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The liquidity impact of insider trading on small and medium size enterprises

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ABSTRACT

This study compares the impact of insider trading by corporate employees of small and medium-sized enterprises (SMEs) on the stock price liquidity of these firms with that of larger institutions. Using publicly reported data, we assess how trades placed by SME insiders affect the bid-ask spread of their companies' stock. We document that the spread gets significantly larger following these transactions relative to trades by insiders from larger firms. Collectively, the evidence suggests that insider trading by SME executives, as well as non-executives, decreases liquidity for their firms. One important implication from our findings is that the cost of insider trading is more severe for SMEs, firms characterized by greater information asymmetry.

Introduction

Insider trading can impact a firm and its shareholders in a number of ways. Trading by insiders in possession of private information can serve as a mechanism of disclosing private information, and thereby improving price accuracy (Manne, 1966). Insider trading can also serve as an effective way to incentivize and reward managers for increasing stock price, allowing them to profit from trading as they create information that improves firm value (Bainbridge, 2000). On the other hand, insider trading can impose costs upon the firm and its shareholders by decreasing the price liquidity of its equity in the open market (Bainbridge, 2000; Fischel & Carlton, 1982).

Stock price liquidity, typically defined as the ease or difficulty with which a security is traded, is important for all publicly traded firms. Smaller firms, which already face liquidity constraints, are even more sensitive to its changes (Lipson & Mortal, 2009) as declines in liquidity increase the cost of trading for investors. To encourage investment, firms must compensate shareholders for the higher transaction costs by paying higher returns required by investors (Amihood & Mendelson, 1986; Brennan & Subrahmanyam, 1996; Eleswarapu, 1997). This leads to an increase in the company's cost of raising capital.

Liquidity can be measured as the price difference between buying and immediately selling a particular asset. For equities, a significant component to this cost is the bid-ask spread set by the market maker, which is the difference between the market price of buying and the market price of selling a stock. Market makers purchase securities at bid price with expectation of earning revenue from selling them at ask price (Copeland & Galai, 1983; Demsetz, 1968). However, stock prices may not reflect all value relevant information, particularly when there is information unknown to the market. Under circumstances of sufficient information asymmetry corporate insiders in possession of private information may trade when the securities are mispriced by market makers. The greater the perceived probability of informed trading, the wider the spread set by market maker (Easley, Hvidkjaer, & O'Hara, 2002). In other words, market makers take potential information asymmetry into account and establish bid-ask spreads to offset expected losses from

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trading against insiders possessing superior information (Copeland & Galai, 1983; Glosten & Milgrom, 1985; Kyle, 1985; Leland, 1992). This results in a higher cost of trading for all investors and a higher cost of capital for the firm.

Corporate insiders have continual access to private information that is potentially exploitable. Fidrmuc, Goergen, and Renneboog (2006) show significant positive association between the profitability of insider transactions and an insiders' rank in United Kingdom firms. Similarly, Ravina and Sapienza (2010) and Wang, Yong-Chul, and Francis (2012) demonstrate evidence of profitability of trades placed by directors and high level executives. Consequently, trading on the part of these insiders represents an environment of information asymmetry, where insiders have an informational advantage over market makers.

Although insiders of all firms are likely to possess information that is private, the frequency and significance of the information varies. Small and medium size enterprises in particular are typically associated with more severe information asymmetry relative to larger corporations. This difference in information flow is due to a number of factors. For example, Kale and Arditi (1998) show that small and medium size enterprises are characterized by liability of newness. In addition, these firms struggle to gain perceived legitimacy (Nagy, Rutherford, Truong, & Pollack, 2017), suffer from a lack of sufficient trading history (Cassar, 2004), as well as greater information opacity (Berger & Udell, 1998). Huddart and Ke (2007) further illustrate that information flow is limited at small firms due to less coverage by financial analysts. Small businesses, therefore, face more difficulty in tracking financial information including ratio analyses and performance data (Williams, Manley, Aaron, & Daniel, 2018). It is hence not surprising that prior insider trading studies consistently document increased profitability around the transactions of corporate insiders at smaller institutions (Frankel & Li, 2004; Lakonishok & Lee, 2001; Seyhun, 1986).

In this study, we explicitly examine the liquidity impact of the transactions of insiders at SMEs relative to those of larger corporations, where SMEs are defined as firms with 500 or fewer employees. Using transactions reported by corporate insiders in accordance with the Securities Exchange Act of 1934, we find a significant positive association between the bid-ask spread and trades placed by SME insiders relative to the spreads of similar trades by non-SME insiders. This difference in the liquidity result holds statistically for both purchase and sell transactions, and it is economically significant. The increase in the bid-ask spreads of SME firms is 26 to 42 basis points greater than that of larger firms.

The implication of these findings is that the cost of potential insider trading is heightened in these more opaque, smaller firm environments. We also provide evidence that this association remains positive and significant regardless of the rank of the insider, suggesting that order flow from even lower-ranking insiders impacts liquidity in a negative way. Overall, our work provides evidence suggesting an enhanced impact on liquidity from the trades of insiders at SMEs, firms characterized by more severe information asymmetry.

Our findings also suggest that insiders of SMEs should recognize that even though trading in their firms' shares, when not based on private information, is not illegal, it can impose indirect costs on the firm. As executives acutely aware of the liquidity issues faced by SMEs, these insiders should consider the consequences for their firms when making their trading decisions. Specifically, that trading can impose a decrease in liquidity of their SME and a higher cost of raising capital for their already constrained firm.

Literature Review

Information and Liquidity

A significant body of work studies insider transactions reported to the Securities Exchange Commission (SEC) by officers, directors, and holders of 10% or more a company's shares. These studies provide evidence suggesting that transactions by corporate insiders contain information regarding the future performance of the firm. The informational content of the trades is typically found to be greater for insider purchases relative to insider sale transactions (Jeng, Metrick, & Zeckhauser, 2003; Lakonishok & Lee, 2001; Lin & Howe, 1990; Seyhun, 1986). In addition, the predictive power of the transactions by the insiders differs with the timing of the trades (Brooks, Chance, & Cline, 2012), persistence of insider profitability

(Cline, Gokkaya, & Liu, 2017), and the sequence of trades (Cohen, Malloy, & Pomorski, 2012).

Evidence also suggests that the profitability of insider trades varies with the firm's level of information asymmetry, as well as information asymmetry resulting from insider's position within the firm (Aboody & Lev, 2000; Frankel & Li, 2004; Huddart & Ke, 2007; Piotroski & Roulstone, 2005; Ravina & Sapienza, 2010). Huddart and Ke (2007) and Frankel and Li (2004) demonstrate a negative association between analyst following and profitability. Consistent evidence is also presented by Aboody and Lev (2000), who illustrate that insider trading is more profitable in R&D intensive firms. While Piotroski and Roulstone (2005) show positive association between insider trading by top executives and directors and firms' future earnings, Ravina and Sapienza (2010) find that the profitability of trades by directors serving on audit committees is significantly higher than that of other independent directors.

The importance of access to private information through insider rank is further highlighted by evidence in other studies. Wang et al. (2012) present findings that the trades by higher-level executives with access to financial data are more profitable and are associated with better information about firms' future earnings. Fidrmuc et al. (2006) demonstrate higher profitability of directors' trades in firms with lesser presence of outside blockholders, emphasizing the link between informational content of transactions by ranked insiders and the degree of information asymmetry at the firm. In other words, trading by insiders who, due to their positions and rank, have better access to valuable relevant information represents situations where such outsiders as market makers are at informational disadvantage.

Given the evidence of informational advantage of corporate insiders over outsiders, another strand of literature assesses the impact of this informational advantage on liquidity by investigating the association between informed trading and measures of liquidity. The bid-ask spread set by market makers results from the market makers' attempt to balance expected profits from non-informed traders with the expected losses from traders with superior information (Copeland & Galai, 1983; Glosten & Milgrom, 1985; Leland, 1992). Assuming traders with superior information exploit their informational advantage, market makers widen the spread to compensate for potential losses from trading against those information motivated traders (Kyle, 1985).

Empirical studies often utilize reported transactions by corporate insiders to test these theoretical predictions. Cao, Field, & Hanka (2004) investigate the impact of insider trading on market liquidity in the light of IPO lockup expirations from 1995 through 1999. They focus on lockup expirations since they represent periods of arguably greater information asymmetry and allow for better evaluation of the impact on liquidity. The expirations result in pre-announced, large scale rises of sales by insiders which lead to temporary small increases in effective bid-ask spread, as well as substantial changes in quote depth.

Chung and Charoenwong (1998) also examine transactions by corporate insiders using intraday data during 1988 to analyze the relation between insider trades and the bid-ask spread. Their cross-sectional findings reveal that a greater intensity of insider trading is associated with larger spreads; however, time-series results demonstrate lack of evidence for spread changes on the dates of the insider transactions. Overall, the studies suggest that market makers concerned with trading at an informational disadvantage establish wider spreads in the presence of trades from corporate insiders that are more likely to be driven by relevant private information.

Information and Small and Medium Size Enterprises

Small and medium size enterprises are typically characterized by a high degree of information opacity (Angerer, Niemand, Kraus, & Thies, 2018) due to their nature of being high growth firms with limited public history. Thus, the informational content of transactions by corporate insiders is positively related to the level of information asymmetry of their firms (Aboody & Lev, 2000; Frankel & Li, 2004; Huddart & Ke, 2007; Piotroski & Roulstone, 2005; Ravina & Sapienza, 2010; Bradley, Cline, & Lian, 2014). This is recognized by market makers and reflected in their changes to the bid-ask spread to mitigate trading at an informational disadvantage (Cao et al., 2004; Heflin & Shaw, 2000; Roulstone, 2003).

The information opacity of small and medium size enterprises changes as they advance through their business cycle; however, SMEs remain more informationally opaque than their larger counterparts (Berger & Udell, 1998; Caneghem & Van Campenhout, 2012; Cassar, 2004; La Rocca, La Rocca, & Cariola, 2011). Initially, SMEs lack an established track record and trading history (La Rocca et al., 2011; Ortiz-Molina & Penas, 2008). In addition, SMEs face liability of newness and the necessity to create and develop reliable relationships with other economic agents and gain legitimacy from their environment (Kale & Arditi, 1998; Singh, Tucker, & House, 1986). Even as SMEs develop, they are still likely to have limited operating history, less publicly disclosed financial information, fewer followings by other economic agents, and, overall, less visibility by the public (Berger & Udell, 1998; Caneghem & Van Campenhout, 2012).

Prior findings suggest that insiders' informational advantage over outsiders impacts liquidity, in particular, bid-ask spread. Additional evidence also implies higher degree of information opacity in smaller firms. We therefore posit that this role of superior information contained in insiders' trades will be greater for firms characterized by greater information asymmetry. Specifically, we hypothesize that trading by corporate insiders of SMEs will have a more severe impact on liquidity relative to that of larger corporations.

Method

According to Section 16 (a) of the Securities Exchange Act of 1934, corporate insiders are required to file Form 3 (initial filing), Form 4 (changes in ownership), and Form 5 (transactions not reported on Form 4) to update changes in the ownership of their holdings. For our insider transactions data, we employ the transactional Form 4, Table 1 data reported for open market purchases and sales provided by Thomson Financial Insider Trading Data. We limit our sample to the period from January 2002 to December 2016 to avoid the impact of the US stock market decimalization on our results. Prior to 2001, fractional format was used in price quotes in the US stock market. Following the Securities and Exchange Commission's orders, decimal pricing in the equities and options markets was implemented by April 9 of 2001, which led to changes in bid-ask spreads among other outcomes (Bessembinder, 2003).

We also restrict the dataset to trades with cleanse codes R, H, C, L, or I to ensure data accuracy (Liu & Swanson, 2016; Otto, 2014). According to Thomson Financial Insiders Data Feed Manual, codes R, H, and C are assigned to records that have been verified with high level of confidence, while codes L and I indicate cleansed and improved but not completely verifiable data. Liu and Swanson (2016), together with Otto (2014), in the studies on share repurchasing and CEO compensation, respectively, refer to the Thomson Financial manual for cleanse code definitions and point out that these constraints to the data are important to insure accuracy. We further limit the sample to exclude amended filings, transactions where the price deviates more than 20% from the price reported in the Center for Research in Security Prices (CRSP) on the trade date (Lakonishok & Lee, 2001), and trades resulting from option exercises. This results in a sample of 599,747 reported open market transactions. The sample is merged with the Compustat, S&P Global Inc. database which contains financial and accounting information based on the firms' financial filings. Historical stock trade data, including the stock prices, stock returns, and volume are collected and merged from CRSP.

Based on the merged data, we calculate our variables of interest and all control variables. We employ the bid-ask spread as our measure of stock liquidity. Following Corwin and Schultz (2012), the spread is estimated on the date of each insider transaction using high and low prices from CRSP. Like Corwin and Schultz (2012), we assume that daily high and low prices represent buy and sell transactions in most cases, and thus the ratio of high-to-low prices reflects the stock price's variance and the bid-ask spread. In addition, it is assumed that unlike the volatility component of the ratio, the bid-ask component does not grow with the length of trading interval (Corwin & Schultz, 2012). Following Corwin and Schultz (2012), the spread is then estimated as specified in the equations below, with $H_{t-1,t}$ being the highest price over two days an $L_{t-1,t}$ being the lowest price over the same two-day interval. As equation (1) shows, in our estimations, β is the sum of squared logarithms of ratios of the highest to lowest prices for day t and t-1, while γ is squared logarithm of the highest price over two days to the lowest price over the

same two days.

$$Spread = \frac{2(e^{\alpha}-1)}{1+e^{\alpha}}, \text{ where} \qquad (1)$$

$$\alpha = \frac{\sqrt{2\beta}-\sqrt{\beta}}{3-2\sqrt{2}} - \sqrt{\frac{\gamma}{3-2\sqrt{2}}}$$

$$\gamma = \left[log\left(\frac{H_{t-1,t}}{L_{t-1,t}}\right)\right]^2$$

$$= \left[log\left(\frac{H_{t,}}{L_{t,}}\right)\right]^2 + \left[log\left(\frac{H_{t-1}}{L_{t-1}}\right)\right]^2$$

We focus on the SME dummy variable as our primary variable of interest, where the identifier is equal to one if a trade is placed by an SME insider and 0 if the transaction is placed by a non-SME insider. Firm size is calculated as the natural logarithm of the firm's market equity in the prior fiscal year. Volatility is estimated as the standard deviation of the daily stock price returns in the prior year. Volume is measured as the daily number of shares traded scaled by the firm's market value.

Results

Descriptive Statistics

Table 1 provides descriptive statistics for SMEs and large firms, where SMEs are defined as firms with 500 or fewer employees. Stock price for SMEs is significantly lower with an average (median) price of $12.73 ($8.61) versus $26.66 ($17.56) for non-SMEs. SMEs also demonstrate significantly higher volatility of daily stock prices (0.041 compared to 0.035) and significantly smaller market capitalization.

Multivariate Analysis: Base Model

Results from OLS regression on liquidity are reported in Table 2. We estimate models for all buy and sell transactions pooled, as well as insider purchases and sales separately. The dependent variable in each regression is the bid-ask spread estimated following Corwin and Schultz (2012) as described above. Wider Corwin and Schultz (2012) bid-ask spreads reflect less liquidity. The key independent variable of interest is the SME dummy variable indicating whether a trade is placed by an insider associated with a SME on the day of the transaction versus a trade place by non-SME insider. To control for other determinates of liquidity, we follow prior literature and include measures of firm size, stock return volatility, trading volume, and price

Table 1:
Descriptive statistics for small and medium enterprise and non SME for the period from 2002 to 2016

	SME			Non SME			Diff
	Mean	**Median**	**STD**	**Mean**	**Median**	**STD**	
Spread	0.0564	0.0377	0.0641	0.0425	0.0311	0.0407	***
Price	12.73	8.61	20.97	26.66	17.56	69.53	***
Volume	14,865	2,311	300,694	15,345	4,204	621,009	
Volatility	0.0414	0.0329	0.0348	0.0350	0.2603	0.0184	***
Size	519	127	2,223	4,868	539	22,657	***
N	599,747	599,747	599,747	599,747	599,747	599,747	

Bid-Ask Spread proxy estimated following Corwin and Schultz (2012) based on daily CRSP prices.
Price is the price on the trade day.

Volume is measured as daily trading volume scaled by market capitalization.

Volatility is estimated as standard deviation of the daily stock returns in the prior year. *Size* equals the log of market capitalization at the end of the previous fiscal year end.

****, **, and * denote significance at* $p < .01$, $p < .05$, $p < .10$ respectively.

of the stock (Stoll, 2000). Year fixed effects are also included in all regressions. Firm size is a proxy for information available about a firm or the overall level of information asymmetry, while volatility represents uncertainty about short-term cost of holding a stock for market makers (Heflin & Shaw, 2000; Stoll, 1978). Trading volume is associated with trading activity for a stock and is a measure of the market maker's opportunity for optimal inventory and his ability to recover losses due to presence of informed traders (McInish & Wood, 1992).

$$Spread_{i,t} = \beta_1 SME + \beta_2 Price + \beta_3 Volume + \beta_4 Volatility + \beta_5 Size + \varepsilon \quad (2)$$

Model 1 of Table 2 reports results for purchase and sell trades combined. The coefficient on SME is positive and statistically significant at the 1% level, indicating a strong positive association between the bid-ask spread and SME identifier. This suggests that trades placed by insiders of SME are associated with spreads that increase more relative to the spreads of larger firms experiencing a similar insider transaction. The association is also economically significant as the bid-ask spread increases by about 33 basis points in response to the trades placed by insiders working for SMEs compared to trades by non-SMEs insiders.

Models 2 and 3 of Table 2 report estimates for buys and sells, respectively. Insiders sell their stock for a number of reasons other than information regarding the firm's future. In addition, insiders are more hesitant to trade on negative information, as the litigation risk associated with reported insider sales is greater than that of purchases (Brochet, 2010; Chen, Martin, &

Table 2

Impact of insider trading on bid-ask spread: base model - OLS *regression for the liquidity measure on the transaction day by corporate insiders from 2002 to 2016*

	All	**Buys**	**Sells**
	(1)	**(2)**	**(3)**
SME	0.00328***	0.00417***	0.00260***
	(15.40)	(13.93)	(8.21)
Price	-0.00002***	-0.00009***	-0.00001***
	(-21.14)	(-28.96)	(-15.86)
Volume	0.0001***	0.000004***	0.00003***
	(16.65)	(3.69)	(22.96)
Volatility	1.02458***	0.94524***	1.06783***
	(340.53)	(182.88)	(284.30)
Size	-0.00004***	-0.00004***	-0.00004***
	(-17.70)	(-5.60)	(-17.07)
Constant	0.00328***	0.00417***	0.00260***
	(15.40)	(13.93)	(8.21)
Observations	599,747	201,574	398,173
R^2	0.2216	0.2158	0.2303

The regressions are performed for buys and sells combined in Model 1, as well as separately in Model 2 and 3, respectively.

The dependent variable is *Bid-Ask Spread* proxy estimated following Corwin and Schultz (2012) based on daily CRSP prices.

SME is indicator variable equal to 1 for firms with number of employees equal or greater than 500 and 0 otherwise.

Price is the price on the trade day.

Volume is measured as daily trading volume scaled by firm's market value.

Volatility is estimated as standard deviation of the daily stock returns in the prior year.

Size equals the log of market capitalization at the end of the previous fiscal year end.

****, **, and * denote significance at* $p < .01$, $p < .05$, $p < .10$ respectively.

$Spread_{i,t} = \beta_1 SME + \beta_2 Price + \beta_3 Volume + \beta_4 Volatility + \beta_5 Size + \varepsilon$

Wang, 2012). This implies that the sell transactions are less likely to contain private information relative to buy transactions and, thus, the findings for sales are likely to have less of an impact. Indeed, both buy and sell transactions by SME corporate insiders have significant positive associations with liquidity; however, the impact for the purchases is greater (approximately 42 compared to 26 basis points for sells).

Other results in the models are similar to prior work. While Heflin and Shaw (2000) demonstrate a negative association between firm size and measures of the bid-ask spread, Roulstone (2003) and Stoll (2000), among others, show negative association between stock price and the spread. We also find firm size and stock price to be negatively associated with the liquidity. Consistent with Roulstone (2003), the findings in Table 2 indicate a positive association between the bid-ask spread and trading volume. Volatility is also positive and significant, supporting the findings of Chung and Charoenwong (1998), Heflin and Shaw (2000), and Stoll (2000).

Multivariate Analysis: Executive Rank

Finance literature finds consistent evidence that access to information is a key factor contributing to the profits of insiders (Cline et al., 2017; Fidrmuc et al., 2006; Niehaus & Roth, 1999; Wang et al., 2012). Access to firm information is likely to vary with insiders' rank (Wang et al., 2012). CEOs have the highest level of access to all firm-wide data, while other executives, including other C-level insiders, have broad access as well but primarily within their areas of expertise. Non-executives, unlike the other two groups, possess relatively limited information.

To investigate whether the rank and associated access to the information have an impact on stock price liquidity, we divide our sample into three subgroups based insider title: CEOs, executives, and non-executives. Executive insiders are those who have Chief, President, or Vice President in their titles, while non-executives group contains all other insiders, including directors.

Table 3 reports OLS regression results for the bid-ask spread based on equation (2) for insiders of different rank. In each panel, we provide estimations for all transactions combined, as well as purchases and sales separately. Like our previous tests, we use the SME indicator as our main variable of interest and include the same control variables. SME is equal to one if a trade is placed by CEO, an executive, or non-executive of a SME and zero if transaction is made by CEO, an executive, or non-executive of non-SME in Panels A, B, and C, respectively. Model 1 of Panel A demonstrates that there exists a positive and significant association between bid-ask spreads and trades placed by the CEOs of SMEs relative to transactions by CEOs of large enterprises. The association remains positive and significant for purchase and sell transactions as shown in Models 2 and 3 of Panel A, respectively. Consistent with the findings presented in Table 2, results reported in Table 3 suggest that market makers at an informational disadvantage attempt to offset trading against insiders with high-level information. They widen the spread more (by approximately 29 to 45 basis points) when trades are made by chief executives working for firms with greater information asymmetry relative to the ones who work for larger corporations.

Panel B of Table 3 reveals that the association between liquidity and transactions by SME executives is positive and significant as well. The results are consistent across all three models, implying that all trades by executives of other rank working for SMEs are recognized as potentially informative and are associated with wider spreads compared to other executives at larger firms.

In Panel C of Table 3 we observe similar findings for SME non-executives. All models show positive and significant association between the bid-ask spread and transactions by these non-executives versus trades by non-executives of non-SMEs. This suggests even trades by non-executives associated with SMEs lead to reduced liquidity compared to transactions by non-executive insiders of large firms.

Overall, the findings for CEO, executives, and non-executives of SMEs show that the role of the SMEs' insiders does not vary with their rank. Both executives and non-executives contribute to a reduction in liquidity as measured by the bid-ask spread relative to trades from insiders at larger firms. This suggests that in an environment of greater information asymmetry, transactions by insiders of any rank have significant impact on liquidity of these firms.

Table 3
Impact of insider trading on bid-ask spread: Executive rank - OLS regression for the liquidity measure on the transaction day by corporate insiders of different ranks from 2002 to 2016

	All	Buys	Sells
	(1)	(2)	(3)
Panel A: CEO			
SME	0.00283***	0.00295***	0.00455***
	(4.91)	(3.49)	(5.52)
Price	-0.00006***	-0.00008***	-0.00006***
	(-16.18)	(-8.67)	(-16.06)
Volume	0.00001***	0.000003	0.0298***
	(5.35)	(1.07)	(85.53)
Volatility	0.95730***	0.79751***	1.03596***
	(110.85)	(56.12)	(97.08)
Size	-0.0006***	-0.0005**	-0.0005***
	(-6.09)	(-2.51)	(-4.62)
Constant	0.02287***	0.03059***	0.01684***
	(34.30)	(25.41)	(22.52)
Observations	79,946	26,579	53,367
R^2	0.2025	0.1731	0.3276
Panel B: Executives			
SME	0.00207***	0.00257***	0.00317***
	(5.56)	(4.42)	(6.25)
Price	-0.00006***	-0.00009***	-0.00006***
	(-25.30)	(-14.15)	(-25.66)
Volume	0.0003***	0.00005**	0.0247***
	(13.89)	(2.14)	(136.10)
Volatility	1.03585***	0.89312***	1.04568***
	(192.16)	(90.71)	(166.20)
Size	-0.0002***	-0.0005***	-0.0001***
	(-4.70)	(-3.56)	(-2.69)
Constant	0.01732***	0.02323***	0.01510***
	(43.39)	(30.51)	(33.87)
Observations	200,628	53,332	147,296
R^2	0.2266	0.2025	0.3279
Panel C: Non-Executives			
SME	0.00370***	0.00473***	0.00290***
	(14.25)	(13.55)	(7.36)
Price	-0.00001***	-0.00009***	-0.00001***
	(-14.10)	(-25.32)	(-9.87)

Volume	0.00001***	0.000004***	0.00021***
	(12.08)	(3.01)	(14.86)
Volatility	1.01311***	0.96738***	1.02959***
	(277.52)	(158.93)	(222.61)
Size	-0.0005***	-0.0003***	-0.0005***
	(-14.75)	(-4.20)	(-14.24)
Constant	0.01659***	0.01902***	0.01632***
	(61.18)	(42.63)	(47.06)
Observations	399,119	148,242	250,877
R^2	0.2202	0.2218	0.2241

The regressions are performed for buys and sells combined in Model 1, as well as separately in Model 2 and 3, respectively.

The dependent variable is *Bid-Ask Spread* proxy estimated following Corwin and Schultz (2012) based on daily CRSP prices.

SME is indicator variable equal to 1 for firms with number of employees equal or greater than 500 and 0 otherwise.

Price is the price on the trade day.

Volume is measured as daily trading volume scaled by firm's market value.

Volatility is estimated as standard deviation of the daily stock returns in the prior year.

Size equals the log of market capitalization at the end of the previous fiscal year end.

****, **, and * denote significance at* $p < .01$, $p < .05$, $p < .10$ respectively.

$Spread_{i,t} = \beta_1 SME + \beta_2 Price + \beta_3 Volume + \beta_4 Volatility + \beta_5 Size + \varepsilon$

Discussion and Conclusion

One of the potential costs of trading by corporate insiders is a decrease in the liquidity of the company's stock (Bainbridge, 2000; Fischel & Carlton, 1982). A reduction in liquidity can present challenges, especially for smaller firms, which by their nature face many financial and liquidity constraints already. Reduced liquidity results in higher cost of trading for investors, which means investors expect higher returns to mitigate the increased trading costs. This, in turn, results in higher cost of raising capital for the firm. (Amihood & Mendelson, 1986; Brennan & Subrahmanyam, 1996; Eleswarapu, 1997).

The bid-ask spread measures the transaction cost of investors, and thus represents a measure of liquidity. Market makers balance bid and ask prices based on the likelihood of trading with an informed trader to profit from the difference (Copeland & Galai, 1983; Demsetz, 1968). As corporate insiders have access to non-public information, they may choose to trade when the assets are mispriced, placing market makers at informational disadvantage. To mitigate potential losses due to this information asymmetry and its exploitation by corporate insiders, market makers set wider bid-ask spreads as the likelihood of informed order flow increases (Copeland & Galai, 1983; Glosten & Milgrom, 1985; Kyle, 1985; Leland, 1992). Consequently, the greater the perceived probability of informed trading, the wider the spread set by market makers (Easley et al., 2002).

Firms of small and medium size are typically found to be associated with greater information asymmetry (Joshi & Anand, 2018) compared to large firms due to such factors as liability of newness (Kale & Arditi, 1998), lack of trading history (Cassar, 2004), as well as greater information opacity (Berger & Udell, 1998).

In this study, we focus on trades placed by insiders of small and medium-sized enterprises to examine the impact these trades have on the liquidity of SMEs. By employing transactions reported by the corporate insiders, we show a significant positive association between the bid-ask spread and trades by SME insiders relative to those around the trades of non-SME insiders. The decrease in liquidity varies from about 26 to 42 basis points more than that of larger firms and is significant for sells and purchases.

In addition, we find evidence that the results hold for insiders of all ranks. This suggests that smaller firms face greater liquidity constraints around

insider transactions relative to larger institutions. The implication is that in these environments of information asymmetry, insider trading is particularly costly. This cost present yet another financial constraint to SMEs.

One significant implication from these findings is that insiders of SMEs should keep in mind that even though their trades may not violate law, they are not necessarily harmless to the firms. As executives of the SMEs closely familiar with liquidity issues their firms face, these insiders should be aware of more severe consequences for SMEs when contemplating whether and when to trade in their firms' shares. Specifically, that trading can impose a decrease in liquidity of their SME and a higher cost of raising capital for their already constrained firm.

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