BID-ASK SPREADS UNDER AUCTION AND SPECIALIST MARKET STRUCTURES: EVIDENCE FROM THE ITALIAN BOURSE

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Abstract

Several studies find that bid-ask spreads for stocks listed on the NYSE are lower than for stocks listed on Nasdaq. However, the nature of trading on the NYSE, which comprises a specialist and a limit order book, complicates the comparison. In 2001, a structural change was implemented on the Italian Bourse. Many stocks that traded in an auction market switched to a specialist market, where the specialist controls the order book. Our results indicate that spreads tightened when stocks moved to the specialist market. This reduction in spreads is robust to market capitalization, industry affiliation and the event window around the structural change. Using a third market to control for market wide factors, we confirm the reduction in spreads. The specialists' ability to offer price improvement further lowers the cost of executing trades. Specialist market structures are more advantageous to market participants.

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1. Introduction

Stock exchanges worldwide implement various methods of trading equity securities. Each exchange has a set of rules which dictate how orders are submitted, who handles and processes these orders, and ultimately how prices are set (O'Hara, 1995). The organisation of trading directly affects the provision of liquidity to market participants. Individual and institutional investors both prefer liquid markets that offer low trading costs, and can absorb large orders without severe price penalties. The provision of liquidity has been central to much interest from both academics and market regulators. In particular, comparing specialist markets (such as the NYSE) with other market structures (such as the dealer structure of Nasdaq) to determine which offers optimal liquidity is of significant practical importance. This paper investigates the variation in liquidity caused by the change from an auction market to a specialist market on the Italian Bourse.

Almost all research on liquidity comparisons is US based. The overwhelming majority of studies find that a specialist market results in lower costs of trading compared to a dealer market. Affleck-Graves, Hedge and Miller (1994), Huang and Stoll (1996) and Bessembinder and Kaufman (1997) compare the magnitude of bid-ask spread components for NYSE / AMEX stocks to Nasdaq stocks. They show that execution costs are lower for NYSE / AMEX listed companies, regardless of capitalization. They also find that adverse selection is not causing the wider spreads on Nasdaq.[1]

Christie and Huang (1994) and Barclay (1997) examine if structurally induced changes in trading costs occur when firms relocate from a dealer market to a specialist

[1] Neal (1992) compares the bid-ask spread for options on AMEX, which operate a specialist structure and the Chicago Board of Exchange (CBOE), which operate a competitive market maker structure. He finds that when trading volume is low, the specialist structure provides more liquidity, although the benefit decreases when trading volume increases.

market. Their results confirm that the move away from Nasdaq leads to a significant reduction in bid-ask spreads.[2] Amidst these studies finding lower costs on the NYSE (and AMEX), several studies find that execution costs are lower on Nasdaq. Dubofsky and Groth (1984) and Cooper, Groth and Avera (1985) find that the highest liquidity exists for Nasdaq stocks. Chan and Lakonishok (1997) show that the cost of trading in small firms is lower on Nasdaq, while the NYSE provides better execution for larger firms.

While these studies are comparing liquidity across exchanges, the exact nature of the comparison is unclear. Nasdaq is a 'competitive' dealer market, employing several market makers for each security. The NYSE, however, is ambiguous. Brock and Kleidon (1992) describe specialists on the NYSE as monopolistic market makers.[3] Huang and Stoll (1996) describe the NYSE as an auction market that employs a specialist for each security. Affleck-Graves, Hedge and Miller (1994, p1473) describe the specialist as "enjoying an exclusive franchise to make a market in a listed stock and to manage the book of public limit orders". The adoption of a limit order book to provide additional liquidity is considered as competition to the specialist (Glosten, 1994). Overall, the exact nature of trading on the NYSE cannot be classified as a single, definitive market structure.

Demsetz (1996) argues that the limit order book alongside the specialist makes comparisons using the NYSE difficult. In particular, customer limit orders can obscure the link between observed bid-ask spreads and the costs of market making. Bid and ask quotes could reflect supply and demand conditions of investors rather than the inventory, order processing and adverse selection components of professional market makers. This is confirmed by Kavajecz (1999) who finds that public limit

[2] Nimalendran and Petrella (2003) find that specialist intervention improves liquidity for the most illiquid stocks on the Italian Stock Exchange.
[3] Brock and Kleidon (1992) also propose that the specialist's market power varies across the day.

orders are represented in about 64 percent of NYSE specialists' quotes, and Ross, Shapiro and Smith (1996) who report that limit orders account for 65 percent of all executed orders. This, as Demsetz clearly states, "… must yield an average NYSE spread that, for similar stocks, is smaller than on the Nasdaq" (1996, p92). Thus comparing bid-ask spreads on the NYSE and Nasdaq can be misleading as spreads on the NYSE do not accurately represent the costs of making a market.

This hybrid nature of trading on the NYSE makes comparing liquidity across dealer and specialist markets ambiguous. In this paper, we have access to a dataset that allows an accurate comparison between two market structures. On the 2 April, 2001, a specialist segment was introduced on the Italian Bourse. Stocks that originally traded in an auction market commenced trading in a specialist market. This specialist, rather than competing with the limit order book, receives *all* orders and decides whether to execute these against his / her own inventory, or to post them in a limit order book which *he / she* controls.

In addition to this 'clean' experimental design, we directly test for the advantages of a specialist market over an auction market. The majority of stock exchanges worldwide are organized as auction markets. Glosten (1994) proposes that traders will benefit from a completely open electronic limit order book. This is an indirect claim that an order-driven auction system is more advantageous to market participants compared to the specialist market currently used on the NYSE. Examining the benefits (or costs) of moving between the most commonly used market structure and a specialist market is of immediate practical importance. Finally, over the transition period, a third market segment on the Italian Bourse continued trading as normal. We are thus able to ascertain the exact impact on liquidity of relocating

from an auction market to a specialist market, while controlling for overall market changes with the third market segment.

Our results indicate that there is a significant reduction in bid-ask spreads when stocks move to a specialist market. After controlling for changes in price, volume and volatility, the reduction in spreads remain. Over the transition period, the control market segment shows minimal variation, indicating that reduced spreads are directly attributable to changes in market structure. Our results also indicate that the liquidity benefits are robust to market capitalization and industry affiliation, as well as the time period around the structural change. Finally, by allowing price improvement within quotes, the specialist is further reducing the cost of trading.

The remainder of this paper is structured as follows. The following section describes the institutional details of the Italian Bourse. Section 3 describes the data and empirical results, while Section 4 provides several additional tests. Section 5 summarises the paper.

2. Institutional Details

The Italian Bourse operates a segmented market structure. Prior to 1991, all trading took place by means of an open outcry auction system on ten regional stock exchanges. Since April 1994, all trading has been centralized through an electronic auction market. The market is supported by a network linking all authorized securities firms throughout Italy and abroad (Handbook of World Stock Exchanges, 2001). It enables trading in real time of all securities, independently of physical location. With this system, liquid equity securities traded continuously over an entire trading day, while a parallel system for less liquid securities traded continuously for approximately half the trading day.

On the 2 April, 2001, the two categories of shares (liquid and less liquid) were replaced by three new segments, primarily based on market capitalization. Financial instruments above a pre-defined level set by the Exchange were classified as "Blue-Chips". Trading for these securities continue as for the auction market described. For financial instruments below the level, the issuer decided to be included in one of two market segments. The first is the ordinary segment of the market, known as "SBO". Trading in this segment continues as for the auction market described. Alternatively, the issuer could be included in the "Star" segment.[4]

The Star segment differs in that each security is assigned a specialist to control trading. All orders originally sent to the electronic order book are now channeled to the specialist. Rather than competing with the limit order book (like NYSE specialists), the Star specialist controls the limit order book. Thus the specialist can execute the order against his / her own inventory. Alternatively, the specialist can post the order in the electronic order book visible to other participants.

Additional to these three primary segments, the Italian Bourse also has the "Nuovo Mercato" (herein New Market), a market designed to handle high-growth companies. Trading in the New Market commenced in June 1999. Companies in this segment are also appointed a specialist to sustain liquidity. These specialists must expose all orders until a minimum daily quantity is transacted. However, the specialist has monopolistic powers for institutional block orders, where he / she can hold the order for five minutes before deciding to either transact the order, or post it in the electronic limit order book (Handbook of World Stock Exchanges, 2001).

[4] All three segments trade continuously over the entire trading day.

3. Data and Empirical Results

To test the effect of moving from an auction market to a specialist market, we identify firms that were listed on the original market structure (liquid and less liquid securities), and moved to one of the three new segments (Blue Chip, SBO or Star). To control for major differences in liquidity and firm size, several stocks are automatically excluded from the sample. Firms that traded as less liquid securities, or firms that moved to the blue chip segment, are not considered.[5] From the remaining stocks, we select all stocks that traded for at least 12 months prior to and after the structural change. This leaves a total of 77 stocks. Of these 77 stocks, 57 continued trading in the ordinary auction market (SBO market), while 20 commenced trading in the new Star market.[6]

For these 77 stocks, we collect daily closing bid, ask and transaction prices, both one year before and after the 2 April, 2001 structural change. We also collect daily high and low prices and daily turnover for each stock. Market capitalization of all 84 firms on the trading day prior to the structural change is also available. The data is sourced from a Bloomberg database.

In order to explore the impact on the bid-ask spread of the change from an auction market to a specialist market, two measures are examined.[7] The first is the quoted spread (in €), defined as

Quoted Spread = Ask – Bid

[5] We also exclude foreign listed companies.
[6] A list of all Star and SBO ticker symbols is provided in the Appendix.
[7] Prior literature also examines the effective spread, which takes into account trading within the bid and ask quotes. As the pre- period in our experiment utilized only an auction market, no trading occurred within the best quotes. Thus, the effective spread is equal to the quoted spread. However, for stocks that moved to the Star market, trading inside the spread can be facilitated by the specialist. To examine this possibility, an additional test comparing the quoted and effective spreads for the Star stocks after the structural change is reported later in the paper.

To control for stock price variations, both over time and across stocks, we also examine the proportional quoted spread, defined as

Proportional Spread = (Ask – Bid) / [(Ask + Bid) / 2]

3.1 Univariate Results

Table 1 provides descriptive statistics for the two spread measures, as well as other stock characteristics, for stocks that moved from the auction market to the Star market, and for stocks remaining in the auction (SBO) market. Statistics are calculated using data from 12 months prior to and after the structural change.

For the 20 stocks that switched to the specialist Star market, the quoted spread falls from €0.059 to €0.043, a significant reduction of €0.016. After adjusting for the stock price, the proportional spread falls from 1.122 percent to 1.039 percent, a significant reduction of 0.083 percent. Over the same period, stocks which remained under an auction system show a reduction in quoted spread of €0.014. However, the proportional spread increased by the insignificant amount of 0.024 percent. Overall, our univariate results indicate a reduction in bid-ask spreads when stocks move from an auction market to a specialist market. This reduction is evident in Figure 1. The reduction in the proportional spread occurs on the day of the structural change (day zero) for Star stocks, after which a new equilibrium bid-ask spread level is attained (the spread for SBO stocks remains unchanged).

<INSERT TABLE 1>

<INSERT FIGURE 1>

Table 1 also presents descriptive statistics for several stock characteristics. Closing prices for stocks that switched to the Star market have fallen. Prior to the move, the average closing price is €5.35, whilst after the move the average falls to

€4.43. The average daily volume also falls by 17,578 shares (insignificantly different from zero). Given the significant reduction in stock price, and the minor reduction in volume, stock turnover also falls, from an average of €555,827 in the 12 months prior, to an average of €363,457 in the 12 months after the switch. However, stock volatility is significantly reduced under the specialist system, with a reduction of 0.156 percent.[8]

Over the same period, stocks remaining in the auction market (SBO stocks) also exhibit variation. The average stock price falls from €4.43 to €3.47, whilst average volume falls from 275,645 to 234,402. Together, this leads to a reduction in turnover of €161,017, similar to the Star market. However, the volatility of the SBO stocks remains constant after the structural change. Overall, trading activity for Star and SBO stocks falls after the switch, although the reduction in spreads is localized to Star stocks.

3.2 Regression Results

Our univariate results indicate a significant reduction in bid-ask spreads when stocks move to a specialist market. Also, other stock factors, including turnover and volatility also vary with the switch, for both the Star and SBO markets. Changes in these other factors could be driving the reduction in spreads. To control for the impact that these additional factors have on the spread, four regressions are estimated. The first two control for variation (both over time and across stocks) in the spreads of stocks that remain in the auction market segment. Specifically, the following two regressions are estimated,

[8] Volatility is calculated as the natural logarithm of high price / low price.

$$\text{Star\_QS}_t = \beta_0 + \beta_1 \text{ Change}_t + \beta_2 \text{ SBO\_QS}_t + \varepsilon_t \quad (1)$$

$$\text{Star\_PS}_t = \beta_0 + \beta_1 \text{ Change}_t + \beta_2 \text{ SBO\_PS}_t + \varepsilon_t, \quad (2)$$

where Change_t is a dummy variable that takes the value of one after the structural change, zero otherwise. Star_QS_t is the quoted spread (in euros) for stocks that moved to the specialist Star market and Star_PS_t is the proportional quoted spread for the same stocks. SBO_QS_t is the quoted spread (in euros) for stocks that remained in the SBO auction market and SBO_PS_t is the proportional quoted spread for the same stocks.

As the bid-ask spread is dependant on several factors including turnover and volatility, and both have shown variation after the structural change, we also control for these factors. The next two regressions examine the change in spread for Star stocks after controlling for changes in turnover and volatility in both the Star and SBO markets.[9] Specifically, the following two regressions are estimated,

$$\text{Star\_QS}_t = \beta_0 + \beta_1 \text{ Change}_t + \beta_2 \ln(\text{SBO\_Turn}_t) + \beta_3 \text{ SBO\_Vol}_t + \beta_4 \ln(\text{Star\_Turn}_t) + \beta_5 \text{ Star\_Vol}_t + \varepsilon_t \quad (3)$$

$$\text{Star\_PS}_t = \beta_0 + \beta_1 \text{ Change}_t + \beta_2 \ln(\text{SBO\_Turn}_t) + \beta_3 \text{ SBO\_Vol}_t + \beta_4 \ln(\text{Star\_Turn}_t) + \beta_5 \text{ Star\_Vol}_t + \varepsilon_t \quad (4)$$

[9] Specifically, the quoted spread for Star stocks is estimated using the following regression –

$$\text{Star\_QS}_t = \beta_0' + \beta_1' \text{ Star\_Turn}_t + \beta_2' \text{ Star\_Vol}_t + \varepsilon_t' \quad (3')$$

Similarly, the quoted spread for SBO stocks is estimated using the following regression –

$$\text{SBO\_QS}_t = \beta_0'' + \beta_1'' \text{ SBO\_Turn}_t + \beta_2'' \text{ SBO\_Vol}_t + \varepsilon_t'' \quad (3'')$$

Substituting (3') and (3'') into (1) leads to (3). Similar calculations are used for the proportional spread, resulting in (4).

where $\ln(SBO\_Turn_t)$ is calculated as the natural logarithm of daily stock turnover (in euros) for SBO stocks and SBO_Vol_t is the daily volatility, calculated as the natural logarithm of the daily high price / low price for SBO stocks. Both $\ln(Star\_Turn_t)$ and $Star\_Vol_t$ are calculated similarly for Star stocks. $Change_t$ is again a dummy variable that takes the value of one after the structural change, zero otherwise.[10] All variables are calculated using data from 12 months prior to and after the structural change.

Table 2 presents coefficient estimates and adjusted R-squared values for the four regressions. The first two regressions indicate that after controlling for variation in SBO stock spreads (which have a positive effect on Star stock spreads), both the quoted and proportional spreads are reduced after the structural change. Both dummy variables have negative coefficients which are significant at all conventional levels.

The next two regressions, after controlling for turnover and volatility in both the Star and SBO markets, indicate that both the quoted and proportional spreads decline after the structural change. The coefficients for the dummy variables are significantly negative (at all conventional levels). Coefficient estimates for the four explanatory variables are as expected. An increase in turnover in both the Star and SBO markets reduces spreads, although our univariate results indicate that both turnover and spreads decline for Star stocks. An increase in volatility widens spreads. Overall, after controlling for spreads in the SBO market, and other factors affecting spreads in both the Star and SBO markets, both the quoted and proportional spreads are significantly tighter under a specialist rather than auction market structure.

<INSERT TABLE 2>

[10] Dependant variables are as described for the first two regressions.

4. Additional Tests

This section provides several additional tests to examine the robustness of the reduced spread for the specialist market stocks.

4.1 Effect of Firm Size and Industry Affiliation

Much of the literature has suggested that although specialist markets provide lower spreads than dealer markets, the benefit from shifting to a specialist market is greater for smaller firms. As the Italian Bourse already has a segment for large firms in excess of €800 million, known as "Blue Chips", the stocks remaining in the SBO and Star markets are already medium to small capitalization stocks. To examine the impact of firm size, we divide our samples of SBO and Star stocks into two groups. As the average market capitalization of both the Star and SBO samples is approximately €300 million, all stocks with market capitalizations greater than €300 million are considered medium capitalization stocks, while all stocks less than €300 million in capitalization are considered small capitalization stocks. Our analysis around the structural change is then completed separately for small and medium capitalization stocks. The results are presented in Table 3 (market capitalization details), Table 4 (small capitalization stocks) and Table 5 (medium capitalization stocks).

Descriptive market capitalization statistics are presented in Table 3 for all stocks, small capitalization stocks and medium capitalization stocks. The average market capitalization of small stocks is €146.9 million for Star stocks and €142.1 million for SBO stocks. The medium capitalization stocks have an average of €513.7 million for Star stocks and €493.7 million for SBO stocks. The median results also indicate that the within the small and medium groups, there is minimal difference

between the market capitalization of Star and SBO stocks. There is minimal difference in the size of firms that moved to the specialist market or remained in the auction market.

<INSERT TABLE 3>

Descriptive spread and stock statistics are presented in Panel A of both Table 4 and Table 5. The reduction in spreads for small capitalization stocks averages €0.018 (proportional spread falls by 0.1000 percent), while the reduction averages €0.016 (0.1078 percent in proportional spreads) for medium capitalization stocks. Regression results, in Panel B of both tables, are also consistent. All dummy variables are significantly negative across all eight regressions. All turnover variables have negative coefficients, while volatility variables have positive coefficients. The reduction in spreads occurs for both small and medium capitalization stocks.

<INSERT TABLE 4>

<INSERT TABLE 5>

Extending the role of firm size, a large firm in a particular industry sector may be considered a small firm in another industry sector. To examine if the market capitalization of a firm within a particular industry sector affects spreads, we perform a matching procedure with our two samples. For each Star stock, we find all SBO stocks in the same industry sector. From all possible matches, we select the SBO stock with a market capitalization closest to the capitalization of the Star stock. We do this for all 20 Star stocks. The regression results are presented in Table 6.

The results in Table 6 are consistent with the full sample results. After controlling for spread changes in the matched SBO stocks, spreads for the Star stocks still show considerable reductions, with both dummy variables significantly negative. The last two regressions, after controlling for turnover and volatility of both the SBO

and Star matched stocks, again indicates a decline in spreads, with both dummy variables significantly negative. The reduction in spreads when stocks move from an auction market to a specialist market is thus robust to both the size and industry affiliation of the firm.

<INSERT TABLE 6>

4.2 Length of Event Window

Over time, a stock's characteristics vary. Thus, the event window in which variables are measured is important. A 12 month pre- and post- event window could include significant variation in turnover and volatility. To examine the sensitivity of our results to the length of the event window, we calculate all variables for both three and six months before and after the structural change. We then re-estimate all four regressions separately for the three month and six month event windows. The results are presented in Table 7.[11]

The three month results are presented in Panel A. Consistent with earlier findings, all four regressions have significantly negative coefficients for the dummy variable. Unlike with the previous regressions though, all turnover explanatory variables are insignificantly negative, while only the Star volatility variables are significantly positive (the SBO volatility variables are positive, but not significantly different from zero). The six month results are presented in Panel B. As with the three month results, all dummy variables are significantly negative, indicating a reduction in spreads around the structural change. All explanatory variables are significantly different from zero in their proposed directions, except for the SBO variables in the third regression, which are insignificantly different from zero

[11] For space considerations, we only include regression results. Descriptive statistics similar to those presented earlier in the paper are calculated, and are consistent with our initial results. These results are available upon request.

(although in their expected direction). We conclude that our finding of a reduction in spreads when stocks switch to a specialist market is robust to the length of the event window.

<INSERT TABLE 7>

4.3 Control with the 'New Market'

It is possible that market wide events are narrowing spreads. Over the transition period, trading in the New Market continued normally. Although New Market stocks are generally high-growth, high-volatility stocks, if spreads and other stock characteristics exhibit systematic changes over the same event window, overall market forces could be driving the decline in spreads for Star stocks. To examine this possibility, we analyze a sample of stocks trading on the New Market over the same time period. The results are presented in Table 8.

As the New Market commenced trading in June 1999, only six stocks traded for the full two year period around the structural change. As the previous section shows that our results are robust over both three and six month event windows, to increase the number of stocks included we present results for the 13 stocks that traded for the entire six months prior to and after the change. Descriptive statistics are presented in Panel A of Table 8. Similar to Star and SBO stocks, the quoted spreads decline over the period (with a reduction of €0.15). After adjusting for the stock price, results indicate an increase in proportional spread, although this increase is not significantly different from zero. Both turnover and volatility experience minimal variation around the structural change.

The four regressions used previously are estimated, New Market variables replacing SBO variables. The results from all four regressions indicate that spreads in

Star stocks decline after they commence trading in the specialist market. Unlike with the SBO variables, the New Market turnover and volatility variables have coefficients insignificantly different from zero for the final two regressions. We thus confidently conclude that factors affecting the market overall are not driving the reduction in spreads for Star stocks.[12]

<INSERT TABLE 8>

4.4 The Role of Effective Spreads

Much of the previous literature has calculated effective spreads. Effective spreads capture the actual cost of executing trades when some transactions occur inside the best bid and ask quotes. Prior to the structural change, all trading took place on an electronic auction market. Thus, no transactions occurred within the best quotes, and the effective spread equals the quoted spread. Before and after comparisons of the effective spread are meaningless. However, our results indicate that quoted spreads (both euro and proportional) are reduced when stocks move to the specialist market. If the specialist allows trades to occur inside the spread, the effective spreads will be lower than the quoted spreads after the structural change, providing further evidence of the benefits of a specialist market structure.

To examine this issue, we calculate the effective quoted half spread as [Transaction Price – (Ask + Bid) / 2], and compare this to the quoted half spread, calculated as (Ask – Bid) / 2 for the 20 Star stocks in the 12 months after the structural change. We also calculate the effective percentage half spread as [Transaction Price – (Ask + Bid) / 2] / (Ask + Bid) / 2, and compare this to the

[12] We also test the impact of the New Market over three and 12 month periods around the structural change. With the three month period, 18 stocks are included, whilst there are only six stocks for the 12 month period. Under both alternatives, results are qualitatively similar. There is strong evidence that the quoted and proportional spreads decline when stocks commence trading in the specialist Star market. These results are readily available upon request.

proportional quoted half spread calculated as [(Ask – Bid) / 2] / (Ask + Bid) / 2, again for the 20 Star stocks. The results are presented in Table 9.

The comparison of the quoted half spread with the effective half spread indicates that effective spreads are lower than quoted spreads. The half spread averages €0.022, while the effective spread averages €0.018. The difference of €0.0034 is significantly different from zero. Percentage spread results are consistent. The difference between proportional and effective spreads of 0.0863 percent is significantly different from zero. Thus the specialist's ability to offer price improvement over the best quotes provides an even lower cost of trading than was attainable in the auction market.[13]

<INSERT TABLE 9>

5. Summary

Several studies have compared the differences in bid-ask spreads for stocks listed on the NYSE and Nasdaq. The majority of these studies show that the cost of executing trades is lower on the NYSE. However, the nature of trading on the NYSE is ambiguous, sometimes referred to as an auction market and other times a specialist market. The existence of a limit order book 'competing' with the specialist further complicates the comparison of spreads with other market structures. On the 2 April, 2001, a structural change was implemented on the Italian Bourse. Many stocks that traded in an auction market switched to a specialist market (Star), while other stocks remained in an auction market (SBO). As the Star specialist controls, rather than competes with the limit order book, we have a 'natural' experiment where the impact of a specialist's involvement on the bid-ask spread can be ascertained.

[13] We also compare effective and quoted spreads using three and six month event windows after the structural change. The results from this are consistent with the 12 month results, and are available upon request.

Our results indicate that spreads tighten when stocks move from an auction market to a specialist market. After controlling for the bid-ask spread, the turnover and the volatility in the SBO and Star markets, both the quoted and proportional Star spreads exhibit considerable reductions after the structural change. This reduction in spreads is robust to the market capitalization of the stock, the firms' industry affiliation and the event window around the structural change. Using the New Market to control for market wide factors, we confirm the reduction in spreads for Star stocks. The specialist, in allowing price improvement within the best quotes, is further reducing the cost of executing trades. We conclude that bid-ask spreads are tighter with a specialist. Compared to an auction market, a specialist market proves more advantageous to market participants.

Appendix

This table lists the ticker symbols for the 20 stocks that switched to the Star market on 2 April, 2001 (Panel A) and the 57 stocks which remained in the ordinary SBO market (Panel B).

Panel A: Star stocks				
AMG	CMB	IMA	MRT	RG
BFE	CRM	IP	NM	RM
BRE	CSP	JH	PEL	SG
CEM	DMH	LD	PIN	STEF
Panel B: SBO stocks				
ACS	ENR	IZ	RIC	TFI
ARN	FDP	MCL	RON	VEM
ASR	GC	MF	SAD	VIN
B	GEM	MFNC	SCH	VLA
BAN	GI	MON	SIT	ZUC
BDB	GNV	OLI	SMI	
BE	IFP	PAG	SMU	
BRI	IGV	PF	SN	
CARR	IML	PINF	SNA	
CLE	IMS	PMS	SOL	
COF	IPG	POL	SPF	
CRA	ITH	PRO	SPO	
DAN	ITK	RAT	SSL	

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Table 1
Descriptive Statistics
This table reports descriptive statistics (number of stocks, quoted and proportional spread, closing price, daily volume, daily turnover and daily volatility) for the 20 Star and 57 SBO stocks. Stocks are included if they traded continuously for 12 months prior to and after the 2 April, 2001 structural change. Volatility is calculated as the natural logarithm of the ratio of daily high to low stock prices. For each variable, the table reports the mean, median and change in mean for the 12 months before and after the structural change. Statistical significance emanates from the test of whether the mean change is significantly different from zero.

	Star market		SBO market	
	Before	After	Before	After
Number of stocks	20		57	
Quoted spread (€)				
Mean	0.059	0.043	0.052	0.038
Median	0.055	0.042	0.051	0.038
Mean change	-0.016**		-0.014**	
Proportional spread (%)				
Mean	1.122	1.039	1.320	1.344
Median	1.062	1.016	1.276	1.307
Mean change	-0.0830**		0.0240	
Closing price (€)				
Mean	5.35	4.43	4.43	3.47
Median	5.38	4.36	4.45	3.22
Mean change	-0.92**		-0.96**	
Daily volume (shares)				
Mean	111,612	94,034	275,645	234,402
Median	107,328	89,034	211,717	189,742
Mean change	-17,578		-41,243	
Daily turnover (€)				
Mean	555,827	363,457	845,462	684,445
Median	422,429	319,842	617,682	519,683
Mean change	-192,370**		-161,017**	
Daily volatility (%)				
Mean	2.810	2.654	3.058	3.029
Median	2.730	2.493	2.891	2.829
Mean change	-0.1560*		-0.0290	

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Table 2
Multiple Regression Results
This table reports results from the four regressions for the 20 stocks that moved from an auction market to the specialist Star market on the 2 April, 2001. Stocks are included if they traded continuously for 12 months prior to and after the structural change. The dependant variable is measured as the quoted euro spread for the Star stocks in the first and third regressions, while it is measured as the proportional quoted spread in the second and fourth regressions. The change dummy variable takes the value of one after the structural change, zero otherwise. The SBO spread variable is the quoted euro spread for the first regression, and the proportional quoted spread for the second regression. The third and fourth regressions include the natural logarithm of the euro turnover for Star and SBO stocks, as well as the percentage volatility, measured as the natural logarithm of the ratio of daily high to low stock prices, again for Star and SBO stocks. All variables are calculated using data from 12 months prior to and after the structural change. For each regression, coefficient estimates, statistical significance and adjusted R-squared values are reported.

Dependant variable	Intercept	Change	SBO spread	SBO turnover ln(€)	SBO volatility (%)	Star turnover ln(€)	Star volatility (%)	Adj. R^2
Star quoted spread (€)	0.0281**	-0.0072**	0.5884**					0.3660
Star proportional spread (%)	0.0041**	-0.0009**	0.5350**					0.4060
Star quoted spread (€)	0.0430**	-0.0170**	--	-0.0050*	0.5492**	-0.0047*	0.3551*	0.3560
Star proportional spread (%)	0.0084**	-0.0011**	--	-0.0011**	0.0870**	-0.0012**	0.1327**	0.3833

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Table 3
Market Capitalization
This table reports descriptive market capitalization statistics for the 20 stocks that moved from an auction market to the Star specialist market on the 2 April, 2001, and the 57 stocks which remained in the ordinary SBO auction market. Stocks are included if they traded continuously for 12 months prior to and after the structural change. Stocks with market capitalizations below the overall mean are moved into the small stock segment, while stocks with market capitalizations above the overall mean are moved into the medium stock segment. For each Star and SBO sample, the table reports the mean, minimum, median and maximum value, calculated on the trading day prior to the structural change. All amounts shown are in millions of euros.

	Mean	Minimum	Median	Maximum
All stocks *(20 Star, 62 SBO)*				
Star	296.9	37.08	258.8	724.5
SBO	277.9	16.73	146.0	798.5
Small stocks *(12 Star, 42 SBO)*				
Star	146.9	37.08	135.0	293.2
SBO	142.1	16.73	125.4	286.8
Medium stocks *(8 Star, 15 SBO)*				
Star	513.7	305.5	556.8	724.5
SBO	493.7	309.8	491.6	798.5

Table 4
Small Stock Segment
This table reports descriptive statistics, including quoted and proportional spread, turnover and volatility (Panel A) and regression results (Panel B) for small Star and SBO stocks, as classified in Table 3. Stocks are included if they traded continuously for 12 months prior to and after the 2 April, 2001 structural change. For each variable, the table reports the mean and median (in parentheses) for the 12 months before and after the structural change, and the change in mean values. Statistical significance emanates from the test of whether the mean change is significantly different from zero. In the regressions, the dependant variable is measured as the quoted euro spread for the Star stocks in the first and third regressions, while it is measured as the proportional quoted spread in the second and fourth regressions. The change dummy variable takes the value of one after the structural change, zero otherwise. The SBO spread variable is the quoted euro spread for the first regression, and the proportional quoted spread for the second regression. The third and fourth regressions include the natural logarithm of the euro turnover and percentage volatility for Star and SBO stocks. For each regression, coefficient estimates, statistical significance and adjusted R-squared values are reported.

A. Descriptive statistics	Mean before (Median before)	Mean after (Median after)	Mean change
Quoted spread (€)	0.068 (0.04)	0.050 (0.03)	-0.018**
Proportional spread (%)	1.254 (1.046)	1.154 (1.016)	-0.1000**
Turnover (€)	281,528 (139,162)	224,888 (104,480)	-56,639**
Volatility (%)	2.514 (2.207)	2.309 (2.074)	-0.2050**

Table 4, continued

B. Regressions	Intercept	Change	SBO spread	SBO turnover ln(€)	SBO volatility (%)	Star turnover ln(€)	Star volatility (%)	Adj. R^2
Star quoted spread (€)	0.0376**	-0.0134**	0.4072**					0.3565
Star proportional spread (%)	0.0030**	-0.0004*	0.6157**					0.4448
Star quoted spread (€)	0.1598**	-0.0194**	--	-0.0050**	0.4447**	-0.0046*	0.3604*	0.3688
Star proportional spread (%)	0.0346**	-0.0010**	--	-0.0013**	0.0788**	-0.0015*	0.1633*	0.4260

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Table 5
Medium Stock Segment
This table reports descriptive statistics, including quoted and proportional spread, turnover and volatility (Panel A) and regression results (Panel B) for medium Star and SBO stocks, as classified in Table 3. Stocks are included if they traded continuously for 12 months prior to and after the 2 April, 2001 structural change. For each variable, the table reports the mean and median (in parentheses) for the 12 months before and after the structural change, and the change in mean values. Statistical significance emanates from the test of whether the mean change is significantly different from zero. In the regressions, the dependant variable is measured as the quoted euro spread for the Star stocks in the first and third regressions, while it is measured as the proportional quoted spread in the second and fourth regressions. The change dummy variable takes the value of one after the structural change, zero otherwise. The SBO spread variable is the quoted euro spread for the first regression, and the proportional quoted spread for the second regression. The third and fourth regressions include the natural logarithm of the euro turnover and percentage volatility for Star and SBO stocks. For each regression, coefficient estimates, statistical significance and adjusted R-squared values are reported.

A. Descriptive statistics	Mean before (Median before)	Mean after (Median after)	Mean change
Quoted spread (€)	0.045 (0.023)	0.029 (0.019)	-0.016**
Proportional spread (%)	0.9553 (0.7269)	0.8475 (0.7014)	-0.1078**
Turnover (€)	739,680 (471,567)	523,544 (369,314)	-216,136**
Volatility (%)	3.065 (2.541)	2.754 (2.221)	-0.3115**

Table 5, continued

B. Regressions	Intercept	Change	SBO spread	SBO turnover ln(€)	SBO volatility (%)	Star turnover ln(€)	Star volatility (%)	Adj. R^2
Star quoted spread (€)	0.0181**	-0.0032*	0.3573**					0.3220
Star proportional spread (%)	0.0053**	-0.0007**	0.4436**					0.2464
Star quoted spread (€)	0.0593	-0.0092**	--	-0.0025	0.3264*	-0.0010	0.7721**	0.2389
Star proportional spread (%)	0.0245**	-0.0013**	--	-0.0010**	0.0838**	-0.0005	0.0946**	0.2890

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Table 6
Size and Industry Matched Sample
This table reports results from the four regressions for the 20 stocks that moved from an auction market to the specialist Star market on the 2 April, 2001. Stocks are included if they traded continuously for 12 months prior to and after the structural change. The SBO sample is based on a matching procedure with the 20 Star stocks. First all SBO stocks are grouped according to industry affiliation. Then for each Star stock, the SBO stock from the same industry group, and with a market capitalization as close as possible to the Star stock, is selected. This results in a matched Star – SBO sample of 20 stocks. From this sample, the dependant variable is measured as the quoted euro spread for the Star stocks in the first and third regressions, while it is measured as the proportional quoted spread in the second and fourth regressions. The Change dummy variable takes the value of one after the structural change, zero otherwise. The SBO spread variable is the quoted euro spread for the first regression, and the proportional quoted spread for the second regression. The third and fourth regressions include the natural logarithm of the euro turnover and percentage volatility for Star and SBO stocks. For each regression, coefficient estimates, statistical significance and adjusted R-squared values are reported.

Dependant variable	Intercept	Change	SBO spread	SBO turnover ln(€)	SBO volatility (%)	Star turnover ln(€)	Star volatility (%)	Adj. R^2
Star quoted spread (€)	0.0326**	-0.0078**	0.5835**					0.2564
Star proportional spread (%)	0.0048**	-0.0012**	0.559**					0.4415
Star quoted spread (€)	0.1595**	-0.0203**	--	-0.0030*	0.7942**	-0.0076**	0.5631**	0.2687
Star proportional spread (%)	0.0344**	-0.0016**	--	-0.0013**	0.1324**	-0.0011**	0.1774**	0.3974

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Table 7
Sensitivity to Event Window
This table reports results from the four regressions for the 20 stocks that moved from an auction market to the specialist Star market on the 2 April, 2001. Stocks are included if they traded continuously for 12 months prior to and after the structural change. The dependant variable is measured as the quoted euro spread for the 20 Star stocks in the first and third regressions, while it is measured as the proportional quoted spread in the second and fourth regressions. The change dummy variable takes the value of one after the structural change, zero otherwise. The SBO spread variable is the quoted euro spread for the first regression, and the proportional quoted spread for the second regression. The third and fourth regressions include the natural logarithm of the euro turnover and percentage volatility for Star and SBO stocks. All variables are calculated using data from three months (Panel A) and six months (Panel B) around the structural change. For each regression, coefficient estimates, statistical significance and adjusted R-squared values are reported.

Dependant variable	Intercept	Change	SBO spread	SBO turnover ln(€)	SBO volatility (%)	Star turnover ln(€)	Star volatility (%)	Adj. R^2
Panel A: 3 month window								
Star quoted spread (€)	0.0332**	-0.0080**	0.3864**					0.2087
Star proportional spread (%)	0.0064**	-0.0013**	0.3607**					0.4215
Star quoted spread (€)	0.0645	-0.0070*	--	0.0009	0.0314	-0.0036	0.7995*	0.1734
Star proportional spread (%)	0.0187*	-0.0007*	--	-0.0004	0.0635	-0.0007	0.1615**	0.4273
Panel B: 6 month window								
Star quoted spread (€)	0.0331**	-0.0107**	0.4862**					0.2606
Star proportional spread (%)	0.0047**	-0.0009**	0.4841**					0.2871
Star quoted spread (€)	0.1308**	-0.0121**	--	-0.0009	0.2600	-0.0071*	0.8344*	0.2582
Star proportional spread (%)	0.0279**	-0.0007*	--	-0.0011*	0.1018**	-0.0009*	0.2102*	0.4178

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Table 8
Control with the New Market
This table reports descriptive statistics, including quoted and proportional spread, turnover and volatility (Panel A) and regression results (Panel B) for Star and New Market stocks. Star stocks are included if they traded continuously for 12 months prior to and after the 2 April, 2001 structural change, while New Market stocks traded continuously for six months prior to and after the change. For each variable, the table reports the mean, median (in parentheses) and change in mean for the six months around the structural change. Statistical significance emanates from the test of whether the mean change is significantly different from zero. In the regressions, the dependant variable is measured as the quoted euro spread for the Star stocks in the first and third regressions, while it is measured as the proportional quoted spread in the second and fourth regressions. The change dummy variable takes the value of one after the structural change, zero otherwise. The New Market spread variable is the quoted euro spread for the first regression, and the proportional quoted spread for the second regression. The third and fourth regressions include the natural logarithm of the euro turnover and percentage volatility for Star and New Market stocks. All variables are calculated using data from six months around the structural change. For each regression, coefficient estimates, statistical significance and adjusted R-squared values are reported.

A. Descriptive statistics	Mean before (Median before)	Mean after (Median after)	Mean change
Quoted spread (€)	0.434 (0.41)	0.284 (0.27)	-0.150**
Proportional spread (%)	0.5342 (0.4971)	0.6136 (0.5868)	0.0794
Turnover (€)	1,131,166 (851,067)	1,167,845 (792,485)	36,679
Volatility (%)	3.918 (3.657)	4.172 (4.078)	0.2540

Table 8, continued

B. Regressions	Intercept	Change	New Market spread	New Market turnover ln(€)	New Market volatility (%)	Star turnover ln(€)	Star volatility (%)	Adj. R^2
Star quoted spread (€)	0.0496**	-0.0078*	0.0283*					0.1527
Star proportional spread (%)	0.0089**	-0.0018**	0.4039**					0.3115
Star quoted spread (€)	0.0893*	-0.0061*	--	-0.0012	0.2228	-0.0041	1.108**	0.2658
Star proportional spread (%)	0.0050**	-0.0010**	--	-0.0007	0.0123	-0.0006	0.2424**	0.4639

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Table 9
Effective Spreads
This table reports quoted and effective half spreads (both euro and percentage) for the 20 stocks that moved from an auction market to the Star specialist market. Stocks are included if they traded continuously for 12 months prior to and after the 2 April, 2001 structural change. For each measure, the mean, median and mean difference is reported. Statistical significance emanates from the test of whether the mean difference between the effective and quoted spread is different from zero.

	Half spreads (€)		Half spreads (%)	
	Quoted	Effective	Quoted	Effective
Mean	0.022	0.018	0.5537	0.4674
Median	0.014	0.009	0.4380	0.3114
Mean difference	-0.004**		-0.0863**	

** Indicates statistical significance at the 0.01 level
* Indicates statistical significance at the 0.05 level

Figure 1
Proportional Quoted Spreads
This figure depicts the average proportional quoted spread for the 20 stocks that moved from the auction market to the Star specialist market on the 2 April, 2001, and the 57 stocks which remained in the ordinary SBO auction market. Day zero is the first day of trading in the Star market.