We also find that the trading volume is significantly larger for high disclosing firm-quarters but only for firms under the quote-driven regime. On the other hand, SETSmm firms exhibit significantly greater trading volume compared to quote-driven trading companies both for low and high disclosers. In contrast to our expectations, we find that stock price volatility increases in disclosure but only for quote-driven trading. One possible explanation is that for small and less frequently traded stocks positive changes in disclosure activities increase their volatility. We investigate this issue further in our sensitivity checks where we carry out analyses separately for thinly and less thinly traded stocks. Overall, the univariate analyses provide first evidence that investors consider disclosure activities in their trading decisions and that this is particularly pronounced for small stocks that trade on hybrid trading systems with enhanced transparency. Next, we continue our analyses by giving consideration to a set of firm characteristics that may influence the interactions amongst disclosure activities, trading mechanisms and resulting economic benefits.

**Multivariate Analyses**

In Table 3 we report results from a two-stage estimation model using the pooled sample for the research period from January 2002 to December 2008. Panel A presents the results from the first-stage probit regressions (4) for the six economic benefit proxies from the second-stage equation (1). Results from the first-stage model suggest that in general firms which are likely to switch to SETSmm trading system are bigger, less capital intensive, with smaller presence of insiders (except when economic benefit is proxied by PRIMPACT, ZERORET and DAYS), part of the AIM50 index and less
profitable. Financial leverage (FLEV) does not appear to be a significant determinant of firm’s decision to move to SETSmm.

Panel B sets out the results from the second-stage regression equation (1). The coefficients that capture the incremental economic benefits of disclosure for firms that move to SETSmm trading system (SET*DIS) have all predicted signs and are statistically significant except in the volatility regression. The results indicate significant increases in economic benefits of disclosure for firms trading under a more transparent trading regime. For example, coefficient on SET*DIS in the SPREAD regression is -0.123 (p-value = 0.001) implying that greater disclosure is associated with an average reduction in the bid-ask of 75% for firms that trade under the SETSmm regime – controlling for all other variables. On the other hand, the coefficient on NOSET*DIS is not statistically significant suggesting that disclosure does not seem to improve liquidity in terms of a reduction in bid-ask spreads for firms with less transparent trading mechanism. Moreover, the tests of the differences in total (p-value = 0.050) and incremental (p-value = 0.033) effects of disclosure between SET and NOSET firms show that the reduction in bid-ask spread due to disclosure is significantly larger for SET firms.

We also document that there is a significant reduction in the proportion of zero return days (ZERORET) for high disclosing SET firms (coefficient on SET*DIS is -0.0434, p-value < 0.001). This is a reduction of approximately 9% relative to the low disclosing SET firms’ average of 49%, holding all other variables constant. As expected, we do not observe similar statistically significant decrease in ZERORET for high disclosing NOSET firms. The difference in the degree at which the two trading mechanisms reinforce the effects of disclosure on liquidity measured by ZERORET is also confirmed by the statistically significant difference between magnitudes of incremental coefficients SET*DIS and NOSET*DIS (p-value = 0.022).

Firms that trade under SET regime seem to accrue greater net benefits from increased disclosure also in terms of PRIMPACT and DAYS. The findings suggest that for these
firms the price impact decreases (the coefficient on SET*DIS is -0.120, p-value = 0.080), i.e. investors are able to trade in a stock causing relatively smaller changes in its price.

The trading frequency measured by DAYS increases in disclosure (the coefficient on SET*DIS is 0.027, p-value = 0.012): on average, high disclosing SET firms have a proportion of trading days with nonzero volume in a given quarter that is 0.027 above the low disclosing SET firms – holding all other variables constant. Relative to the sample average of 0.849 this is an increase of more than 3%. On the other hand, there seem to be no significant incremental effect of disclosure on PRIMPACT and DAYS when firms trade within a quote-driven trading structure (coefficients on NOSET*DIS are not statistically significant from zero).

In addition, we find that trading volume (VOLUME) increases for high disclosing firms irrespective of the trading mechanism in place. For example, high disclosing SET firms have median daily turnover which is 0.001 above the low disclosing SET firms (the coefficient on interaction variable SET*DIS is 0.001, p-value < 0.001) and high disclosing NOSET firms have median daily turnover that is 0.001 above that of low disclosing NOSET firms (the coefficient on NOSET*DIS is 0.001, p-value < 0.001). However, there is a significant difference in average trading volumes between high disclosing SET and NOSET firms (the coefficient on SET + SET*DIS = 0.0079, p-value < 0.001, the coefficient on NOSET + NOSET*DIS = 0.0044, p-value = 0.002, the difference between the two coefficients being statistically significant with a p-value < 0.001 – not reported). This difference in trading volume between the two groups of firms can be attributed to a “pure” trading mechanism effect rather than to increased disclosures. This is reflected in significantly different trading volumes between low disclosing SET and NOSET firms (the coefficient on SET = 0.007, p-value = 0.001, the coefficient on NOSET = 0.004, p-value = 0.011, the difference between them is significant with a p-value < 0.001). Thus, disclosure does not seem to have a significant marginal contribution in improving trading volumes for SET firms as they already experience higher volumes resulting from more transparent trading.
Finally, we do not find that high disclosing firms with more transparent trading systems experience lower volatility (VOLAT) of their stock returns, a result which is in contrast to our hypothesis. The coefficient on SET*DIS is positive and significant (0.006, p-value < 0.001) and significantly greater in magnitude than the coefficient on NOSET*DIS (0.003, p-value = 0.014) implying that improved disclosures increase price volatility of SET stocks relatively more than for NOSET stocks. Although in contrast to our prediction, this finding is in line with the results reported by Leuz and Verrecchia (2001) who find a positive association between disclosure and volatility that is driven by the behaviour of small and less liquid stocks. Considering that our sample is comprised of small and thinly traded stocks, our finding is not surprising.

**Sensitivity Analysis**

Grossman and Miller (1988) and Nimalendran and Petrella (2003) argue that very thinly traded stocks are most likely to benefit from specialist market makers’ intervention. For example Nimalandren and Petrella (2003) find that thinly stocks which switch from pure order to a specialist supported (hybrid) trading mechanism exhibit larger reductions in bid-ask spreads and transactions costs relative to moderately thin stocks. To the extent that the quote-driven system is characterized by a greater specialist intervention and their support in liquidity by sanctioning traders exploiting private information of very thinly traded stocks they may have less incentives to trade on the hybrid market system such as SETSmm characterized by a smaller degree of market makers’ participation. On the other hand, thinly traded stocks may view SETSmm as an instrument to enhance the visibility of their disclosures activities and reduce the adverse selection by informed specialist that “cream-skim” liquidity orders and leave informed orders to other liquidity providers. Hence, we argue that thinly traded stocks are likely to consider a trade off between a greater transparency associated with moving to SETSmm against smaller specialist participation and support in providing their liquidity.

In order to estimate the extent to which such a trade-off is reflected in our economic benefits measures and to check how the behaviour of thinly traded stocks affects our cross-section multivariate analysis we follow the approach by Nimalendran and Petrella
(2003) and divide our sample into very thinly stocks and moderately think stocks depending on the level of their market capitalization in a particular quarter. We re-estimate the two stage estimation model and report results in Table 5. Contrary to Nimalendran and Petrella (2003) we find that very thinly stocks benefit from trading on a system with less specialist intervention. Moreover, we find that very thinly traded stocks benefit from trading on SETSmm in particular if they are high disclosers and thus have strong incentives to enhance their visibility by means of trading on a more transparent market segment. This finding provides support to our initial argument that it is important to consider trading mechanism and corporate disclosure jointly as strategic variables affecting stock liquidity and performance. For example, we find that among very thinly traded stocks, high disclosers exhibit significant economic benefits across all six measures - except for the volatility regression - (the coefficients on SET*DIS are significant and with the expected signs). The results from the volatility regression here confirm interpretation of our earlier findings that the positive relationship between increased disclosure and volatility is mainly driven by very thinly traded stocks. The effect of improved disclosure on the volatility of moderately thin stocks is zero as in Leuz and Verrecchia (2001) and Bushee and Noe (1999).

In sum, the evidence provides support for our predictions that small and thinly traded stocks with incentives to disclose will experience greater benefits of increased disclosure activities when they trade with a more transparent trading structure such as SETSmm.

5. CONCLUSION

Given the literature on corporate disclosure it may seem that the advice for firms with thinly traded stocks is that if they increased disclosure this would mitigate some of the problems associated with lack of visibility in the market. However, even when firms increase disclosure they can not be sure that institutional and other investors increase their holdings of the stock. In fact institutional investors sometimes refer to the ‘lobster pot’ problem with thinly traded stocks – they can get in easy enough but with wide bid ask spreads it is difficult to extricate oneself from a position profitably. Firms may

9 Moderately thin stock are those with market capitalization greater than three times the sample median.
increase disclosure to reduce the bid ask spread. However, the extent to which this is strategy is likely to be successful will depend on the specific market micro structure in place. With a pure quote driven system, firms that increase disclosure may see relatively little improvement in spreads, compared to under a hybrid order system with limited market maker presence. This research supports this view. We find that stocks that trade under a hybrid order system see more benefit from disclosure.

This research provides a link between two previously separate research approaches. In the area of market microstructure the performance according to a range of criteria of various quote and order driven systems is compared. However, typically that research does not consider how varying the transparency of the trading protocol varies the benefits to a firm from greater disclosure of firm specific information. Similarly in the disclosure literature a tacit assumption usually is the benefits of disclosure are fixed since trading protocols do not change. However, as recent advances in protocol design in stock exchanges such as AIM and ISE suggest, the benefits can be varied by appropriate choice of design of market microstructure.
BIBLIOGRAPHY


Table 1: Descriptive Statistics

Panel A: Dependant Variables

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## Table 1 (Continued)

### Panel B: Disclosure and Firm Characteristics

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**Notes:** The sample consists of a maximum of 7,952 observations from 284 AIM firms during 28 quarters from January 2002 to December 2008. NOSET (SET) denotes observations from firms trading with a quote-driven (hybrid – SETSmm) trading mechanism. Panel A of the table reports descriptive statistics for the six dependant variables: SPREAD is a quarterly median of daily quoted spreads measured at the end of each trading day as the absolute difference between the bid and ask price divided by the mid-point. ZERORET is the percentage of trading days with zero daily stock returns out of all potential trading days in a given quarter. PRIMPACT is the quarterly median of the daily ratios computed as the absolute daily stock return divided by the pound value of the daily trading volume. DAYS is the proportion of trading days with a positive trading volume out of all trading days in a quarter. VOLUME is quarterly median of daily turnover ratio, i.e., daily number of shares traded divided by the total number of shares outstanding. VOLAT is quarterly standard deviation of daily stock returns. Panel B reports descriptive statistics for the disclosure variable and for firm characteristics: WIRES is the quarterly sum of press releases articles from Factiva. SIZE is the market value of equity, ROA is the ratio of operating income to total assets, OWNERDIS is the percentage of widely held shares, CAPINT is the ratio of long-term assets to total assets, FLEV is the ratio of total financial debt to total assets and AIM50 is an indicator variable that takes the value of 1 if a firm is included in the AIM50 index in a given quarter or 0 otherwise. Asterisks indicate that the means of the two groups are significantly different using a two-tailed F test. *** p<0.001, **
p<0.05, * p<0.1. We delete observations falling in the first and 99th percentile for all variables except for indicator variables.
Table 2: Univariate Analysis of the Dependant Variables Across the Two Trading Mechanism

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<th>(1) - (2) p-value</th>
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<tr>
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<td>3877</td>
<td>b</td>
<td>3381</td>
<td>1687</td>
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<tr>
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(b)-(a) p-value 0.000 0.000 0.000 0.000

p-value 0.000 0.000 0.000 0.000

ZERORET

VOLUME

VOLAT

PRIMPACT

VOLAT

PRIMPACT
Table 2 (Continued)

Notes: The table reports mean values of the six dependant variables across low and high disclosing firms under the two trading regimes: SETSmm and Quote-driven. Low (high) disclosure refers to firm-quarter observations from the lower (upper) half of the continuous variable WIRES’ distribution. The six dependant variable used are: SPREAD is a quarterly median of daily quoted spreads measured at the end of each trading day as the absolute difference between the bid and ask price divided by the mid-point. ZERORET is the percentage of trading days with zero daily stock returns out of all potential trading days in a given quarter. PRIMPACT is the quarterly median of the daily ratios computed as the absolute daily stock return divided by the pound value of the daily trading volume. DAYS is the proportion of trading days with a positive trading volume out of all trading days in a quarter. VOLUME is quarterly median of daily turnover ratio, i.e., daily number of shares traded divided by the total number of shares outstanding. VOLAT is quarterly standard deviation of daily stock returns. P-values indicate that the means of the compared groups are significantly different using a two-tailed F test.
### Table 3: Multivariate Regressions

<table>
<thead>
<tr>
<th>Panel A: First Stage Probit Model</th>
<th>Log(SPREAD)</th>
<th>ZERORET</th>
<th>Log(PRIMPACT)</th>
<th>DAYS</th>
<th>VOLUME</th>
<th>VOLAT</th>
</tr>
</thead>
<tbody>
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<td>0.456***</td>
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<td>0.859***</td>
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<td>Constant</td>
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<td>-6.017***</td>
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### Table 3 (Continued)

**Panel B: Second Stage Regressions**

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<th>ZERORET</th>
<th>Log(PRIMPACT)</th>
<th>DAYS</th>
<th>VOLUME</th>
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<td><strong>-0.0434</strong>*</td>
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<td><strong>0.001</strong>*</td>
<td><strong>0.006</strong>*</td>
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<td>-0.00502***</td>
<td>-0.00847***</td>
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<tr>
<td>Log(VOLUME)</td>
<td><strong>-0.246</strong>*</td>
<td><strong>-0.0533</strong>*</td>
<td><strong>-0.937</strong>*</td>
<td><strong>0.0230</strong>*</td>
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<td>Log(VOLAT)</td>
<td><strong>0.262</strong>*</td>
<td><strong>-0.143</strong>*</td>
<td><strong>1.272</strong>*</td>
<td><strong>0.0382</strong>*</td>
<td><strong>0.039</strong>*</td>
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<td>Log(OWNERDIS)</td>
<td><strong>-0.144</strong>*</td>
<td><strong>-0.0510</strong>*</td>
<td><strong>0.144</strong>*</td>
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Table 3 (Continued)

<table>
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<tr>
<th>Panel C: Tests for Differences in coefficients</th>
<th>Log(SPREAD)</th>
<th>ZERORET</th>
<th>Log(PRIMPACT)</th>
<th>DAYS</th>
<th>VOLUME</th>
<th>VOLAT</th>
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<tbody>
<tr>
<td>Total Effects of disclosure (NOSET + NOSET*DIS)</td>
<td>0.5449 **</td>
<td>0.8801 ***</td>
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<td>0.036</td>
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<td>(SET + SET*DIS)</td>
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<td>0.9554 ***</td>
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Differences between NOSET and SET (p-values)

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<tr>
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</table>

Notes: The sample consists of a maximum of 7,952 observations from 284 AIM firms during 28 quarters from January 2002 to December 2008. Panel A reports results from the first stage binary probit regression (4). The dependant variable (SET) is a dummy which takes the value of 1 if the firm trades under the SETSmm regime and 0 otherwise. SIZE is the market value of equity, ROA is the ratio of operating income to total assets, OWNERDIS is the percentage of widely held shares, CAPINT is the ratio of long-term assets to total assets, FLEV is the ratio of total financial debt to total assets and AIM50 is an indicator variable that takes the value of 1 if a firm is included in the AIM50 index in a given quarter or 0 otherwise. Panel B reports results from the second stage regression (1) across six dependent variables: SPREAD is a quarterly median of daily quoted spreads measured at the end of each trading day as the absolute difference between the bid and ask price divided by the mid-point. ZERORET is the percentage of trading days with zero daily stock returns out of all potential trading days in a given quarter. PRIMPACT is the quarterly median of the daily ratios computed as the absolute daily stock return divided by the pound value of the daily trading volume. DAYS is the proportion of trading days with a positive trading volume out of all trading days in a quarter. VOLUME is quarterly median of daily turnover ratio, i.e., daily number of shares traded divided by the total number of shares outstanding. VOLAT is quarterly standard deviation of daily stock returns.

We classify firm quarter observations into in a given quarter. PRIMPACT is the quarterly median of the daily ratios computed as the absolute daily stock return divided by the pound value of the daily trading volume. DAYS is the proportion of trading days with a positive trading volume out of all trading days in a quarter. VOLUME is quarterly median of daily turnover ratio, i.e., daily number of shares traded divided by the total number of shares outstanding. VOLAT is quarterly standard deviation of daily stock returns.
We classify firm quarter observations into the two distinctive groups using two binary variables: NOSET that marks the observations from firms trading under a quote-driven regime and SET that indicates the subset of firms switching to hybrid system SETSmm. To capture the effect of disclosure on the six dependant variables we introduce DIS is a binary indicator variable that divides firm-quarter observations into high and low disclosers depending on whether an observations falls into the upper (DIS=1) or lower (DIS=0) half of the continuous variable WIRES’ distribution. To capture interaction between disclosure and trading mechanism we interact DIS with NOSET and SET, respectively. Panel C reports magnitudes and statistical significance of the linear combinations of the coefficients: (NOSET + NOSET*DIS) and (SET+SET*DIS) respectively across the six dependant variables. It also reports statistical significance (p-values) of the differences between coefficients capturing total and incremental effects of disclosure across the two types of trading mechanisms. ***, **, * Significantly different from zero at 1%, 5% and 10%, respectively. P-values are reported underneath each corresponding coefficient.
<table>
<thead>
<tr>
<th>Panel A: First Stage Probit Model</th>
<th>Log(SPREAD)</th>
<th>ZERORET</th>
<th>Log(PRIMPACT)</th>
<th>DAYS</th>
<th>VOLUME</th>
<th>VOLAT</th>
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</thead>
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<td></td>
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<td>Log(SPREAD)</td>
<td>ZERORET</td>
<td>Log(PRIMPACT)</td>
<td>DAYS</td>
<td>VOLUME</td>
<td>VOLAT</td>
</tr>
<tr>
<td>--------------------------</td>
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<td>---------------</td>
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<tr>
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<td>Very thin</td>
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<td>Moderately thin</td>
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<td>1743</td>
<td>258</td>
<td>1167</td>
<td>274</td>
</tr>
<tr>
<td>Wald chi2</td>
<td>80,474.99</td>
<td>11,830.10</td>
<td>16,177.25</td>
<td>511.18</td>
<td>135,611.09</td>
<td>61,361.14</td>
</tr>
</tbody>
</table>
Table 5 (Continued)

Notes: The sample consists of a maximum of 7,952 observations from 284 AIM firms during 28 quarters from January 2002 to December 2008. Very (moderately) thin stocks are those with market capitalization (less) greater than three time sample median in a given quarter. Panel A reports result from the first stage binary probit regression (4). The dependant variable (SET) is a dummy which takes the value of 1 if the firm trades under the SETSmm regime and 0 otherwise. SIZE is the market value of equity, ROA is the ratio of operating income to total assets, OWNERDIS is the percentage of widely held shares, CAPINT is the ratio of long-term assets to total assets, FLEV is the ratio of total financial debt to total assets and AIM50 is an indicator variable that takes the value of 1 if a firm is included in the AIM50 index in a given quarter or 0 otherwise. Panel B reports results from the second stage regression (1) across six dependant variables: SPREAD is a quarterly median of daily quoted spreads measured at the end of each trading day as the absolute difference between the bid and ask price divided by the mid-point. ZERORET is the percentage of trading days with zero daily stock returns out of all potential trading days in a given quarter. PRIMPACT is the quarterly median of the daily ratios computed as the absolute daily stock return divided by the pound value of the daily trading volume. DAYS is the proportion of trading days with a positive trading volume out of all trading days in a quarter. VOLUME is quarterly median of daily turnover ratio, i.e., daily number of shares traded divided by the total number of shares outstanding. VOLAT is quarterly standard deviation of daily stock returns. We classify firm quarter observations into the two distinctive groups using two binary variables: NOSET that marks the observations from firms trading under a quote-driven regime and SET that indicates the subset of firms switching to hybrid system SETSmm. To capture the effect of disclosure on the six dependant variables we introduce DIS is a binary indicator variable that divides firm-quarter observations into high and low disclosers depending on whether an observations falls into the upper (DIS=1) or lower (DIS=0) half of the continuous variable WIRES' distribution. To capture interaction between disclosure and trading mechanism we interact DIS with NOSET and SET, respectively. ***, **, * Significantly different from zero at 1%, 5% and 10%, respectively. P-values are reported underneath each corresponding coefficient.