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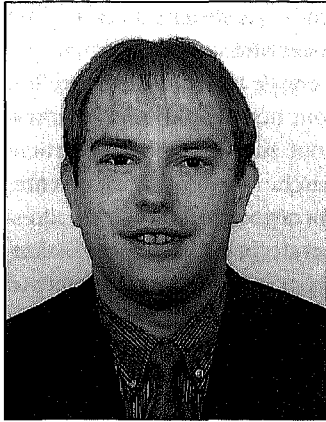
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Competition between Auction and Dealership Markets :

Brussels versus London

SUMMARY

Since 1990, London's SEAQ International has been attracting considerable trading volume in Belgian equities. We investigate competition between the Brussels CATS market and SEAQ International by using transactions, quotation, and limit order book data. We provide evidence on total trading costs on both exchanges. Therefore, we focus on indirect as well as direct trading costs. CATS indirect trading costs are lower than on SEAQI. The CATS indirect trading costs increase with trade size. The latter holds more for non-cross listed shares. Total trading costs on CATS are lower (higher) for small (large) trade sizes.

I. INTRODUCTION

In 1985, the London Stock Exchange started SEAQ International (the Stock Exchange Automated Quotation (SEAQI))¹, a screen-based dealership market devoted to shares of non-UK companies. London's SEAQI captured considerable trading volume from the continental exchanges in non-UK equities (see e.g. Worthington (1991)). 1990 was the first year in which shares of some major Belgian companies were quoted on SEAQI. At the end of 1994, SEAQI denotes about 1,204 non-UK companies on its screens of which 14 Belgian ones. Authorities and market participants of the domestic continental exchanges reacted by modernising and adapting their trading systems as brokers wanted to regain the market share lost to London. The Brussels Stock Exchange also experiences this competitive pressure.

In this paper, we investigate competition between the quote driven SEAQI and the order driven Brussels CATS system (Computer Aided Trading System). We obtained a simultaneous record of quotes, limit orders and transactions in both Brussels and London. This allows us to compare the cost

of trading Belgian shares on CATS and on SEAQI. The cost of a trade has at least two components. The first is the commission cost. Commission rates on both exchanges are freely negotiable.² The second is an indirect trading cost called the bid-ask spread. The latter arises because, generally, in selling even a modest amount of shares one gets a lower price than one has to pay to buy it. We update the results of Anderson and Tychon (1993). In addition, we investigate the relation of indirect trading costs with trade size.

This paper proceeds as follows. Section II discusses a framework for competition among exchanges. Section III focuses on the trading volume of Belgian shares. We investigate whether SEAQI has diverted trade away from Brussels or not. Section IV studies total trading costs while section V presents some concluding remarks.

II. COMPETITION AMONG EXCHANGES

II.1. Theoretical framework

Historically, stock trading was geographically dispersed in regional exchanges. Traders had to acquire information about locally operating firms. They incurred transportation and other costs as their physical presence on the floor was needed. The progress in information dissemination and trading technology challenged the concentration of trading in regional exchanges. Nowadays, trading floors all around the world are accessible to professional investors at comparable costs to local mar-

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¹ We use the notation SEAQI to distinguish SEAQ International from SEAQ.

² Before October 21, 1994, the Brussels Stock Exchange experienced fixed commissions on transactions in shares except for large volumes. Now, commission rates are freely negotiable.



kets. The question whether information is partly localised remains. The high speed communications facilities enable to monitor prices on other exchanges. As a result, the nature of competition has changed. In former years, brokers competed within a single trading market. Today, competition not only occurs between brokers within one exchange but also trading markets compete. Additional competitive forces also arise from derivative markets (see Stoll (1992)).

The dispersal of equity trading ultimately has two effects. First, it causes *fragmentation* as orders in one market are unable to trade with orders in other markets. This implies a lower liquidity such that fragmentation in case of perfect competition, is welfare reducing (Pagano (1989)). The fragmentation effect appears *within* the same as well as across financial centers. For instance, the co-existence of a dealership and auction market within the same exchange causes fragmentation. The latter effect, however, can be reduced by requiring adequate links between the dealership and auction market. A regulatory policy of interlinking markets is not obvious *across* financial centres of different countries. Secondly, it creates additional *competition*. The latter has beneficial effects as it lowers costs and spurs innovation (Stoll (1992)).

Competition between market makers *within one market* has received considerable attention. Grossman and Miller (1988) argue that a higher number of market makers leads to lower spreads as the fundamental asset risk becomes more *diversified* among market makers. Dennert (1993) focuses on price competition between market makers. He models competition between market makers in one financial market, with liquidity and informed traders. A higher number of market makers increases the *risk exposure* of the individual market maker as informed traders can 'exploit' their information with every market maker. Therefore, an increase in the number of market makers induces higher transactions costs for the liquidity traders. As a conclusion, the relation between the

number of market makers and the liquidity depends on the *risk-exposure* and the *risk-diversification* effect.

Gehrig, Stahl and Vives (1994) analyze competition *among exchanges* in an environment where investors enjoy a local informational advantage. This informational segregation is a source of horizontal differentiation yielding potential for the co-existence of exchanges. Next, two forces introduce vertical differentiation in the analysis. First, a large market introduces potential for portfolio diversification. Secondly, the beneficial liquidity externality increases the appeal of the dominant stock exchange. Therefore, in the absence of informational segregation, and at the same commission cost, all traders prefer the exchange offering the highest liquidity and the largest diversified portfolio. Informed traders have several avenues to exploit their private information if a security is traded at multiple locations (Chowdry and Nanda (1991)). Therefore, one can expect an increase of informed trading if a stock is cross-listed.

II.2. Trading systems

II.2.1. The Brussels CATS market

The Brussels Stock Exchange is organized as a continuous market, called the CATS system.³ The CATS computer system continuously provides information on the market and processes all orders. At 10:00 in the morning, trade starts with a batch auction followed by continuous trading from 10:00 till 16:30. The CATS system is an *order driven* system as traders submit orders before prices are determined (Madhavan (1992)).

Traders can submit two types of orders, limit orders and market orders. A limit order specifies a quantity of shares to be bought or sold at a pre-specified price. Priority is given according to price and time of submission. The exact quantity of shares offered or asked at the limit prices, however, is not necessarily known to traders. Extra liquidity is supplied to the market by 'hidden orders': i.e. portions of limit orders that are there to be executed against but are invisible to the users of CATS (Röell (1992)).

³ Trading on the Brussels Stock Exchange can be performed on a spot basis (contantmarkt) or on a forward basis (CATS). The focus of this study is the dominating CATS market.

TABLE 1 : Selected companies

Company	code	entry on CATS	SEAQI date
Barco	BAR	04/07/89	
BBL	BBL	07/05/92	
Bekaert	BEK	04/04/89	
CBR	CBR	07/02/89	09/90-12/91 03/92
CMB	CMB	08/10/91	
Cock.Sam.	COKP	06/06/89	
Colruyt	COL	05/07/90	
Delhaize	DEH	07/03/89	09/90-12/91 03/92
Electrabel*	ELB	10/12/90	12/90-12/91 03/92
Electrafina	ELC	23/05/89	
Fortis	FOR	06/03/90	05/93
Gen.Bank	GBK	07/06/90	03/92
GBL	GBL	16/03/89	09/90-12/91 03/92
Gevaert	GEV	04/04/89	
GB INNO BM	GIB	24/01/89	09/90-12/91 03/92
Kredietbank	KB	07/05/92	01/90
Petrofina	PET	20/04/89	09/90
Powerfin**	PWF	22/01/90	
Roy.Belge	RB	06/03/90	
Soc.Gen.	SGB	04/07/89	09/90-12/91 03/92
Solvay	SOL	24/01/89	09/90-12/91 03/92
Tessen. chemie	TES	04/04/89	
Tractebel	TRC	24/01/89	09/90-12/91 03/92
UCB	UCB	07/02/89	
Union Min.	UM	06/06/89	08/93

* merger of Ebes and Intercom

**before 22/01/90 Unerg

Traders like to hide part of their large orders in this way so as not to alarm market participants. Market orders are executed against the best limit orders outstanding. The exchange uses a discriminatory price rule. In other words, market orders are executed at successive prices determined by limit orders on the book ranked by price priority and time of submission.⁴ Hence, each inframarginal limit order is executed at its own limit price. A trader submitting a market order runs execution risk for two reasons (Pagano and Röell (1993a)). First, he does not know what price he will receive. Secondly, he is uncertain about the actual execution of his order.⁵ The latter also holds if one submits a limit order.

4 Brokers do not know the identity of the counterparty.

5 This occurs if, for instance, the limit order book is insufficiently deep. For very liquid shares, this risk is approximately zero.

6 The London Stock Exchange can allow 'firm' quotation even when there are only two market makers. The mandatory quote period for Belgian stocks is 9:30-15:30 London time.

7 The transactions data for London, however, do not include Arbed.

II.2.2. SEAQ International (SEAQI)

SEAQI is a quotation system operated by the London Stock Exchange. It is a *dealership market* where market makers are obliged to quote 'firm' prices. Quotes are firm if there are more than two market makers.⁶ Market makers are obliged to maintain quotes during the mandatory quote period for at least minimum marketable quantities. A market maker displaying a price for a larger size must be prepared to deal at that price and size. Trading in shares on SEAQI takes place by telephone. SEAQI is a *quote driven* market as dealers post prices before order submission (Madhavan (1992)). Traders know at what price they will trade and therefore face no execution risk (Pagano and Röell (1993a)). As of December 1994, 14 Belgian stocks were quoted on SEAQI.

III. TRADING VOLUME

The focus of our analysis is on the Belgian shares that are denoted on SEAQI. The Belgian section on SEAQI in June 1994 includes 14 shares plus Arbed.⁷ As we have no data for Brussels for the warrant of Petrofina, we excluded it from our data set. For the Brussels CATS market, we selected 25 Belgian shares with the greatest trading volume in 1993. This enables us to evaluate the impact of SEAQI on the trading volume on CATS. Table 1 reports the selected shares, their date of entry on CATS, and the period of firm quotation on SEAQI. The evolution of trading volume during 1990-1994 is given in Table 2.

Trade in foreign shares on the Brussels Stock Exchange accounts for approximately 22%. Note that the 25 Belgian shares account for about 83% of total domestic trading volume. The cross-listed shares take about 60% of total domestic trading volume. The annual volumes for the Belgian shares on SEAQI are presented in Table 3. We divide the volumes reported by SEAQI by 2 to make them more comparable to Brussels volumes.⁸ SEAQI has been successful in attracting trading volume in Belgian stocks. It trades around 110 mia BF per year implying 45% of trading volume on Brussels' spot and for-



TABLE 2 : Annual Volumes Brussels (mioBF)

	1990	1991	1992	1993	1994
Total Brussels	319185	289999	315556	494438	553758
spot %	25.00%	22.29%	16.73%	13.92%	11.16%
forward %	75.00%	77.71%	83.27%	86.08%	88.84%
Foreign stocks %	29.28%	24.80%	17.66%	21.64%	22.55%
Domestic stocks %	70.72%	75.20%	82.34%	78.36%	77.45%
Cross-listed firms					
CBR	5981	6235	6733	16364	19170
DEH	12140	20840	26866	27722	21535
ELB	11794	14809	23495	37575	40291
FOR	4774	3015	4164	9998	11612
GBK	2816	7645	17057	20022	25042
GBL	4880	3904	3772	8599	10089
GIB	6968	8324	11245	16108	13430
KB	2380	2683	10335	18924	17377
PET	20182	29794	33367	26419	27330
SGB	10711	7457	5834	14976	14529
SOL	11846	12158	11113	19594	27633
TRC	3271	3670	3757	14965	10908
UM	4053	3084	3863	9943	30304
(1) Total cross-listed	101795	123616	161601	241210	269252
Other active issues					
BAR	3628	1879	1996	4791	4505
BBL	1937	3432	7187	12884	7919
BEK	5693	3745	5400	10343	15167
CMB	1337	6614	3954	5078	6264
COKP	3709	1966	1796	5199	9505
COL	2241	4401	5845	8078	6406
ELC	2537	2479	2783	3600	6062
GEV	2021	1650	1842	3424	4833
PWF	1593	4017	2825	6080	3671
RB	1873	2139	2955	6962	5423
TES	2366	1774	2123	3825	6960
UCB	7390	7510	8428	10064	9070
(2) Total other active	36324	41605	47134	80329	85784
(1)/domestic	45.09%	56.68%	62.19%	62.26%	62.78%
(3)=(1)+(2)	138120	165221	208736	321539	355036
(3)/Domestic	61.18%	75.76%	80.33%	82.99%	82.78%

Source: Brussels Stock Exchange.

ward in the same shares. SEAQI market share declined in 1994 with 5%. The yearly behavior of the individual shares seems to vary a lot.

The deal size statistics for CATS and SEAQI show the following.⁹ The median transaction size on SEAQI is about 8 times larger than on CATS. An average order on SEAQI is around 12 mio BF, while in Brussels around 0.9 mio BF. The mean transaction size is about 13 times larger on SEAQI. Obviously, larger deals are more dominantly present on SEAQI.

An interesting question arises concerning the effect of competition between the quote driven SEAQI, and the order driven CATS system on trading volume. Does a quotation on the SEAQI screens divert trade away from Brussels?¹⁰ As in Anderson and Tychon (1993) and/or Pagano and Röell (1991), we ran the regressions shown in Table 4 below. The data cover the 25 Belgian shares (see Table 1) for the period 01/86 till 12/94. We test whether a variable related to trading activity on SEAQI helps to explain trading volume on the Brussels Stock Exchange. The dependent variable is the monthly trading volume in Brussels per firm. We measure the effect of SEAQI on Brussels trading volume in two alternative ways. The first is by introducing a dummy (SEAQI) taking value 0 before the stock started trading on SEAQI, and 1 afterwards. The second is introducing the trading volume for the relevant share as right hand side variable. A positive (negative) coefficient implies in both regressions that trade on SEAQI is associated with higher (lower) trading in Brussels. We control for other effects as global trading volume, lagged own trading volume, and a time trend. The results show that the SEAQI coefficient is positive and marginally significant.

Therefore, we can conclude that the introduction of a Belgian share on the SEAQI screens does not divert trade away from Brussels. This observation has several explanations. A first possibility is based on the theory of optimal inventory holdings. If SEAQI dealers fulfill large orders, their inventory holdings rise (decrease) above (be-

TABLE 3: Annual volume SEAQI (Belgian Shares)

	1990	SEAQI/Br	1991	SEAQI/Br	1992	SEAQI/Br	1993	SEAQI/Br	1994	SEAQI/Br
	mioBF	%spot+for	mioBF	%spot+for	mioBF	%spot+for	mioBF	%spot+for	mioBF	%spot+for
CBR	552	38.10	1906	30.58	2090	42.17	7892	48.23	6298	32.85
DEH	1649	52.64	7436	35.68	9982	48.84	11311	40.80	12124	56.30
ELB	215	21.03	4960	33.49	10086	51.65	20833	55.44	15520	38.52
FOR	0	0.00	0	0.00	0	0.00	3230	45.51	4813	41.45
GBK	0	0.00	0	0.00	6243	46.46	9240	46.15	12975	51.81
GBL	178	19.00	256	6.56	317	10.13	3182	37.01	5719	56.68
GIB	255	23.26	2479	29.79	3814	45.58	5148	31.96	5223	38.89
KB	762	32.03	2386	88.96	4838	46.81	10671	56.39	8625	49.64
PET	1045	18.27	13962	46.86	13100	39.26	5976	22.62	9008	32.96
SGB	446	21.10	2992	40.12	2425	51.33	9076	60.60	5147	35.43
SOL	253	7.99	2436	20.04	2973	34.99	8659	44.19	11124	40.25
TRC	142	14.54	695	18.93	358	11.69	10600	70.83	2389	21.90
UM	0	0.00	0	0.00	0	0.00	5232	81.44	14443	47.66
TOTAL	5496	25.00	39509	35.96	56224	43.30	111051	47.30	113406	42.12

Source: Brussels Stock Exchange and SEAQ International.

low) a desired level. The latter can be rebalanced through intradealer trade or orders on another stock exchange. The natural place for Belgian shares is the Brussels Stock Exchange. Then, the Brussels Stock Exchange acts as a market of 'last resort' (Pagano and Röell (1993b)). Secondly, informed traders can exploit their private information by several avenues if a security trades at multiple locations (Chowdhry and Nanda (1991)). This can increase the amount of informational trading. Thirdly, the additional competitive pressure can increase the liquidity of a share. Therefore, investors may shift their focus to shares with a higher liquidity increasing trade in those shares and decreasing trades in other shares generating a vicious circle. The latter reasoning seems confirmed by the coefficients of the BEL20. There is some evidence that a share in the BEL20 basket is more actively traded than other shares. The time trend is significant and negative. This implies that shares over time are less frequently traded.

8 Several other studies apply the same procedure as there is some double counting of transactions (Anderson and Tychon (1993), Helbling (1993), Pagano and Röell (1993b)). This double counting may occur as both buyer and seller can report trades to the London Stock Exchange.

9 See Degryse (1995).

10 It is clear that the introduction of a share on SEAQI generates both a trade diversion and trade creation effect. We can only measure the net result.

TABLE 4: The impact of SEAQI on trading volume in Brussels

Dependent Variable: Vol(i,t) Variable		
Constant	-0.914	110.76
t	(-0.01) ^a	(1.01)
Totvol	0.012**	0.095**
t	(4.74)	(4.22)
Vol(i,t-1)	0.438	0.399
t	(1.72)	(1.63)
SEAQI	430.385*	-
t	(2.26)	
VOLSEAQ	-	0.827**
t		(3.04)
CATS	80.451	104.941*
t	(1.90)	(2.23)
BEL20	91.859*	65.18
t	(2.04)	(1.39)
Time	-2.880**	-3.078**
t	(-3.724)	(-4.401)
R ²	0.276	0.307
MDV	703.385	703.385
# obs	2573	2573
Est. Proc.	OLS	OLS

a heteroskedastic-consistent t-statistics between brackets (**) significant at 5 (1)% significance level.

Vol(i,t) : Brussels trading volume of share i in month t (spot plus forward in value terms)

Totvol: Brussels total trading volume in month t (netted out for own volume)

SEAQI: dummy equals 1 if share was SEAQI listed in month t and zero otherwise.

CATS: dummy equals 1 if share was CATS listed in month t and zero otherwise.

VOLSEAQI: Volume of share i on SEAQI divided by two.

BEL20: dummy equals 1 if share was in BEL20 in month i and zero otherwise.



IV. TRADING COSTS

In this section, we compare the liquidity offered by the two exchanges. A market is liquid if traders can quickly buy or sell large numbers of shares when they want, and at low transactions costs. Harris (1990) distinguishes *four* dimensions of liquidity: *width*, *depth*, *immediacy* and *resiliency*. The bid-ask spread for a given number of shares determines the *width*. *Depth* refers to the amount of shares that can be traded at given bid and ask quotes. *Immediacy* refers to the amount of time it takes to carry out a transaction. *Resiliency* is the time it takes before prices revert to former levels after a large order has been received by the market. Subsection IV.1. studies the liquidity (**indirect trading costs**) on both exchanges. First, we describe the dataset obtained from the Brussels and London Stock Exchange. Next, we provide some results on different liquidity measures. For a more rigorous analysis, we refer to Degryse (1995) or Degryse (1996). Subsection IV.2 focuses on **total trading costs** by adding commission costs and indirect trading costs.

IV.1. Comparing liquidity (indirect costs)

IV.1.1. Data description

The Brussels data set consists of two parts, namely data on limit orders and transactions data. First, we observed the CATS *limit order* book during trading days between June 17 and June 30, 1994.¹¹ More specifically, the limit order book was downloaded six times per trading day for 25 shares. This implies 1,500 limit order books. We know the exact time of downloading and observed the limit orders as well as the hidden orders. In addition, the downloaded limit order book reflects greater depth than the best five quotes made available to the market participants. Besides this limit order book, there is a 'terms' market where brokers can post prices and sizes for at least two million BF. Trades on the 'terms' market have to occur at prices between the best bid and ask prices. The 'terms' market, however, is not used intensively.¹² Secondly, we have data concerning transactions on CATS. During the sample period, around

20,000 transactions were carried out on CATS. As the CATS market is a real time system, the transactions data are time stamped.¹³ We also know the broker identification codes allowing us to identify large transactions executed against a series of small transactions. However, we can not identify for all trades whether it was buyer or seller initiated. More details concerning trade size and number of transactions were given above.

The data from the London Stock Exchange cover June 1994. They consist of two parts. The first is a transcription of all changes in the trading screen for all 13 Belgian stocks plus Arbed. There are 1,700 revisions of quotes during the sample period. We know the bid and ask price, their input time, their size, and an identification code of the dealer. As market makers are obliged to quote bid and ask prices, we are able to reconstruct the SEAQI screen at every point during the observation period. The second part consists of the transactions data. During June 1994, 1,344 transactions occurred on SEAQI. The data denote buyer and seller code, transaction time, trade price and size, and whether the dealer acts as principal or agent. As the SEAQI requires no immediate transaction publication, there may be some misreporting of transaction times. Some deals are reported without transaction time.¹⁴

IV.1.2. Measuring liquidity

Liquidity is a concept encountered in the financial market microstructure literature. It incorporates several dimensions. As noted earlier, we distinguish width, depth, immediacy and resiliency. Liquidity is measured by the average trading cost, i.e. the difference between the market price at which an order is executed and the 'mid price' (the expected price unconditional on the size and direction of the order) (op. cit. Pagano and Röell (1993b)). A measure of liquidity is the bid-ask spread (gap between the bid and ask quotes). The literature provides two types of estimates of the bid-ask spread.

- The first is called the *quoted spread*. That is the difference, for a particular trade size, between the lowest ask price and the highest bid price quoted on a market at a

¹¹ The information was downloaded manually from the CATS screen starting at 10:30, 11:30, 12:30, 13:30, 14:30 and 15:30. Downloading the limit order book of 25 shares took around 30 minutes.

¹² During the sample period, only two transactions were executed on the 'terms' market.

¹³ More specifically, the data are time stamped up to ten seconds.

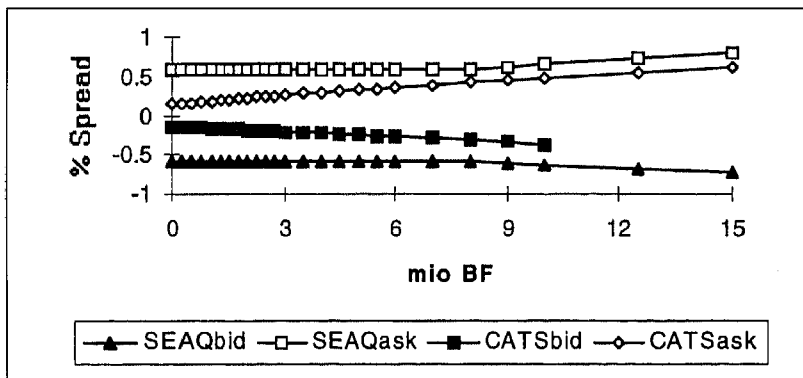
¹⁴ The transactions data include SEAQI as well as off exchange trades. We are not able to separate those two types of transactions. However, the SEAQI trades outnumber the off exchange trades. Therefore, we believe this is not a serious problem.



point in time. The quoted spread represents the cost of an urgent transaction (immediacy). This cost is determined by the limit order book in Brussels and by the market makers quotes in London. A typical example is shown in figure 1. The results for all shares indicate that the quoted spread is substantially smaller on CATS than on SEAQI. However, SEAQI is deeper than CATS. SEAQI exerts competitive pressure on CATS as the cross-listed shares show, after correcting for their larger trading volume, lower spreads than the non-cross-listed ones.

- A second measure of the bid-ask spread is the *effective spread*. The latter is based on transaction prices rather than on quoted prices. The results for the effective spread indicate that it is smaller for CATS than SEAQI. The effective spread on CATS increases with trade size. The difference between CATS and SEAQI, however, is smaller. The SEAQI effective spread is on average about 50% of the SEAQI quoted spread. This implies that most trading takes place within the dealer's quotes.

FIGURE 1 : The quoted spread (CATS and SEAQI quotes for Generale Bank)



IV.2. Total trading costs

Traders submitting orders incur at least two costs, i.e. a direct and an indirect trading cost. The former is measured by the commission rate. In this section, we add both cost components to obtain a picture of the competitiveness of the Brussels CATS and the London SEAQI market.

At the time of gathering the sample, commission rates were to a large extent fixed in Brussels (see Table 5). Therefore, comparing the total trading costs is representative for that period. Since October 21, 1994, commission rates are freely negotiable on

the Brussels Stock Exchange. Some brokers decreased the commission schedule, in particular for larger deal sizes.¹⁵ In order to gain insights in the effects of the liberalization of commission rates, we present the following exercise. We compute total trading costs under the assumption that indirect trading costs remained constant. As proxy for the direct trading costs, we obtained the commission schedule from a large representative bank. We applied this new schedule to investigate the competitive position of the Brussels CATS market.

Before proceeding, we want to point to the following *caveats*. First, under a regime of fixed commissions, brokers are to a large extent compensated for their services via commission rates. Freely negotiable and lower commission rates imply that brokers will search for other revenues. The latter implies that they will try to increase their profits by taking positions. This can have two effects. On the one hand, traders can become more aggressive to make more and larger deals. On the other hand, they can try to earn more on each trade by becoming less aggressive. As a result, lower commission rates may induce a change in the indirect trading costs. Secondly, we apply

TABLE 5: Commission rates.

Brussels (CATS) before 21/10/94	%
Transaction tax	nil*
Commission 200BF plus	
0-5mio BF	0.8
5-10mioBF	0.6
10-20mioBF	0.3
20-30mioBF	0.2
>30mioBF	negotiable
Additional charge	0.03
Brussels (CATS) after 21/10/94	%
Transaction tax	nil*
Commission negotiable	
Additional charge	0.03
London SEAQI	%
Transaction tax	nil
Commission (1994) for Deal Size £	
0-600	3.70
601-2000	1.33
2001-10000	0.61
10001-20000	0.36
20001-50000	0.22
50001-100000	0.17
100001-250000	0.16
250001-1000000	0.14
>1000000	0.15

* 0.17 for non-institutional domestic investors. Source: Brussels Stock Exchange, and London Stock Exchange quarterly.

15 The 'Financieel Economische Tijd' of 10/12/94 provides a short survey of commission schedules. Their conclusion is that the previously fixed commission rates remain for smaller transactions. Commission rates for larger transactions, however, decreased.



the *quoted spread* as a measure for indirect trading costs for two reasons. The first is that the mean trade sizes in Brussels and London differ substantially. Therefore, the effective spread measure is only reliable for larger trade sizes. The second is that applying the same exercise would not yield additional insights. Thirdly, lowering commission rates in Brussels has effects on the strategies of SEAQI dealers. The latter can improve their quotes. In other words, the indirect trading costs on SEAQI may decrease.

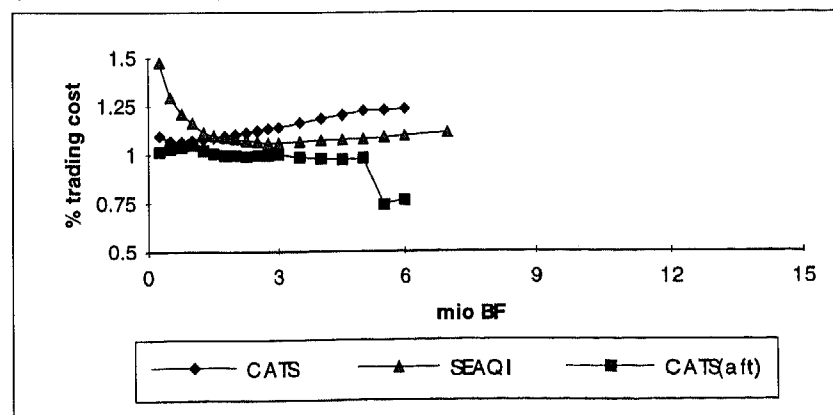
Figure 2 presents the total trading costs on SEAQI and CATS, before and after the liberalization of commission rates. We offer total trading cost measures for CATS up to 6 mio BF and SEAQI up to 7 mio BF as these are the deepest sizes available for all shares. Before October 21, CATS outranges SEAQI for deal sizes up to about 1.5 mio BF. SEAQI provides lower trading costs for larger trades. The CATS percentage trading costs increase with deal size as the quoted spread increases more than the commission schedule decreases. The latter observation would not hold when comparing total trading costs on the basis of the effective spread. Given the caveats mentioned earlier, CATS offers lower trading costs than SEAQI after the liberalisation of the commission rates in Brussels. Therefore, we can conclude that this liberalisation enables brokers to compete with SEAQI dealers for larger deals.

V. CONCLUDING REMARKS

This paper analyzed the markets for Belgian equities on CATS and SEAQI, and their relationship. The quote driven SEAQI market has attracted considerable trading volume in non-UK equities including Belgian ones. The comparison of the CATS auction market and the SEAQI dealership market yields the following results:

- The introduction of a company on SEAQI does not divert trade away from the Brussels CATS market. A possible explanation is that the latter acts as a 'market of last resort'.
- The liquidity of exchanges has different aspects, i.e. immediacy, width, depth, and resiliency. Immediacy can be inferred from analyzing the quoted spreads. The quoted spread for Belgian equities is substantially lower in Brussels than in London. In general, the market is deeper in London than in Brussels.
- The quoted spreads, after correcting for trading volume, are lower for cross-listed shares than for non-cross-listed shares due to the competition between SEAQI and CATS. In other words, the competition effect dominates the fragmentation effect.
- The indirect trading costs based on transaction prices (effective spread) can be substantially lower than the quoted spread. The effective spread is lower in Brussels than in London. The difference, however, is smaller than for the quoted spread. The CATS effective spread increases slightly with trade size.
- The total trading costs before the Brussels liberalization of commission rates were higher for large trades on CATS than on SEAQI. The liberalization, however, enables brokers on the Brussels Stock Exchange to compete with SEAQI dealers for larger trades. Recently, Brussels as well as other continental exchanges regain market share from SEAQI.

FIGURE 2: Trading cost on the basis of the quoted spreads (cross-listed shares)



REFERENCES

- Anderson, R.W. and P. Tychon (1993), Competition among European Financial Markets: The Case of Cross-listed Belgian Equities, *Revue de la Banque/ Bank-en Financieuzen*, 363-376.
- Chowdhry, B. and V. Nanda (1991), Multimarket Trading and Market Liquidity, *Review of Financial Studies* 4, 483-511.
- Degryse, H. (1995), *Essays on Financial Intermediation, Product Differentiation, and Market Structure*, Katholieke Universiteit Leuven Doctoral Dissertation.
- Degryse, H. (1996), The Total Cost of Trading Belgian Shares: Brussels versus London, Cahiers de Recherches Economiques DEEP 9602, Université de Lausanne
- Dennert, J. (1993), Price Competition between Market Makers, *Review of Economic Studies* 60, 735-751.
- De Financieel Economische Tijd, various issues.
- Gehrig, T., K. Stahl and X. Vives (1994), Competing Exchanges, in *The location of Economic activity: New theory and Evidence* (CEPR London).
- Glosten, L. and L. Harris (1988), Estimating the components of the bid/ask spread, *Journal of Financial Economics* 21, 123-142.
- Grossman, S. and M. Miller (1988), Liquidity and Market Structure, *Journal of Finance*, 617-637.
- Harris, L. (1990), Liquidity, Trading Rules, and Electronic Trading Systems, *NYU-Salomon Center Monograph 1990-4*.
- Helbling, T. (1993), The Effects of Foreign Competition on Stock Markets: SEAQ International vs. Switzerland, in Blattner, N., H. Genberg and A. Swoboda (eds.), *Banking in Switzerland*, Physica-Verlag.
- Madhavan, A. (1992), Trading Mechanisms in Securities Markets, *Journal of Finance*, 607-641.
- Pagano, M. (1989), Trading volume and Asset Liquidity, *Quarterly Journal of Economics*, 255-274.
- Pagano, M. and A. Röell (1993a), Auction markets, dealership markets and execution risk, in Conti, V. and R. Hamoui (eds), *Financial Markets' Liberalization and the role of banks*, (Cambridge University Press, Cambridge), 200-212.
- Pagano, M. and A. Röell (1993b), Shifting Gears: an Economic Evaluation of the Reform of the Paris Bourse, in Conti and Hamoui (eds.) *Financial Markets' Liberalisation and the Role of Banks*, (Cambridge University Press, Cambridge), 152-177.
- Stoll, H. (1992), Principles of Trading Market Structure, *Journal of Financial Services Research*, 84-103.
- Worthington, P.M. (1991), Global Equity Turnover: Market Comparisons, *Bank of England Quarterly Bulletin*, 246-249.